ANNEXURE –I

Syllabus of III and IV Semester Courses for Four-Year Multidisciplinary Undergraduate B.Tech. Degree Programme in Civil Engineering

(In view of NEP-2020)

For students admitted in academic session 2025-26 and onwards



03/09/2026

Member Secretary
Academic Council
Jawaharlal Darda Institute of
Engineering & Technology, Yavatmal

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SHRI JAWAHARLAL DARDA EDUCATION SOCIETY'S
JAWAHARLAL DARDA
INSTITUTE OF ENGINEERING AND TECHNOLOGY, YAVATMAL
AN AUTONOMOUS INSTITUTE
Affiliated to Sant Gadge Baba Amravati University, Approved by AICTE, New Delhi and DTE Maharashtra
93VP+PWF: P6, MIDC Area, Lohara, Yavatmal - 445 001, Maharashtra (www.jdiet.ac.in)

1. Vision

To become an epicentre of cultivating creative minds in Chemical Engineering education and research for sustainable development of the region and mankind.

2. Mission

1. To develop technically proficient chemical engineers by providing quality resources, updated teaching learning processes and research acumen.
2. To train technocrats to handle industrial, environmental and societal problems through eco-friendly solutions.
3. To groom technocrats with strong basics to cater the needs of industries and research areas of the nation.
4. To make graduates capable to serve the society better with innovative and economical techniques.

3. Programme Education Objectives

PEO1 - Graduates will be able to fulfil the technical manpower requirements of the chemical engineering sector locally and globally.

PEO2 - Graduates will be able to apply mathematical, scientific and technical concepts to solve problems in chemical engineering and allied sectors.

PEO3 - Graduates will be able to adopt a multidisciplinary and research-based approach to develop cutting-edge chemical technologies and products to meet changing needs.

PEO4 - Graduates will be able to pursue lifelong learning in the domains of chemical, environmental, energy, economics and management.

PEO5 - Graduates will be able to work effectively in teams and demonstrate communication skills, leadership, entrepreneurship, moral ethics and social values through participation in co-curricular activities.

4. SDG of United Nation

1. **No Poverty:** End poverty in all its forms everywhere.
2. **Zero Hunger:** End hunger, achieve food security, improve nutrition, and promote sustainable agriculture.
3. **Good Health and Well-being:** Ensure healthy lives and promote well-being for all at all ages.
4. **Quality Education:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities.
5. **Gender Equality:** Achieve gender equality and empower all women and girls.
6. **Clean Water and Sanitation:** Ensure availability and sustainable management of water and sanitation for all.

7. **Affordable and Clean Energy:** Ensure access to affordable, reliable, sustainable, and modern energy.
8. **Decent Work and Economic Growth:** Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work.
9. **Industry, Innovation, and Infrastructure:** Build resilient infrastructure, promote sustainable industrialization, and foster innovation.
10. **Reduced Inequalities:** Reduce inequality within and among countries.
11. **Sustainable Cities and Communities:** Make cities and human settlements inclusive, safe, resilient, and sustainable.
12. **Responsible Consumption and Production:** Ensure sustainable consumption and production patterns.
13. **Climate Action:** Take urgent action to combat climate change and its impacts.
14. **Life Below Water:** Conserve and sustainably use oceans, seas, and marine resources.
15. **Life on Land:** Protect, restore, and promote sustainable use of terrestrial ecosystems, forests, and biodiversity.
16. **Peace, Justice, and Strong Institutions:** Promote peaceful and inclusive societies, provide access to justice, and build effective, accountable institutions.
17. **Partnerships for the Goals:** Strengthen the means of implementation and revitalize the global partnership for sustainable development.

5. WK: Washington Accord Knowledge Profile-Attributes for engineering program

WK1:A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Outcomes (NBA, Jan 2025)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and

leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

7. Programme Specific Indicators

Oil & Gas Industry

1. Apply material and energy balances for process design.
2. Select appropriate unit operations and equipment for process requirements.
3. Ensure process safety and chemical handling practices.
4. Optimize chemical processes for efficiency and cost-effectiveness.
5. Simulate chemical processes using software tools.
6. Implement safety protocols for handling hydrocarbons and toxic materials.
7. Develop processes minimizing environmental emissions.
8. Identify properties of materials used in equipment design with respect to IS Codes.
9. Selection of material of construction (MOC), equipment sizing.
10. Estimate cost of project, budgeting and Billing process.
11. Examine quality of work to ensure processes meet required specification, standards and regulations.
12. Interpret contracts, terms, project specifications and legal requirements in projects.
13. Apply principles of chemical engineering (thermodynamics, fluid mechanics, reaction engineering, geology).
14. Identify, formulate, and analyze complex problems with consideration for safety and sustainability.
15. Design and develop processes considering health, safety, environment, and cost.
16. Conduct experimental investigations using modern laboratory and analytical techniques.
17. Use modern engineering tools and software (Matlab, Aspen HYSYS, PetroSim, OLGA, CFD, GIS tools) for design and optimization.
18. Evaluate environmental and societal impacts applying sustainability strategies of wastewater treatment and carbon capture.
19. Follow professional ethics, industry standards, and legal industrial frameworks.
20. Work effectively in multidisciplinary teams for project execution.
21. Communicate technical reports effectively with regulators, industry professionals, and society.
22. Apply project management principles for it's development and execution.
23. Practice lifelong learning by upgrading skills in multi-disciplinary fields.
24. Exhibit leadership, time management, decision-making, and problem-solving abilities.

25. Demonstrate adaptability and resilience to work in challenging environments.
26. Exhibit cultural sensitivity and inclusiveness while working in multinational teams.
27. Design competency in Plant Layout and Piping Design with efficient operation, maintenance, and safety.

Pharmaceutical Industry

28. Apply catalytic process design in petrochemical industries.
29. Prepare PIDs, Flowsheets related to process
30. Develop structural plans/drawings and safety documents.
31. Identify process failures or production, analysing causes and suggest improvements to prevent future occurrence.
32. Perform material testing including corrosive, pressure for design and analysis as per IS and boiler Codes.
33. Proficiency in Transport Phenomena, momentum, heat, and mass transfer for the design and optimization of equipment.
34. Apply Chemical Reaction Engineering knowledge to ensure optimal yield and selectivity.
35. Apply principles of Thermodynamics to analyze energy transformations and evaluate the feasibility and efficiency of chemical processes.
36. Apply advanced knowledge for the development of processes and products.
37. Evaluate waste minimization, circular economy practices in industry.
38. Food and Beverage Industry
39. Apply chemical engineering, microbiology, and food science principles in food preservation, processing, and beverage manufacturing.
40. Analyze food composition, nutritional content, and process impacts to ensure product quality, safety, and compliance with global food standards.
41. Design and optimize unit operations in food industries with focus on hygiene, safety, and efficiency.
42. Conduct investigations on shelf life, food spoilage, contamination control, and sensory evaluation using and statistical analysis.
43. Evaluate sustainable food processing methods such as green packaging, waste-to-energy conversion, by-product utilization, and energy-efficient technologies.
44. Apply ethical practices and follow food safety standards in food processing and beverage manufacturing.

Environmental and Water Treatment Industry

45. Apply principles of chemical & biochemical engineering in design and operation of wastewater treatment, desalination, and effluent treatment plants.
46. Apply pollution control technologies and sustainable practices.
47. Apply skills in Separation Processes, purifying products and recycling unreacted materials.
48. Analyze industrial wastewater discharge, heavy metal contamination, air pollution, and solid waste management.

49. Evaluate sustainable strategies such as zero-liquid discharge & resource recovery.

Renewable Energy and Fuels

50. Apply principles of chemical engineering engineering in the production of biofuels, hydrogen, syngas, and synthetic fuels.
51. Analyze renewable energy conversion processes for techno-economic feasibility.
52. Design and optimize renewable energy systems.
53. Conduct investigations on fuel properties, combustion behavior, emission analysis, and lifecycle assessment of renewable fuels.
54. Evaluate carbon capture, carbon trading, and circular economy strategies for integrating renewables with conventional energy systems.

Materials Polymer Industry

55. Apply principles of polymer chemistry, material science, and rheology for development and processing of plastics, elastomers, fibers, composites, and advanced materials.
56. Analyze structure–property relationships of materials.
57. Design and optimize polymer processing operations.

Basic Science

58. Apply mathematical techniques such as algebra, trigonometry, calculus, differential equations, linear algebra, probability and statistics to solve problems.
59. Apply physical principles such as motion, forces, energy and materials to solve problems.
60. Apply knowledge of chemical properties and reactions for construction material and environment (Corrosion, polymer, electrochemistry etc.)

Engineering Science Courses

61. Demonstrate proficiency in basic workshop operations (fitting, carpentry, welding, sheet metal, plumbing and machining etc.)
62. Apply the principles of engineering mechanics to analyse and solve problems involving forces, moment, equilibrium, friction, centred and MOI etc.
63. Apply the principles electrical engineering to analyse and maintain electrical systems, circuits, machines and power systems.
64. Demonstrate ability to interpreted and create drawings using geometric constructions, orthographic projections, isometric projections and CAD tools.
65. Demonstrate ability to apply fundamental principals of algorithms, programming, data structures and computing system to solve conceptual problems.

Generic Competencies (Chemical Engineering)

A. Problem-Solving Skills

66. Analytical Thinking: Ability to analyze complex problems, break them down into smaller components, and find effective solutions.
67. Critical Thinking: Ability to evaluate multiple solutions to a problem and choose the best course of action based on available data, safety, and cost-efficiency.

B. Communication Skills

68. Oral Communication: Ability to communicate complex technical information clearly to a variety of audiences, including clients, stakeholders, contractors, and team members.
69. Written Communication: Proficiency in drafting reports, proposals, technical specifications, and documentation that are clear, concise, and accurate.
70. Interpersonal Communication: Ability to collaborate effectively with multidisciplinary teams, clients, and project stakeholders.

C. Project Management

71. Time Management: Efficiently managing time and prioritizing tasks to meet deadlines in a dynamic project environment.
72. Resource Management: Ability to plan, allocate, and manage resources such as labour, materials, and equipment to ensure project efficiency.
73. Budgeting and Cost Control: Skills in estimating project costs, monitoring budgets, and ensuring projects are completed within financial constraints.
74. Risk Management: Ability to identify, assess, and mitigate risks during the planning and execution of engineering projects.

D. Teamwork and Leadership

75. Team Collaboration: Working effectively as part of a team, contributing to the success of the project through collaboration, open communication, and respect for others' expertise.
76. Leadership Skills: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
77. Conflict Resolution: Ability to resolve conflicts between team members, clients, or contractors, ensuring that project objectives are still achieved.

E. Attention to Detail

78. Accuracy: Ensuring all engineering calculations, designs, and project plans are accurate and align with building codes, regulations, and standards.
79. Quality Assurance: Ensuring that the materials and processes used in construction adhere to high standards of quality and safety.

F. Ethical and Professional Integrity

80. Ethical Decision Making: Adhering to a strict code of ethics, ensuring public safety, environmental protection, and transparency in all dealings.
81. Accountability: Taking responsibility for the success or failure of a project, being proactive in addressing issues, and delivering results.

G. Adaptability and Flexibility

82. Openness to Change: Being able to adapt to new technologies, tools, and methods, as well as evolving project requirements or environmental conditions.
83. Learning and Development: Actively seeking opportunities for professional growth, staying current with industry trends, and acquiring new skills to remain competitive.

H. Technical Competency

84. Understanding of Engineering Principles: A strong foundation in the core principles of chemical engineering, including structural, geotechnical, environmental, transportation, and water resources engineering.
85. Technology Proficiency: Proficiency in using engineering software, such as AutoCAD, Chemical 3D, and BIM tools, to design, model, and manage projects.
86. Data Analysis: Ability to analyze large amounts of technical data and make informed decisions based on this information.

I. Creativity and Innovation

87. Creative Problem Solving: Thinking outside the box and coming up with novel solutions to engineering challenges.
88. Innovative Design: Contributing new ideas for designs and processes that can improve efficiency, reduce costs, or make better use of resources.

J. Cultural and Environmental Awareness

89. Sustainability Awareness: Knowledge of sustainable construction methods, green building practices, and the importance of reducing the environmental impact of engineering projects.
90. Cultural Sensitivity: Understanding and respecting cultural differences when working in diverse teams or international projects.
91. Environmental Impact Understanding: Considering the environmental consequences of engineering decisions and striving to minimize negative impacts through design and construction methods.

K. Decision-Making Skills

92. Data-Driven Decisions: Using available data, facts, and technical analysis to make informed decisions about the design, execution, and management of projects.
93. Prioritizing Decisions: Knowing which decisions need immediate attention and which can be deferred, especially in a high-pressure environment.

L. Regulatory and Legal Knowledge

94. Familiarity with Building Codes and Standards: Understanding and ensuring compliance with local, national, and international building codes, safety regulations, and legal standards.
95. Health and Safety: Knowledge of safety regulations and best practices for ensuring the health and safety of workers, the public, and the environment throughout the project lifecycle.

M. Client-Focused Mindset

96. Client Management: Building and maintaining strong relationships with clients, understanding their needs, and ensuring their expectations are met throughout the project.
97. Customer Service Orientation: Ensuring that client concerns are addressed promptly, and working toward providing value-added solutions that meet their goals.

8. Scheme of Chemical Engineering Department

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Chemical Engineering Degree Programme

Semester - I (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - I	BSC	1SH101BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Physics	BSC	1SH102BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Programming for Problem Solving	ESC	1CS103ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Mechanics	ESC	1CE104ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Applied Physics Lab	BSC	1SH105BS1	0	0	2	0	2	1					25	25	50	25	50	
6	Programming for Problem Solving Lab	ESC	1CS106ES1	0	0	2	0	2	1					25	25	50	25	50	
7	Engineering Mechanics Lab	ESC	1CE107ES1	0	0	2	0	2	1					25	25	50	25	50	
8	Workshop	ESC	1ME108ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Chemical Engineering Processes	VSC	1CH109VS1	1	0	2	1	4	2						50	50	25	50	
10	Communication Skills	AEC	1SH110AE1	1	0	2	1	4	2					25	25	50	25	50	
11	Sports & Yoga	CC	1SH111CC1	0	0	4	0	4	2						50	50	25	50	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Chemical Engineering Degree Programme

Semester - II (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - II	BSC	2SH112BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Chemistry	BSC	2SH113BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Basic Electrical Engineering	ESC	2EE114ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Graphics	ESC	2ME115ES1	2	0	0	2	4	2	60	40	100	40					100	4 Hrs.
5	Elements of Chemical Engineering	PCC	2CH116PC1	1	0	2	1	4	2						50	50	25	50	
6	Traditional Indian Chemical Engineering Practices	IKS	2CH117IK1	1	0	2	1	4	2						50	50	25	50	
7	Applied Chemistry - Lab	BSC	2SH118BS1	0	0	2	0	2	1					25	25	50	25	50	
8	Basic Electrical Engineering - Lab	ESC	2EE119ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Engineering Graphics/CAD Lab	ESC	2ME120ES1	0	0	2	0	2	1					25	25	50	25	50	
10	Universal Human Values	SEC	2SH121VS1	1	0	2	1	4	2						50	50	25	50	
11	Digital Wellness	CC	2SH122CC1	1	0	2	1	4	2						50	50	25	50	
Total				**15**	**0**	**14**	**15**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 15x15 = 225 Hrs]

Exit Option (Level 4.5) for Undergraduate Certificate in Odd Semester of next Academic Year as approved by BOS																			
12	Material and Energy Balances	EC	3CH123EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Numerical Methods in Chemical Engineering	EC	3CH124EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	3CH125EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	3CH126OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Chemical Engineering Degree Programme

Semester - III (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Chemical Engineering Thermodynamics	PCC	3CH201PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Chemical Engineering Analysis	PCC	3CH202PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Process Instrumentation	PCC	3CH203PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - I	MDM	3__204MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - I	OE	3__205OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Chemical Engineering Thermodynamics Lab.	PCC	3CH206PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Chemical Engineering Analysis Lab.	PCC	3CH207PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Process Instrumentation Lab.	PCC	3CH208PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Engineering Economics	EEM	3CH209EM1	2	0	0	2	4	2						50	50	25	50	
10	Constitutional Values and Fundamental Duties	VEC	3SH210VE1	2	0	0	2	4	2						50	50	25	50	
11	Field Project	FP	3CH400FP1	0	0	4	0	4	2					25	25	50	25	50	
12	Disaster Management and Preparedness	NC	3AL001NC1	2	0	0	0	2	-						50	50	25	50	
Total				**19**	**0**	**10**	**17**	**46**	**22**			**450**				**300**		**750**	

Notional Learning Hours : [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 17x15 = 255 Hrs]

Optional Course for Double Minor / Honours Degree																			
13	Double Minor / Honours Course - I	DH	3__211DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Chemical Engineering Degree Programme
Semester - IV (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Fluid Flow Operation[1]	PCC	4CH212PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Chemical Engineering Mechanical Operations	PCC	4CH213PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Process Calculation	PCC	4CH214PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - II	MDM	4__215MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - II	OE	4__216OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Fluid Flow Operation Lab	PCC	4CH217PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Chemical Engineering Mechanical Operations Lab	PCC	4CH218PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Computer Application in Chemical Engineering	VSC	4CH219VS1	0	0	4	0	4	2						50	50	25	50	
9	Technical Writing	AEC	4SH220AE1	1	0	2	1	4	2						50	50	25	50	
10	Fundamentals of Book Keeping and Accounting	EEM	4SH221EM1	1	0	2	1	4	2						50	50	25	50	
11	Environmental Science	VEC	4CE222VE1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
Total				**16**	**0**	**12**	**16**	**44**	**22**			**500**				**250**		**750**	
Optional Course for Double Minor / Honours Degree																			
12	Double Minor / Honours Course - II	DH	4__223DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5) for Undergraduate Diploma in Odd Semester of next Academic Year as approved by BOS																			
13	Fluidization Engineering	EC	5CH224EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
14	Chemical Process Utilities	EC	5CH225EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
15	Internship / Apprenticeship in Industry	EI	5CH226EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
16	Two MOOC/NPTEL Courses	EC	5CH227OC_	8	0	0	8	16	8										

Notional Learning Hours: [Workload (teaching/guidance/practicum) 28x15 = 420 Hrs] + [Learner-engaged time 16x15 = 240 Hrs]

[1] Course sequence amended considering order of learning as on 02/09/2026

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Chemical Engineering Degree Programme

Semester - V (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Heat Transfer Operation	PCC	5CH228PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Chemical Reaction Engineering-I	PCC	5CH229PC1	3	1	0	4	8	4	60	40	100	40					100	3 Hrs.
3	Industrial Waste Treatment	PCC	5CH230PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - I	PEC	5CH231PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - III	MDM	5__232MD_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Open Elective - III	OE	5__233OE_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Heat Transfer Operation Lab.	PCC	5CH234PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Industrial Waste Treatment Lab.	PCC	5CH235PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - I - Lab	PEC	5CH236PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Multidisciplinary Minor - III - Lab	MDM	5__237MD_	0	0	2	0	2	1					25	25	50	25	50	
Total				**17**	**1**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	
Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - III	DH	5__238DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.

Notional Learning Hours: [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Chemical Engineering Degree Programme
Semester - VI (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Chemical Reaction Engineering-II	PCC	6CH239PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Process Dynamics & Control	PCC	6CH240PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Mass Transfer -I	PCC	6CH241PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - II	PEC	6CH242PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Programme Elective Course - III	PEC	6CH243PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Multidisciplinary Minor - IV	MDM	6__244MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Chemical Reaction Engineering-II Lab.	PCC	6CH245PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Process Dynamics & Control Lab.	PCC	6CH246PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - II - Lab	PEC	6CH247PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Personal Skills (GD& PI)	SEC	6CH248VS1	1	0	2	1	4	2						50	50	25	50	
Total				**18**	**0**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - IV	DH	6__249DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5.5) for B. Voc in Odd Semester of next Academic Year as approved by BOS																			
12	Optimization of Chemical Processes	EC	7CH250EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Computer Aided Process Synthesis	EC	7CH251EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	7CH252EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	7CH253OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Chemical Engineering Degree Programme
Semester - VII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Transport Phenomena[2]	PCC	7CH301PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Mass Transfer -II	PCC	7CH302PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Programme Elective Course - IV	PEC	7CH304PE_	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - V	PEC	7CH304PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - V	MDM	7__305MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
6	Mass Transfer -II Lab.	PCC	7CH306PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Programme Elective Course - IV Lab	PEC	7CH307PE1	0	0	2	0	2	1					25	25	50	25	50	
8	Research Methodology	RM	7CH401RM1	2	0	4	2	8	4	30	20	50	20		50	50	25	100	2 Hrs.
9	Project	PR	7CH402PR1	0	0	8	0	8	4					50	100	150	75	150	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**500**				**300**		**800**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
10	Double Minor / Honours Course - V	DH	7__308DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
Optional Course for Honours with Research Degree																			
11	Research Project	RP	7CH403RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

[2] Amended to align with emerging engineering domains as on 02/09/2026

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Chemical Engineering Degree Programme
Semester - VIII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Novel Separation Processes (Online)	PCC	8CH309PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Programme Elective Course - V (Online)*	PEC	8CH310PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Multidisciplinary Minor - VI (Online)	MDM	8__311MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
4	On Job Training (Internship/Apprenticeship)	OJT	8CH404IN1	0	0	24	0	24	12					100	100	200	100	200	
Total				**8**	**0**	**24**	**8**	**40**	**20**			**250**				**200**		**450**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 32x15 = 480 Hrs] + [Learner-engaged time 8x15 = 120 Hrs]

Optional Course for Honours with Research Degree																			
5	Research Project	RP	8C405RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

9. List of Programme Elective Courses

Students will have an option to choose the PEC offered by their respective Major Discipline offered during semester V to VIII

Programme Elective Courses offered by Chemical Engineering

b	Semester	Programme Elective Course/Subjects Name	Course Code
1	V	Computational Techniques in Chemical Engineering (PEC-I)	5CH231PE1
2		Computational Techniques in Chemical Engineering-Lab (PEC-I Lab)	5CH236PE1
		OR	
3		Fluid Particle Mechanics (PEC-I)	5CH231PE2
4		Fluid Particle Mechanics -Lab (PEC-I Lab)	5CH236PE2
5	VI	Chemical Process Technology (PEC-II)	6CH242PE1
6		Chemical Process Technology -Lab (PEC-II Lab)	6CH247PE1
		OR	
7		Biochemical Engineering (PEC-II)	6CH242PE2
8		Biochemical Engineering-Lab (PEC-II Lab)	6CH247PE2
9		Process Equipment Design & Drawing (PEC-III)	6CH243PE1
		OR	
10		System Modelling (PEC-III)	6CH243PE2
11	VII	Petrochemical Technology (PEC-IV)	7CH303PE1
12		Petrochemical Technology-Lab (PEC-IV Lab)	7CH307PE1
		OR	
13		Industrial Pollution Abatement (PEC-IV)	7CH303PE2
14		Industrial Pollution Abatement Lab (PEC-IV Lab)	7CH307PE2
15		AI & ML in Chemical Engineering (PEC-V)	7CH304PE1
		OR	
16		Introduction to Molecular Simulation[6] (PEC-V)	7CH304PE2
17	VIII	Carbon Capture, Utilization and Storage (PEC-VI)	8CH310PE1
		OR	
18		Nanotechnology for Chemical Engineering[16] (PEC-VI)	8CH310PE2

10. Syllabus for Semester III & IV

Level: **5**	Course Code: **3CH201PC1**		Course Category: **PCC**		
Course Name	**Chemical Engineering Thermodynamics**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3CH201PC1 Chemical Engineering Thermodynamics is a compulsory Program Core Course for Second Year B.Tech. Chemical Engineering.

Course Objectives:
The objective of this course is to understand and apply thermodynamic principles to analyze system behaviour, energy transformations, phase and mixture properties, flow processes, and chemical equilibrium in chemical engineering systems.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH201PC1.1	Apply fundamental thermodynamic principles including system classification, process variables, equilibrium criteria, and the First Law with Cp–Cv relations to analyze and quantify energy interactions in chemical engineering systems**.**	C-3
3CH201PC1.2	Evaluate thermodynamic systems using entropy concepts**,** Second-Law statements, Carnot efficiency limits, and Third-Law implications to assess the feasibility and performance of engineering processes**.**	C-5
3CH201PC1.3	Analyze the behavior of pure substances using P–V–T relations, real-gas equations of state, compressibility factors, and phase-rule applications to predict phase behavior in single- and multi-component systems**.**	C-4
3CH201PC1.4	Evaluate colligative property variations and steady-flow energy interactions in throttling devices, compressors, nozzles, and diffusers to perform energy balance calculations for practical engineering equipment**.**	C-5
3CH201PC1.5	Interpret thermodynamic behavior of mixtures through partial molar properties, pressure–temperature effects, and vapor–liquid equilibrium models to design and analyze separation and mixing processes**.**	C-2

3CH201PC1.6	Use thermodynamic equilibrium relations and Gibbs free-energy criteria to determine equilibrium constants, predict reaction direction, and evaluate reaction extent in chemical processes**.**	C-3

Course Contents:

Unit 1	**Introduction to Thermodynamics and First Law of Thermodynamics:** Categorization of systems, Thermodynamics variables and processes, point and path Function, State of equilibrium and its types, First law of thermodynamics, Relation between C_p and C_v, Application of first law to different processes and systems, limitations of the first law, Numerical.	7 Hrs
Unit 2	**Second Law of Thermodynamics:** Statement of Second Law, equivalence between Kelvin-Plank and Clausius Statement, Concept of entropy, Entropy and Irreversibility, Heat Engines heat pumps, and refrigerators, Carnot Cycle, Limitations of Second law of thermodynamics, Numerical. Third law of thermodynamics.	8 Hrs
Unit 3	**Thermodynamics of Pure Substances:** Introduction of pure substance, P-V-T Behaviour of Pure substances, Equation of state, Ideal Gas and Real gas EOS: Vander Waals, Redlich-Kwong, Peng- Robinson, Beattie-Bridgeman and virial equation of state, Compressibility factor, Law of Corresponding State, Numerical. Phase Rule: Derivation, Use, One- Component System, Two Component system, partially miscible system (LCST and UCST), Three Component system	08 Hrs
Unit 4	**Colligative Property and thermodynamics to flow processes:** Elevation in boiling point, depression in freezing point, Lowering of Vapour Pressure, Osmotic Pressure, Numerical. Steady-flow processes and devices, Throttling Device, Compressor, Nozzles and Diffusers, Numerical.	07 Hrs
Unit 5	**Solution Thermodynamics and Properties:** Partial Molar Properties, Effect of pressure and temperature, Chemical Potential, fugacity, fugacity coefficient, Chemical Potential in Ideal Gas Mixture, Thermodynamic functions of mixing, Activity and Activity Co-efficient, Gibbs Duhem equation, Vapour pressure, Raoult's Law and Henry's Law, Numerical.	08 Hrs
Unit 6	**Chemical Equilibria:** Concept of equilibrium, formulation of Equilibrium law, Equilibrium law for Ideal Gases and other form of equilibrium constant, Relation between K_p, K_c and K_x, Free energy change in chemical reaction, Chemical Affinity, Calculation of Equilibrium constant, LeChatlier's Principle, Numerical.	07 Hrs

Text Books:

1. J.M. Smith and H.C. Van Ness, Introduction to Chemical Engineering Thermodynamics, McGraw Hill, 1998
2. Denbigh,K.,`The Principles of Chemical Equilibria with Applications in Chemistry and Chemical Engineering, Cambridge University Press (1968)
3. K.V.Narayanan, A textbook of Chemical Engineering Thermodynamics, Prentice Hall of India Ltd., 2001
4. R.P.Rastogi and R.R. Mishra, An Introduction of Chemical Thermodynamics
5. Houghen and Watson, Chemical Engineering Process
6. Stanley Sandler, Chemical, Biochemical, and Engineering Thermodynamics

Reference Books:

1. Sadler S. I., J, Chemical and Engineering Thermodynamics, John Wiley and Sons, Inc. New York, 3rd Ed.,1999.
2. Elliot J. R. and Lira C.T., Introductory Chemical Engineering Thermodynamics, Prentice Hall, 1999.
3. Eastop T. D. and McConkey A., Applied Thermodynamics for Engineering Technologists, Addison Wesley Longman Ltd., England, 5th Ed., 1999
4. J. M. Smith and H. C. Vauhess, Introduction to Chemical Engineering Thermodynamics
5. H. C. Weber and J. P. Meissner, Thermodynamics for Chemical Engineering

E- Resources:

1. https://nptel.ac.in/courses/103101004
2. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCHA1202.pdf
3. https://studylib.net/doc/27115283/a-textbook-ofchemical-engineering-thermodynamics-kv-narayan
4. https://thermodynamicsbook.com/thermodynamics-free-textbook.pdf
5. https://cdn.bookey.app/files/pdf/book/en/thermodynamics-by-enrico-fermi.pdf

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CH201PC1.1	3	2	-	-	2	-	-	-	-	-	2	3	2	-
3CH201PC1.2	3	3	-	2	2	2	-	-	-	-	3	3	3	-
3CH201PC1.3	3	2	-	2	2	-	-	-	-	-	2	3	3	-
3CH201PC1.4	3	2	2	2	3	2	-	-	-	-	2	3	3	2
3CH201PC1.5	3	3	-	2	3	2	-	-	-	-	3	3	3	2
3CH201PC1.6	3	3	-	2	2	2	-	-	-	-	3	3	3	2
3CH201PC1CO	3	3	2	2	2	2	-	-	-	-	3	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CH202PC1**		Course Category: **PCC**		
Course Name	**Chemical Engineering Analysis**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3CH202PC1 Chemical Engineering Analysis is a compulsory Program Core Course for Second Year B.Tech. Chemical Engineering.

Course Objectives:

The objective of this course develops a comprehensive understanding of reaction kinetics, surface phenomena, catalysis, and modern analytical techniques. It enables students to apply advanced chromatographic, spectroscopic, photochemical, and electro analytical methods.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH202PC1.1	Analyze reaction rates, molecularity, order and integrated rate laws for determining kinetic parameters and predicting chemical reaction behavior.	C-4
3CH202PC1.2	Illustrate adsorption types, isotherms and catalytic characteristics to interpret surface phenomena and optimize heterogeneous and enzymatic catalytic processes.	C-3
3CH202PC1.3	Apply chromatographic principles, classifications and GC-HPLC instrumentation for selecting effective separation techniques in chemical engineering applications.	C-3
3CH202PC1.4	Apply photochemical laws, Lambert-Beer principles and quantum yield concepts to analyze photochemical reactions and evaluate light-induced processes.	C-3
3CH202PC1.5	Analyze UV-Vis, IR and NMR spectroscopic principles, instrumentation and applications to characterize molecular structure and determine chemical properties.	C-4
3CH202PC1.6	Examine electrochemical concepts, cell types and pH metric methods for obtaining analytical measurements and interpreting chemical system behavior.	C-3

Course Contents:

Unit 1	**Fundamentals of Chemical Reaction Kinetics:** Introduction, Rate of reaction, Concept of Molecularity and Order of reaction, Integrated rate expressions for zero, first and second order reaction, Half life period of reaction, Energy of activation and its determination, Numerical	5 Hrs
Unit 2	**Surface Phenomena and Catalysis:** Adsorption, Types of adsorptions, Factors affecting Adsorption, Adsorption isotherms, Langmuir theory of adsorption, BET adsorption isotherm, Criteria-characteristics of catalyst, homogeneous and heterogeneous catalysis, Theory of heterogeneous catalysis, Auto and Enzyme catalysis	5 Hrs
Unit 3	**Advanced Chromatographic Techniques:** Introduction, Classification of chromatographic techniques, Industrial and Chemical Engineering Applications, Principles, Instrumentation and application of Gas Chromatography (GC), High performance liquid chromatography (HPLC)	5 Hrs
Unit 4	**Fundamentals of Photochemistry:** Introduction, Photochemical Reaction, Applications, Lambert and Beer' Law, Photochemical Laws, quantum efficiency and its determination, low & high quantum yield reaction,	5 Hrs
Unit 5	**Advanced Instrumental Spectroscopy:** Introduction to Advanced Spectroscopy, Classification of Spectroscopy, Principle, Instrumentation of and applications of UV-VI Spectroscopy, Infrared (IR) Spectroscopy, Nuclear Magnetic Resonance (NMR) Spectroscopy, Expression for moment of Inertia of rigid rotator of diatomic molecule	5 Hrs
Unit 6	**Electro analytical Techniques:** Introduction, Basic concepts in electrochemistry, Types of electrochemical Cells, Applications, Types of electro analytical methods- Conductometry, pH metry	5 Hrs

Text Books

1. Douglas A, Donald M, James F, Stanley R, Cengage, Fundamentals of Analytical Chemistry, Cengage, 10th Ed.
2. Skoog Douglas A, F James Holler, Stanley R, Principles of Instrumental Analysis, , Cengage 7th Ed
3. Banwell, Fundamentals of spectroscopy , , Tata McGraw-Hill, 4th Ed

Reference Books

1. P.W. Atkins and J.D. Paula, Physical Chemistry, , Oxford University Press.
2. K.J. Laidler and J.M. Meiser, Physical Chemistry, CBS Publisher
3. R. J. Masel, Chemical kinetics and catalysis, John Wiley publications
4. Arthur W. Adamsons, Alice P. Gast, Physical chemistry of surfaces, John Wiley publications

E- Resources

6. http://www.rnlkwc.ac.in/pdf/studymaterial/chemistry/Spectroscopy.pdf
7. https://web.iitd.ac.in/~sdeep/Spectroscopy_lecture_1_2.pdf
8. https://www.bcebhagalpur.ac.in/wpcontent/uploads/2020/03/Spectroscopic-Techniques-and-Applications.pdf
9. http://digimat.in/nptel/courses/video/104106122/L54.html

Mapping of COs with POs and PSO's

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CH202PC1.1	3	3	-	2	2	-	-	-	-	-	-	3	2	-
3CH202PC1.2	3	2	2	2	2	2	-	-	-	-	-	3	3	-
3CH202PC1.3	3	2	2	2	3	-	-	-	-	-	-	3	2	-
3CH202PC1.4	3	2	-	2	2	-	-	-	-	-	-	2	2	-
3CH202PC1.5	3	2	-	2	3	-	-	-	-	-	-	3	2	-
3CH202PC1.6	3	3	-	2	3	-	-	-	-	-	-	3	2	-
3CH202PC1CO	3	2	2	2	3	2	-	-	-	-	-	3	2	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CH203PC**		Course Category: **PCC**		
Course Name	**Process Instrumentation**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**03 Hr**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description: Subject Code3CH201PCProcess Instrumentation is a Programme Core Course for Second Year B. Tech. Chemical Engineering.

Course Objectives:
The objective of this course is to acquaint students with basic Operating principles of Instruments in chemical engineering, and develop practical understanding of process variable measurements in chemical industry.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH201PC1.1	Understand basic measurement methods, types of errors, transducers, and instrument characteristics to ensure accurate and reliable industrial measurements.	C-2
3CH201PC1.2	Apply temperature measurement techniques using RTDs, thermistors, thermocouples, and infrared sensors to monitor and control thermal processes.	C-3
3CH201PC1.3	Analyze pressure sensing methods and low-pressure measurement instruments to measure and regulate process pressure effectively.	C-4
3CH201PC1.4	Evaluate fluid-flow measurement systems such as differential pressure and positive displacement methods to determine flow rates in process industries.	C-5
3CH201PC1.5	Select and compare appropriate level measurement techniques for different liquids and applications to achieve safe and efficient level control.	C-5
3CH201PC1.6	Measure and interpret pH, humidity, and concentration using electrochemical and physical sensing methods to assess process quality and environmental conditions.	C-2

Course Contents:

Unit 1	**Basic method of measurements:** Direct and indirect measurements with examples. Errors in measurements: Types of Errors: Human error, instrument error. Elements of Instruments: Primary and secondary. Transducers: definition, classification primary and secondary. Static characteristics of instruments and Dynamic characteristic. Transmitter: definition different types.	8Hrs
Unit 2	**Temperature measurements**: Introduction to different temperature scale. Resistance Thermometer Detector (RTD): Unbalanced Wheatstone Bridge Direct conversion. Thermistors: Temperature sensing using thermistor. Thermocouple: Basics of thermocouple, Thermocouple types. Solid expansion thermometer: Bimetallic thermometer. Liquid filled thermometer: Hg filled thermometer. High temperature measurement: Pyrometer (Radiation based temperature measurement).	7 Hrs
Unit 3	**Pressure measurements**: Introduction: Units of pressure Types of pressure measurement: Elastic deformation type: Bourdon tube and bellows., Low pressure measurement: McLeod gauge, pirani gauge. Thermocouple gauge: Ionization gauge. Heads measurement: Manometer, its type. Dead weight pressure measurement as a pressure gauge tester.	8 Hrs
Unit 4	**Basics of fluid flow**: Derivation of basic fluid flow equation, Flow meter, flow measurements, Differential pressure measurement Principle of the differential pressure flow meter, Orifice Venturi meter. Positive displacement Flow meters, Different type of ultrasonic Flowmeter. , Pitot tube. Variable area flow meter: Magnetic Flow meter, Head flow meters: Hg manometer and its type	8 Hr
Unit 5	**Level Measurements Introduction**: Industrial application of Level measurement. Direct level measurement: Sight glass method, Hook auge method, Differential pressure method: Air purge method, Displacement type level sensor: Ultrasonic type level sensor, Gamma ray level sensor. Electric method: capacitance type	7 Hrs

Unit 6	**pH measurements**: Basic ideas of pH value, Measurement of electrode potentials: Glass electrode, Reference electrode, Calomel electrode, Humidity Sensing: Basic ideas of humidity sensing, Humidity measurement by dew point sensing, Humidity measurement using Lithium Chloride. Measurement for Concentration: Obtaining concentration of solution by conductivity and conductivity titration, determination of concentration by density meter, hydrometer, refract meter, measurement of concentration of ion and colored solution. (7Hrs)	7 Hrs

Text Books:

1. Padmanaban, R., Instrumentation: Principles and Design, Springer, Tattamangalam, 2000.
2. Eckman, Donald P., Industrial Instrumentation, CBS Publishers, New Delhi, 2002.

Reference Books:

1. Jain, R. K., Mechanical and Industrial Measurements, Khanna Publishers, 1999.
2. Patranabis, D., Principles of Industrial Instrumentation, Tata McGraw-Hill Publishing Ltd., 1999.
3. Johnson, C. D., Process Control Instrumentation Technology, Prentice Hall Inc., Year not specified.
4. Sawhney, A. K., A Course in Electrical and Electronics Measurement and Instrumentation, Dhanpat Rai and Sons, 1999.

E-Resources:

1. https://nptel.ac.in/courses/103105130

Mapping of COs with Pos and PSO's:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CH201PC1.1	3	2	1	2	-	-	-	-	-	2	1	3	2	1
3CH201PC1.2	3	2	2	2	2	-	-	-	-	2	1	3	2	1
3CH201PC1.3	3	3	2	2	2	-	-	-	-	2	2	3	2	2
3CH201PC1.4	2	3	3	2	2	-	-	-	1	2	2	2	3	2
3CH201PC1.5	2	2	2	2	2	-	-	-	1	2	2	2	3	1
3CH201PC1.6	3	2	2	2	2	-	-	-	-	2	2	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CH204MD1**		Course Category: **MDM**		
Course Name	**Environmental Pollution: Policies and Regulations**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 3CH204MD1 Environmental Pollution: Policies and Regulations is a compulsory Multidisciplinary Minor course offered by the department of Chemical Engineering for other Second Year B.Tech. major disciplines.

Course Objectives:

The course provides a comprehensive understanding of major environmental pollutants, their impacts, and key control measures. It also equips students with knowledge of national environmental policies, regulatory frameworks, and governance essential for sustainable development.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH204MD1.1	Apply pollution control strategies and waste management techniques to propose feasible solutions for common environmental problems.	C-3
3CH204MD1.2	Interpret the principles of sustainable development, SDGs, and the precautionary principle for the context of environmental management.	C-2
3CH204MD1.3	Interpret the updated waste management rules and evaluate their contribution to improved compliance and sustainability.	C-2, C-5

Course Contents:

Unit 1	**Environmental Pollution:** Introduction, Categorisation of pollutants and pollution, Definition, Causes, Effects and Control Measures of: a) Air Pollution b) Water Pollution c) Soil Pollution d) Noise Pollution e) Thermal Pollution Solid Waste Management: Principles, methods and significance.	10 Hrs

Unit 2	**Introduction to Environmental Policy & Governance:** Introduction to Environmental Policy, Need and importance of environmental policy, Evolution of environmental regulations, Sustainable development, SDGs & precautionary principle, Preventive Environmental Policy (PEP), Environmental Impact Assessment (EIA)	10 Hrs
Unit 3	**Pollution Control Laws and Regulations in India:** Major Environmental Acts: Environment (Protection) Act, 1986, Water (Prevention & Control of Pollution) Act, 1974, Air (Prevention & Control of Pollution) Act, 1981, Forest Conservation Act, 1980, Wildlife Protection Act, 1972 Pollution-specific Rules (Latest Amendments Included) Solid Waste Management Rules, 2016, Plastic Waste Management Rules, 2016, E-Waste Management Rules, 2022	10 Hrs

Text Books

4. Dr. Anand S. Bal, An introduction to Environmental Management
5. Pandey G.N. and Camey G.C.; Environmental Engineering, Tata McGraw Hill Book Co., New Delhi (1989).
6. Mahajan S.P. Pollution Control in Process Industries, Tata McGraw Hill Book Co.
7. Dr. Azad Kumar Dr. Vartika Singh Dr. Nirupama Singh Dr. Jitendra Singh Tomar, Environmental pollution and their impact on climate change: challenges and restoration, Blue Rose Publishers

Reference Books

5. S.C.Bhatia, Environmental Pollution and control in Chemical Process Industries, , Khanna Publishers (1 January 2001)
6. Rao C.S.; Environmental Pollution Control Engineering, New Age International Publishers, 3rd Edition
7. Justice T S Doabia, Environmental & Pollution Laws in India,Lexis Nexis, Ed 4th

E- Resources

10. https://www.bbau.ac.in/dept/UIET/TCE033%20%20epdf.pub_environmental-pollution-and-control.pdf
11. https://cpcb.nic.in/7thEditionPollutionControlLawSeries2021.pdf
12. https://vardhaman.org/wp-content/uploads/2021/03/ENVIRONMENTAL-SCIENCE-1.pdf

Mapping of COs with POs and PSO's

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CH204MD1.1	2	3	3	2	2	3	2	-	-	2	-	2	3	-
3CH204MD1.2	2	2	2	-	-	3	2	-	-	-	-	2	3	-
3CH204MD1.3	2	3	2	-	-	3	3	-	-	-	-	2	3	-
3CH204MD1CO	2	3	2	2	2	3	2	-	-	2	-	2	3	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3SH205OE1**	Course Category:	**OE**
Course Name	**Soft Skills & Profile Building**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3SH205OE1Soft Skills & Profile Buildingis a compulsory Open Elective Course forSecond Year B. Tech All Branch Students.

Course Objectives:
The objective of this course is to focus on developing advanced communication skills, leadership qualities and professional etiquette among engineering graduates. The course emphasizes workplace communication, interview preparedness, personal branding, and employability skills aligned with industry expectations. It integrates emotional intelligence, digital professional identity, and strategic career planning for holistic professional development.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE1.1	Apply advanced interpersonal, analytical, and persuasive communication techniques in professional contexts for effective professional interactions.	C-3
3SH205OE1.2	Demonstrate professional workplace etiquette, business communication, and group discussion skills to enhance employability.	C-3 A-3
3SH205OE1.3	Analyze leadership styles, emotional intelligence, and team dynamics for effective collaboration.	C-4 A-3
3SH205OE1.4	Design a structured and realistic career plan aligned with industry expectations and personal goals for professional growth.	C-6
3SH205OE1.5	Create ATS-friendly résumés, professional portfolios, and digital profiles for personal branding.	C-6 P-4
3SH205OE1.6	Perform effectively in interviews, workplace simulations, and job-search processes with professional confidence for enhanced employability.	C-3 P-3 A-3

Course Contents:

Unit 1	**Advanced Communication Dynamics:** Advanced interpersonal communication strategies; speech articulation; structuring thoughts and fluency techniques; analytical and critical communication; storytelling techniques for impactful presentations; persuasive communication models.	7Hrs
Unit 2	**Global Workplace Etiquettes, Email Writing & GD–PI Perspective:** Professional greetings and workplace conduct; giving and receiving feedback; handling criticism and adaptability issues; professional values such as punctuality and attire; types of handshakes and significance; effective business email writing; types of Group Discussions, purpose of GDs; mock GDs (video-based); interview strategies and techniques.	8Hrs
Unit 3	**Leadership, Team Dynamics & Corporate Skills:** Personality types using 9/9 matrix; leadership styles; emotional intelligence and leadership relationship; conflict resolution and negotiation techniques; team-building skills (Johari Window perspective); cross-cultural communication; creativity and design thinking; structured problem-solving and decision-making**.**	7 Hrs
Unit 4	**Strategizing Career Planning:** SMART goal setting; mapping skills to career paths; understanding industry expectations; emerging futuristic soft and hard skills (domain-wise); personalized career roadmap; certification planning (technical and non-technical); networking skills and participation in professional communities	7 Hrs
Unit 5	**Profile Building, Portfolio & Personal Branding:** ATS-friendly résumé preparation and common mistakes; video résumé creation and self-marketing pitch; LinkedIn profile optimization and networking strategies; developing online portfolios using platforms such as GitHub, Behance, Google Sites, and Toastmasters	8 Hrs
Unit 6	**Employment Readiness & Industry Integration:** Workplace simulation activities (mock emails, meetings, discussions); mock personal interviews; understanding sector-specific industry dynamics; unconventional career opportunities after engineering; job-hunting strategies and popular job platforms	8 Hrs

Text Books:

1. Alex K., Soft Skills, S. Chand Publishing
2. Meenakshi Raman & Prakash Singh, Business Communication, Oxford University Press

Reference Books:

1. Stephen R. Covey,The 7 Habits of Highly Effective People,Free Press Publication
2. Daniel Goleman, Emotional Intelligence,published by Bantam Books.
3. Shiv Khera, You Can Win,published by Bloomsbury Publishing
4. Richard N. Bolles, What Color Is Your Parachute? Published by Ten Speed Press, Crown Publishing Group

E Resources:

1. NPTEL: Soft Skills and Personality Development
2. LinkedIn Learning – Communication & Career Development Courses
3. Harvard Business Review – Communication & Leadership Articles
4. Coursera /edX – Career Development & Employability Skills Modules

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE1.1	2	3	2	–	–	–	–	2	3	–	–			
3SH205OE1.2	–	2	–	–	–	2	3	3	3	–	–			
3SH205OE1.3	–	3	2	–	–	2	2	3	–	–	–			
3SH205OE1.4	–	3	3	–	–	2	–	–	–	2	3			
3SH205OE1.5	–	2	3	–	3	–	–	–	2	–	2			
3SH205OE1.6	–	2	2	–	2	2	–	2	3	–	2			
3SH205OE1CO	1	3	2	-	1	2	1	2	2	1	1			

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3SH205OE2**	Course Category:	**OE**
Course Name	**Team Building & Management**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3SH205OE2Team Building & Management is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:
The Objective of the course is to develop teamwork capabilities, leadership and managerial skills, collaborative problem-solving abilities, conflict management techniques, and effective decision-making skills required in professional and organizational settings.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE2.1	Explain the principles and importance of effective team building in organizations to foster collaborative work culture.	C-2
3SH205OE2.2	Apply team dynamics and collaboration strategies to achieve common goals.	C-3 A-3
3SH205OE2.3	Analyze leadership styles and managerial roles for effective team performance.	C-4
3SH205OE2.4	Demonstrate conflict resolution, negotiation, and interpersonal management skills for effective team performance.	C-3 A-3
3SH205OE2.5	Apply motivation and performance management techniques in team-based environments for achieving organizational goals.	C-3
3SH205OE2.6	Perform effectively as a team member or leader in simulated managerial scenarios to develop leadership competencies	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Team Building:** Concept of teams; types of teams; stages of team development; characteristics of effective teams; roles and responsibilities of team members; barriers to effective teamwork; team norms and values.	7 Hrs
Unit 2	**Team Dynamics & Interpersonal Relationships:** Group behavior and dynamics; interpersonal communication in teams; trust and collaboration; listening as a team skill; diversity and inclusion in teams; cross-cultural team management	8 Hrs

Unit 3	**Leadership in Teams:** Leadership concepts; leadership styles; emotional intelligence and leadership; situational leadership; influence and power in teams; leadership ethics and responsibilities.	7 Hrs
Unit 4	**Conflict Management & Negotiation:** Sources and types of conflict; conflict resolution techniques; negotiation strategies; managing difficult team members; stress management; maintaining team harmony	7 Hrs
Unit 5	**Motivation, Performance & Team Effectiveness:** Motivation theories; team motivation techniques; goal setting and performance measurement; feedback and appraisal systems; decision-making in teams; problem-solving techniques.	8 Hrs
Unit 6	**Managerial Skills & Team-Based Applications:** Managerial roles and functions; planning, organizing, and controlling teams; delegation and coordination; workplace simulations (team meetings, role plays); case studies on team management; team performance evaluation.	8 Hrs

Text Books:

1.Stephen P. Robbins, Organizational Behavior, Pearson Education

2. L.M. Prasad, Management Principles and Practices, published by Sultan Chand & Sons

Reference Books:

1. Patrick Lencioni, The Five Dysfunctions of a Team, published by Jossey-Bass
2. Peter G. Northouse, Leadership, published by SAGE Publications
3. Daniel Goleman, Emotional Intelligence,published by Bantam Books

E Resources:

1. NPTEL – Organizational Behavior& Management Courses
2. LinkedIn Learning – Team Leadership & Management Modules
3. Harvard Business Review – Teamwork & Leadership Articles
4. Coursera / edX – Team Management and Leadership Courses

Mapping of COs with POs & PSO

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3SH205OE2.1	2	–	–	–	–	–	–	–	–	–	–			
3SH205OE2.2	–	2	2	–	–	–	–	3	2	–	–			
3SH205OE2.3	–	3	3	–	–	–	–	2	–	–	–			
3SH205OE2.4	–	2	2	–	–	2	3	3	–	–	–			
3SH205OE2.5	–	2	2	–	–	–	–	2	–	2	–			
3SH205OE2.6	–	2	2	–	–	2	–	3	2	–	2			
3SH205OE2 CO	1	2	2	-	-	1	1	2	1	1	1			

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **4.5**	Course Code: **3CH206PC1**		Course Category: **PCC**		
Course Name	**Chemical Engineering Thermodynamics Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3CH206PC1Chemical Engineering Thermodynamics Lab is a compulsory Program Core Course for Second Year B. Tech Chemical Engineering Program.

Course Objectives:
The objective of this course is to experimentally evaluate thermodynamic properties, phase behaviour, flow processes, and equilibrium parameters to reinforce core principles of Chemical Engineering Thermodynamics.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH206PC1.1	Perform experiments accurately to determine colligative properties and appreciate the effect of impurities on phase behaviour.	C-4, P-4, A-3
3CH206PC1.2	Operate laboratory systems safely to verify thermodynamic laws in closed and open systems using energy balance equations.	C-3, P-4, A-2
3CH206PC1.3	Conduct heat-of-solution experiments to analyze thermo chemical properties while valuing precise measurement and data recording.	C-4, P-4, A-3

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Determination of boiling point elevation in presence of impurity.
2. Determination of freezing point depression in presence of impurity.
3. Critical solution temperature of phenol water system.
4. Critical Solution temperature of phenol water system in presence of impurity like NaCl.
5. Study of Flow Through a Nozzle and Verification of Steady Flow Energy Equation
6. Determination of Equilibrium Constant of Esterification Reaction
7. Determination of Heat of Solution of a Salt (Enthalpy of Solution)
8. Verification of First Law of Thermodynamics Using a Closed System
9. Study of Liquid–Liquid Equilibrium (LLE) for Partially Miscible Systems (UCST or LCST)
10. Study of Effect of Temperature on Chemical Equilibrium (Le Charlier's Principle Demonstration)

List of Virtual Labs:

1. https://thermodynamics-iitb.vlabs.ac.in/exp/boiling-points-ebulliometer/procedure
2. https://thermodynamics-iitb.vlabs.ac.in/exp/solubility-solid-solvent

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CH206PC1.1	3	2	-	3	2	-	-	-	-	-	2	2	3	-
3CH206PC1.2	3	3	-	3	3	-	-	-	-	-	2	2	3	-
3CH206PC1.3	3	3	-	3	2	-	-	-	-	-	2	2	2	-
3CH206PC1CO	3	3	-	3	2	-	-	-	-	-	2	2	3	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CH207PC1**		Course Category: **PCC**		
Course Name	**Chemical Engineering Analysis Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3CH207PC1Chemical Engineering Analysis Lab is a compulsory Program Core Course for Second Year B.Tech. Chemical Engineering.

Course Objectives:
The objective of this course is to perform practicals based on physicochemical analysis, titrimetric and instrumental methods, and to study reaction kinetics in chemical engineering systems.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH207PC1.1	Demonstrate physicochemical and titrimetric techniques to determine acid strength and critical solution temperatures for analytical evaluation.	C-3, P-5
3CH207PC1.2	Perform conductometric, potentiometric and pH-metric techniques to analyze unknown solutions for accurate chemical characterization.	C-4,P-5 & A-2
3CH207PC1.3	Apply kinetic study methods to determine rate constants, activation energies and reaction effects for understanding chemical reaction behaviour.	C-3,P-4 & A-1

List of Practicals:
Minimum eight practicals from the list mentioned below.

1. Determination of the Critical Solution Temperature (CST) for phenol water system.
2. Determination of the strength of a strong acid (HCl) by titrating with a strong base (NaOH) Conductometrically.
3. Acid Base titration by using Phenolphthalein indicator.
4. Determination of strength of an unknown HCl solution using a pH-metric titration against a standard NaOH solution.
5. Determination of Specific rate constant of hydrolysis of ethyl acetate.
6. Determination of Energy of Activation.
7. Determination of relative strength of two acids by kinetic study of reaction.

8. Effect of Concentration on the rate of reaction of Sodium Thiosulphate with hydrochloric acid.
9. Effect of Temperature on the rate of reaction of Sodium Thiosulphate with hydrochloric acid.
10. Determination of strength of an unknown HCl solution potentiometrically

List of Virtual Labs:

1. https://ccnsb06-iiith.vlabs.ac.in/exp/infra-red-spectroscopy/procedure.html
2. https://www.labxchange.org/library/items/lb:LabXchange:7bf9423d:lx_simulation:1?t=e0ea2815-0e90-4d7c-bc33-fe616d907c16
3. https://www.labxchange.org/library/items/lb:LabXchange:a1943218:lx_simulation:1?t=e0ea2815-0e90-4d7c-bc33-fe616d907c16
4. https://ccnsb06-iiith.vlabs.ac.in/exp/spectroscopic-techniques/

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CH207PC1.1	3	2	-	3	2	-	-	-	-	-	2	3	2	-
3CH207PC1.2	3	3	-	3	3	-	-	-	-	-	2	3	2	-
3CH207PC1.3	3	3	-	3	2	-	-	-	-	-	2	3	2	-
3CH207PC1CO	3	3	-	3	2	-	-	-	-	-	2	3	2	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CH208PC1**		Course Category:	**PCC**	
Course Name	**Process Instrumentation Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3CH208PC1Process Instrumentation Labis a compulsory Programme core Course for Second Year B. Tech. Chemical Engineering.

Course Objectives:
The objective of this course is to perform practical's on the concepts of Process Instrumentation Lab measurement device.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH208PC1.1	Apply principles of industrial instrumentation to evaluate measurement accuracy, instrument response, and process behavior.	C-3 & P-4
3CH208PC1.2	Determine flow coefficients of flow meters and analyze control valve characteristics to assess flow control performance.	C-2 & P-1
3CH208PC1.3	Calibrate pressure, temperature, level, and flow measuring instruments such as thermocouples, level detectors, Venturimeter, and Orifice meter to ensure accurate and reliable measurements.	C-4 & P-7

List of Practical's:
Minimum eight practical's from the list mentioned below.
1. Calibration of pressure gauge using Dead WeightTester.
2. Measurement of level using air purge leveldetector.
3. Calibration of Bimetallicthermometer
4. Calibration of Orifice meter/ Venturimeter / Rota meter
5. Find flow coefficient of Venturi meter /Orifice meter.
6. To Understand control valve flow coefficient.
7. To Understand inherent characteristic control valve.
8. To Understand Installed characteristic control valve.
9. To Understand hysteresis of control valve.
10. To Understand range ability control valve.

List of Virtual Labs: 1. 1.
http://www.digimat.in/nptel/courses/video/103105064/103105064.html

Mapping of COs with POs and PSOs:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3CH208PC1.1	3	2	2	3	2	-	-	-	-	2	2	3	2	2
3CH208PC1.2	3	3	3	3	2	-	-	-	-	2	2	3	3	2
3CH208PC1.3	3	3	2	3	2	2	-	-	2	3	2	3	3	3
3CH208PC1CO	3	2	2	3	2	-	-	-	-	2	2	3	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CH209EM1**		Course Category: **EEM**		
Course Name	**Engineering Economics**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 3CH209EM1 Engineering Economics is a Entrepreneurship Economics Management Education Course for Second Year B. Tech. Chemical Engineering.

Course Objectives:
The objective of this course is to learn the basics of economics like demand and supply, costing factors, market structures. Learning how to use problem-solving methods to make decisions in the face of Privatization and Globalization.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH209EM1.1	Identify economic analysis to evaluate the impact of financial factors on projects.	C-1
3CH209EM1.2	Explain competition in the market and the effects of inflation in the economic structure to understand their impact on economic performance.	C-2
3CH209EM1.3	Predict decisions to evaluate the scope of business in global scenario.	C-3

Course Contents:

Unit 1	**Nature and scope of economics to Engineers :** Nature and scope of economics, Demand and Supply, Demand: concepts, specification, types of demand. Demand Analysis: significance of demand analysis, law of diminishing utility, consumer surplus. Demand Forecasting: concept of forecasting, techniques of demand forecasting.	10 Hrs
Unit 2	**Market and Its Types and Characteristics:** Meaning, types of market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition. Inflation: Causes, measurement, effects, controlling of inflation.	10 Hrs
Unit 3	**Nature and characteristics of Indian economy:** Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Concepts of VAT, WTO. Banking, Foreign exchange.	10 Hrs

Text Books:

1. K.K. Seo , Bernard J. Winger, Managerial Economics, Richard D. Irwin; 5th edition (1 December 1979)
2. J. L. Riggs, Engineering Economics, McGraw Hill Education; 4th edition (6 January 2004)

Reference Books:

1. Adhikary M., Managerial Economics, New Delhi Khosla Publishing House 1994,3rd ed.
2. *Dan Strenhoff and JF Burgess*, "Small Business Management Fundamentals", McGraw. Hill Book Company (1986).

E-Resources:

1. https://nptel.ac.in/courses/112107209
2. https://archive.nptel.ac.in/content/syllabus_pdf/112107209.pdf
3. https://www.eolss.net/sample-chapters/c13/E6-29-30.pdf
4. NPTEL Course, Business Analysis for Engineers by Dr. S. Vaidhyasubramaniam, Department of Management, IIT Madras.

Mapping of COs with Pos:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CH209EM1.1	2	2	-	-	-	3	-	-	-	3	2	-	1	-
3CH209EM1.2	-	2	-	-	-	3	1	-	2	-	2	1	-	1
3CH209EM1.3	-	2	-	-	-	3	-	-	3	3	-	1	1	2
3CH209EM1 CO	1	2	-	-	-	3	-	-	2	2	2	1	1	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3SH210VE1**	Course Category:	**VEC**
Course Name	**Constitutional Values and Fundamental Duties**			
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours **30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	--	SEE Time	--	CIA Marks --
EE Marks	**25**	PA Marks	**25**	Total Marks **50**

Course Description:
Subject Code 3SH210VE1 Constitutional Values and Fundamental Duties is a compulsory Valus enhancement Course for Second Year B. Tech.

Course Objectives:
The objective of the course is to introduce the Indian Constitution, its historical background, fundamental values, rights, and duties.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH210VE1.1	Explain the historical background, making, and significance of the Indian Constitution to Understand the Constitution, Preamble, and core values.	C2
3SH210VE1.2	Interpret Fundamental Rights and Duties (Articles 12–35, 51A) to evaluate their implications through case studies in professional and civic life.	C3
3SH210VE1.3	Apply constitutional principles to engineering ethics, sustainability concerns (Articles 48A, 51A(g)), and demonstrate social commitment, innovation, and inclusive growth as nation builders.	C3

Course Contents:

Unit 1	**Introduction to the Constitution and Fundamental Values**: Overview of the Indian Constitution – Historical background and making of the Constitution; Meaning of Constitution; Preamble – Meaning and significance. Core Constitutional Values – Justice (Social, Economic, Political); Liberty (thought, expression, belief, faith, worship); Equality (status and opportunity); Fraternity (dignity and unity of the nation). Relevance of constitutional values for professionals and citizens.	10 Hrs
Unit 2	**Fundamental Rights and Duties**: Fundamental Rights (Articles 12–35) – Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right	10 Hrs

	to Constitutional Remedies. Fundamental Duties (Article 51-A) – Importance and implications; Role of youth and professionals in upholding duties. Case studies highlighting real-life significance of rights and duties.	
Unit 3	**Application of Constitutional Values in Engineering and Public Life**: Ethical Responsibilities and Constitutional Alignment – Engineering ethics and public interest; Environment and sustainability as constitutional concern (Articles 48A, 51A(g)); Engineers as nation builders – Social commitment, innovation, and inclusive growth.	10 Hrs

Text Books:

1. Basu D. D., Introduction to the Constitution of India, LexisNexis Publication, New Delhi (Twenty-Third Edition).
2. Jain M. P., Constitution of India, LexisNexis Publication, New Delhi (Eighth Edition).
3. Laxmikanth M., Indian Polity, McGraw Hill Education, New Delhi (Sixth Edition).
4. Austin Granville, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, New Delhi.
5. Shukla V. N., Constitution of India, Eastern Book Company, Lucknow (Twelfth Edition).
6. Government of India, Constitution of India (Bare Act), Government of India Publication, New Delhi.

Reference Books:

1. Subhash Kashyap, Our Constitution, National Book Trust, New Delhi.
2. Durga Das Basu, Shorter Constitution of India, LexisNexis Publication.
3. P. M. Bakshi, The Constitution of India, Universal Law Publishing.
4. J. N. Pandey, Constitutional Law of India, Central Law Agency.
5. Seervai H. M., Constitutional Law of India, N. M. Tripathi Pvt. Ltd. (Vols. I–III).
6. B. Shiva Rao, The Framing of India's Constitution: A Study, Indian Institute of Public Administration.
7. D. C. Wadhwa, Political Science and Constitutional Law, Eastern Book Company.
8. Madhav Khosla, The Indian Constitution: Oxford India Short Introductions, Oxford University Press.

E Resources:

1. NPTEL course on Constitutional Studies, Prof. Sudhir Krishnaswamy, National Law School of India University
2. Constitutional Values and Fundamental Duties (University of Delhi – aligned with NEP 2020, available via NPTEL/DU open learning) https://kmc.du.ac.in/kmcouter/collnews/download/40727448169063791359.pdf/LinkedContents/pdf/All/All

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH210VE1.1	3	2	-	1	-	-	-	-	-	-	-	2	2	
3SH210VE1.2	-	3	2	2	-	2	3	3	-	-	-	3	2	-
3SH210VE1.3	-	-	3	3	-	2	3	2	-	2	-	3	3	2
3SH210VE1CO	1	2	2	2	-	2	2	2	-	1	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CH400FP1**		Course Category: **FP**		
Course Name	**Field Project**				
Credits	**02**	Total L:T:P etc. Hours	0:0:4 **60 Hrs**	Total SL Hours	**--**
Total Credit Hours	**60 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3CH400FP1 Community Engagement Project is a Compulsory Experimental Learning Course for Second Year B. Tech. Chemical Engineering.

Course Objectives:

The objective of this course is to identify basic chemical related community issues. Suggest simple, practical solutions based on chemical knowledge. Present finding and recommendations effectively.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH400FP1.1	Analyze field observations, record essential data, and acknowledge community concerns to identify and define real-world chemical engineering problems and local issues.	C-4,P-3& A-1
3CH400FP1.2	Interpret literature sources, prepare data-collection tools, and appreciate community inputs to develop a structured and feasible plan for identified project issues.	C-2, P-2 & A-3
3CH400FP1.3	Apply engineering principles, construct and adjust simple prototypes, and demonstrate responsible practice to propose practical low-cost solutions for community or process-related needs.	C-3, P-4 & A-2

Course Contents:

Module	Description	Hours
Module 1	Orientation & Sensitization	4Hrs
Module 2	Field Visit & Problem Identification	24Hrs
Module 3	Problem–Solution Design & Implementation	20Hrs
Module 4	Documentation, Presentation & Reflection	12Hrs

Note:

1. Students must perform collaboratively within their assigned practical batch groups only.

2. Projects (Must select from the guidelines provided)

1. Field Visit to Swachh Bharat Project Sites and Assessment of Solid Waste Management Practices
2. Soil Health Testing, Drinking Water Quality Analysis and Environmental Sample Assessment
3. Climate Change Awareness, Environmental Pollution and Community Impact Assessment

3. Suggested Chemical Project Themes

1. Water, Wastewater and Environmental Pollution Management
2. Solid Waste Management, Recycling and Waste-to-Resource Technologies
3. Sustainable Rural and Community-Based Process Engineering
4. Water Quality, Sanitation and Public Health Assessment
5. Iindustrial Pollution Prevention and Cleaner Production
6. Energy Conservation and Renewable Energy Applications
7. Climate Change, Carbon Footprint and Sustainable Resource Management
8. Community-Based Waste Valorization and Circular Economy
9. Environmental Monitoring and Basic Chemical Analysis
10. Sustainable Process Design for Rural and Urban Communities
11. Waste Utilization, Resource Recovery & Sanitation
12. Clean Energy, Renewable Fuels & Rural Energy Systems
13. Chemical Safety, Public Awareness & Community Health
14. Water Quality, Treatment & Public Health
15. Food Processing, Preservation & Rural Entrepreneurship
16. Environmental Monitoring & Green Chemistry

4. Documentation /Project Report Format:

The Documentation /Project Report shall contain the following sections:

1. Title Page
2. Certificate & Declaration
3. Abstract
4. Introduction (Community + E&TC relevance)
5. Objectives
6. Literature Survey
7. Methodology (Survey + Technical)
8. Problem Identification
9. Proposed E&TC Solution
10. Implementation / Simulation
11. Results & Analysis
12. Community Feedback & Social Impact
13. Conclusion & Future Scope
14. References
15. Appendices (Photos, questionnaires certification letter issued by the Gram Panchayat office)

Course Plan

Lecture No.	Module Title	Topic	Hours
1	**Module1: Orientation & Sensitization**	Community Engagement & Role of Engineers, Ethics, Social Responsibility & SDGs for Chemical Engineers, Overview of Swachh Bharat Mission, Soil Health, Drinking Water Quality, Climate Change and Environmental Sustainability, Identification of Community Institutions (GP, School, Self Help Group (SHG), Health Centre), Field Safety, Team Formation, Area & Theme Allocation, Orientation and Sensitization	4
2	**Module 2: Field Visits & Problem Identification**	Pre-visit study, permissions and planning for field activities. Site identification and documentation of sanitation, waste and water facilities.	24
3		Field data collection and observation of waste, soil, water and environmental conditions.	
4		Soil and water sample collection, testing and data recording	
5		Analysis of soil and water quality and comparison with standards	
6		Problem identification and preliminary Chemical Engineering solutions.	
7	**Module 3: Engineering Problem–Solution Design & Implementation-**	Analysis of field data and identification of environmental problems.	20
8		Preparation of simple process flow diagrams and improvement plans.	
9		Identification of deficiencies in waste, water, sanitation and	

		pollution control systems.	
10		Development of solutions for waste management, water treatment and pollution control.	
11		Preparation of material requirements and preliminary cost estimates.	
12		Evaluation of technical feasibility, sustainability and community benefits.	
13	**Module 4:** **Documentation, Presentation & Reflection**	Data analysis, graphical representation, results, discussion and conclusion.	12
14		Project report preparation, finalization and presentation.	
15		Evaluation and Viva	

Mapping of COs with Pos & PSOs:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3CH400FP1.1	2	3	-	3	-	3	-	-	2	-	2	2	3	-
3CH400FP1.2	2	3	3	3	-	2	-	2	3	-	2	2	3	-
3CH400FP1.3	3	2	3	3	3	3	-	2	2	-	2	3	3	2
3CH400FP1 CO	2	3	2	3	1	3	-	1	2	-	2	2	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3AL001NC1**		Course Category: **NC**		
Course Name	**Disaster Management and Preparedness**				
Credits	--	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	--
Total Credit Hours	--				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	--	Total Marks	--

Course Description:
Subject Code 3CE001NC1 Disaster Management and Preparedness is a Compulsory Non-Credit course for Second Year B. Tech all disciplines.

Course Objectives:
The objective of this course is to provide students with a comprehensive understanding of disasters, their types, impacts, the complete disaster management cycle, and the roles of various agencies in Disaster Risk Reduction.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE001NC1.1	Identify the concepts of disaster, hazard, vulnerability and risk, and classify disasters to understand the basic nature, causes and profiles of disasters in India.	C-2
3CE001NC1.2	Analyze the disaster management cycle for risk assessment, mitigation, preparedness, response, recovery, and international disaster management frameworks.	C-4
3CE001NC1.3	Apply disaster management practices, including stakeholder roles, national policies, engineers' responsibilities, and preparedness measures for effective disaster risk reduction.	C-3

Course Contents:

Unit 1	**Introduction to Disaster Management:** Concepts and definitions – disaster, hazard, vulnerability, risk, severity, frequency, exposure, capacity, and impact; classification of disasters- Natural disasters: earthquakes, tsunami, landslides, mining, Hydro-Meteorological Disasters: floods, draught, cyclones, coastal erosion. Biological Disaster: epidemics, pest attacks, forest fire, Manmade disasters: Industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, vulnerability profile of India, ecological fragility; principles of disaster prevention and mitigation	10 hrs
Unit 2	**Disaster Management Cycle and Framework:** Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity	12 hrs

	Development. Awareness During Disaster – Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation. Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action Phases of disaster management; vulnerability and capacity assessment, post-disaster environmental response	
Unit 3	**Disaster Management practices:** Roles and responsibilities of government, community, local bodies, NGOs, and other stakeholders, National Policy on Disaster Management Act 2005 Mega Disasters of India and Lessons Learnt, Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster.	8 hrs

Textbooks:

1. Sharma, S. C. (2022). Disaster Management, Khanna Publication.
2. Subramanian, R. (2024). Disaster Management. Vikas Publication.

Reference Books:

1. Gaur, R. C. (2018). Environmental Engineering and Disaster Management. New Age International.
2. Pradeep Sahni, 2024, Disaster Risk Reduction in South Asia, Prentice Hall.
3. Mondal, D. (2022). Disaster Management. New Delhi: CBS Publishers & Distributors
4. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
5. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
6. Natural Disaster Management Policy , 2009,GOI
7. H.N. Shrivastava& G.D. Gupta, Management of Natural Disasters in developing Countries, Daya Publishers , Delhi
8. S.L. Goyal, Encyclopedia of disaster Management, Vol I,II & III Disaster Managemnt Policy and administration, Deep & Deep, New Delhi,2006
9. Coppola D P, Introduction to International Disaster Management, Elsevier Science (B/H), London, 2007
10. Disaster Mitigation in Asia & Pacific, Asian Development Bank

Course Assignments

Internal Assessment at Institute level will be based on following assignments:

1) Study of Recent Disasters (at local, state and national level)
2) Preparation of Disaster Risk Management Plan of an Area or Sector
3) A Case study on Disaster Management

E Recourses:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed61/preview

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE001NC1.1	3	2	-	-	-	3	2	-	-	-	3	-	-	-
3CE001NC1.2	3	3	-	-	-	3	3	-	-	-	3	2	2	-
3CE001NC1.3	3	3	-	-	-	3	3	-	-	3	3	1	2	2
3CE001NC1.CO	3	3	-	-	-	3	3	-	-	1	3	1	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CH211DH1**		Course Category: **DH**		
Course Name	**Biofuels- Types and Applications**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3CH211DH1 Biofuels- Types and Applications is a Double Minor / Honours in Chemical Engineering for Second Year B. Tech.

Course Objectives:
The objective of this course is to provide the knowledge about properties, composition, features of bio fuels and uses of biomass and their environmental impacts.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH211DH1.1	Explain energy sources and biomass types to understand the basics of renewable fuels.	C-3
3CH211DH1.2	Analyze biomass composition and pretreatment to enable effective conversion processes.	C-4
3CH211DH1.3	Compare bioethanol and biobutanol production and practice ethanol recovery to learn alcohol-based biofuel generation.	C-4
3CH211DH1.4	Examine lipid sources and perform transesterification to produce biodiesel.	C-3
3CH211DH1.5	Illustrate biohydrogen production and conduct pyrolysis with upgrading to explore advanced biofuel pathways.	C-4
3CH211DH1.6	Describe and assemble enzymatic and microbial fuel cells to develop basic bioelectrochemical systems.	C-4

Course Contents:

Unit 1	**Introduction:** Sources of energy, introduction of Biofuels, availability of bio-mass, composition of biomass, terrestrial biomass, aquatic biomass. Physical and chemical properties of biomass. Useful and undesirable features of Biofuels	7 Hrs
Unit 2	**Types of Biomass:** Types of biomass, Composition of lignocelluloses, energy crops, chemical pretreatment, enzymatic pretreatment, degradation of cellulose, trichodermacellulases, bacterial cellulases, and comparison with degradation of high starch crops.	8 Hrs

Unit 3	**Bioethanol:** Bioethanol vs. Petrol, production of bio ethanol, ethanol recovery, Bio-butanol: Properties and standards of bioethanol, Lignocellulosic biomass composition and characterizations.	7Hrs
Unit 4	**Biodiesel:** Sources and processing of biodiesel (fatty acid methyl ester); nature of lipids, especially fatty acids and triglycerides. Sources and characteristics of lipids for use as biodiesel feedstock; and conversion of feedstock into biodiesel (transesterification). Use of vegetable oil (SVO) and waste vegetable oil (WVO).	8Hrs
Unit 5	**Bio-hydrogen:** Production of bio hydrogen from anaerobic bacteria, photosynthetic algae, photosynthetic - hydrogenase system. Pyrolysis, bio-oil upgradation.	8 Hrs
Unit 6	**Fuel cells:** Enzymatic fuel cells, microbial fuel cells. Fuel Cell Principle of working, construction and applications.	7 Hrs

Text Books:

1. R.C. Brown, Biorenewable Resources Engineering, New Products from Agriculture, Wiley - Blackwell Publishing, 2003.
2. S. Lee, Y. Shah and K. Park, Biofuels and Bioenergy: Processes and Technologies, Taylor & Francis, 2011.

Reference Books:

1. S.K. Khanal, Anaerobic Biotechnology for Bioenergy Production: Principles and Applications, Wiley - Blackwell Publishing 2008.
2. M. Kaltschmitt and H. Hofbauer, Biomass Conversion and Biorefinery, Springer Publishing, 2008.

E-Resource:

1. NPTEL Online Courses – Renewable Energy Engineering, Bioenergy. https://nptel.ac.in
2. MNRE (India) – National Policy on Biofuels, reports, and updates. https://mnre.gov.in

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CH211DH1.1	3	2	3	2	3	-	-	-	-	-	-	2	2	-
3CH211DH1.2	3	-	3	-	3	-	-	-	-	-	-	3	3	-
3CH211DH1.3	-	-	2	-	3	-	-	-	-	-	-	3	3	2
3CH211DH1.4	3	2	3	2	3	-	-	-	-	-	-	3	3	2
3CH211DH1.5	3	-	3	-	3	-	-	-	-	-	-	3	3	2
3CH211DH1.6	-	-	2	-	3	-	-	-	-	-	-	3	3	2
3CH211DH1 CO	2	1	3	1	3	-	-	-	-	-	-	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CH211DH2**		Course Category: **DH**		
Course Name	**Industrial Hygiene and Occupational Health**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

Course Description:
Subject Code 3CH211DH2 Industrial Hygiene and Occupational Health is a Double Minor / Honours in Chemical Engineering for Second Year B. Tech.

Course Objectives:
The objective of the course is to introduce occupational health hazards in process industries, covering toxicology, exposure assessment, control strategies, physical/ergonomic/biological risks, and basics of health management with legal and regulatory standards.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CH211DH2.1	Analysis and classification of industrial hygiene hazards with reference to real incidents.	C-4
3CH211DH2.2	Interpret toxicology data to calculate permissible exposure durations.	C-3
3CH211DH2.3	Perform selection and application of exposure assessment methods to prepare hazard communication charts.	C-4
3CH211DH2.4	Evaluate physical hazards using data such as noise dose and heat stress to propose appropriate control measures.	C-5
3CH211DH2.5	Perform assessment of ergonomic and biological risks to recommend practical redesign measures.	C-5
3CH211DH2.6	Analysis and summarization of occupational health requirements to prepare compliance and audit checklists	C-4

Course Contents:

Unit 1	**Introduction & Scope of Industrial Hygiene:** Scope and principles; hazard categories (chemical, physical, biological, ergonomic); roles of an industrial hygienist; link between industrial hygiene and process safety. Case study: Bhopal gas tragedy — lessons in IH failure.	7 Hrs
Unit 2	**Basics of Toxicology & Exposure:** Dose–response, acute vs chronic toxicity; LD_{50}, LC_{50}; TLV, PEL, OEL, IDLH, STEL, ceiling limits; toxic interactions. Analytical: Estimate safe exposure durations from TLV values	8 Hrs
Unit 3	**Chemical Exposure Assessment & Controls:** Routes of exposure (inhalation, dermal, ingestion); monitoring strategies (air sampling, direct-reading instruments, biological	7 Hrs

	monitoring); hierarchy of controls. Skill: Interpret MSDS and prepare a hazard communication chart (GHS labels).	
Unit 4	**Physical Hazards:** Noise (measurement, effects, controls); vibration; heat stress; radiation (ionizing & non-ionizing). Analytical: Calculate noise dose and evaluate against OSHA standards. Case study: Heat stress incidents in petrochemical plants.	8 Hrs
Unit 5	**Ergonomic & Biological Hazards:** Principles of ergonomics; musculoskeletal disorders; workstation design; biological agents in chemical and pharma plants. Skill: Identify ergonomic risk factors in a plant layout	7 Hrs
Unit 6	**Occupational Health Management & Legislation:** Common occupational diseases (silicosis, asbestosis, lead poisoning, byssinosis); health surveillance & medical examinations; Indian legislations (Factories Act, ESI, Workmen's Compensation); ILO/ OSHA/WHO conventions. Skill: Prepare a compliance checklist/ report for a chemical plant.	8 Hrs

Text Books:

1. Plog, B.A., Niland, J., & Quinlan, P. Fundamentals of Industrial Hygiene, 6th Edition, National Safety Council, 2012.
2. Goetsch, D.L. Occupational Safety and Health for Technologists, Engineers, and Managers, 9th Edition, Pearson, 2019.
3. Bridger, R.S. Introduction to Ergonomics, 3rd Edition, CRC Press (Taylor & Francis), 2008.

Reference Books:

3. Patty's Industrial Hygiene and Toxicology (Volumes I–IV) Edited by Harris, R.L., 6th Edition, Wiley-Interscience, 2011.
4. Robert Friis, Occupational Health and Safety for the 21st Century, Jones and Bartlett Learning, 2015.

E-Resources:

https://onlinecourses.nptel.ac.in/noc20_mg43/preview

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CH211DH2.1	3	3	2	2	2	3	-	-	2	-	2	3	3	-
3CH211DH2.2	3	3	2	3	3	2	-	-	2	-	2	3	3	-
3CH211DH2.3	3	2	3	3	3	2	-	2	3	2	2	3	3	2
3CH211DH2.4	2	2	3	3	3	3	-	2	2	2	2	3	3	2
3CH211DH2.5	2	2	3	2	3	3	-	2	2	2	2	3	3	2
3CH211DH2.6	2	2	2	2	2	3	-	2	2	2	2	3	3	2
3CH211DH2 CO	3	2	3	3	3	3	-	2	2	2	2	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CH212PC1**		Course Category: **PCC**		
Course Name	**Fluid Flow Operation**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**03 Hr**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code4CH214PC1 Fluid Flow Operation is a Programme Core Course for Second Year B. Tech. Chemical Engineering.

Course Objectives:

The objective of this course is to provide fundamental knowledge of fluid properties, classification, and behavior under static and dynamic conditions and apply the principles of fluid kinematics, continuity, and motion equations in engineering applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CH214PC1.1	Explain fluid properties and static pressure relations to build conceptual understanding for analyzing fluid at rest.	C-2
4CH214PC1.2	Apply laminar–turbulent flow concepts and dimensional analysis to determine velocity profiles for engineering flow applications.	C-3
4CH214PC1.3	Apply Bernoulli and Navier–Stokes laws to determine flow behavior for solving dynamic fluid problems.	C-3
4CH214PC1.4	Demonstrate flow measuring devices to measure discharge and velocity for industrial fluid flow monitoring.	C-3
4CH214PC1.5	Analyze performance of pumps, compressors and flow machinery to select suitable equipment for process industries.	C-4
4CH214PC1.6	Evaluate drag, settling and packed bed flow to design systems for solid–fluid separation efficiency.	C-5

Course Contents:

Unit 1	**Fluid Properties and Fluid Statics:** Definition, basic concepts of fluid, Properties of fluids and their classification. Fluid statics: Forces on fluids, pressure depth relationship for compressible and incompressible fluids. Forces on submerged bodies. Rigid body motion, pressure measurements, Euler's equation.	5Hrs

Unit 2	**Kinematics of Flow:** Fluid flow: Laminar and turbulent flows, Equations of Continuity and Motion in laminar flows and its applications for the calculation of velocity profiles, Dimensional analysis; Buckingham's Pi Theorem; Dimensionless numbers and their physical significance.	5 Hrs
Unit 3	**Fluid Dynamics:** Bernoulli's Equation and engineering applications, Conservation of mass, momentum and energy balance, Navier-Stokes equations, Basics of Turbulent flows, motion for turbulent flows: Prandtl mixing length theory,. Turbulent pipe flow, Boundary layer theory.	5 Hrs
Unit 4	**Flow Measurement:** Flow measuring devices for chemical plants: Orifice meter, Venturimeters, Rotameter, Pitot tube and rectangular & V-Notches.	5 Hrs
Unit 5	**Fluid Moving Machinery:** Pressure drop in Pipe fitting and valves, Friction Construction, working and characteristic features of various types of pumps, compressors, blowers and fans.	5 Hrs
Unit 6	**Flow Past Bodies:** Flow past immersed bodies: Drag, Drag coefficients, Flow through beds of solids, Particle motion, Terminal velocity, Hindered settling, flow through packed bed and fluidized Bed.	5 Hrs

Text Books:

1. K. A. Gavhane, Fundamentals of Chemical Engineering and Materials, 1st Edition (2024).
2. W. L. McCabe, J. C. Smith, P. Harriott P., Unit Operations of Chemical Engineering, 7 th Ed., McGraw-Hill, New York, 2017.
3. R. B. Bird, W. E. Stewart, E. N. Lightfoot, Transport Phenomena, 2nd ed., John Wiley & Sons.
4. Coulson J. M. and Richardson J. F. Chemical Engineering, Vol. 1sixth edition Elsevier publication.
5. Dr. R.K.Bansal , Fluid Mechanics and Hydraulic Machines, 9th edition, Laxmi publications.

Reference Books:

1. F. M. White, Fluid Mechanics, 9 th Ed., McGraw Hill, 2022.
2. G. K. Batchelor, An Introduction to Fluid Dynamics, 2nd Ed., Cambridge Univ Press, (2000)

E-Resources:

1. https://nptel.ac.in/courses/105101082
2. https://nptel.ac.in/courses/103104044NPTEL
3. https://onlinecourses.nptel.ac.in/noc23_ch32/previewNPTEL
4. https://nptel.ac.in/courses/103105353NPTEL

Mapping of COs with Pos and PSO's:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4CH214PC1.1	3	2	-	-	-	-	-	-	-	-	-	3	-	-
4CH214PC1.2	3	3	-	-	2	-	-	-	-	-	-	3	3	-
4CH214PC1.3	3	3	3	2	2	-	-	-	-	-	-	3	-	-
4CH214PC1.4	3	2	3	2	3	-	-	-	-	-	-	3	3	-
4CH214PC1.5	3	3	3	2	3	-	-	-	-	-	-	3	3	-
4CH214PC1.6	3	3	3	3	2	3	-	-	-	-	-	3	3	-
4CH214PC1 CO	3	3	2	2	2	1	-	-	-	-	-	3	2	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CH213PC1**		Course Category: **PCC**		
Course Name	**Chemical Engineering Mechanical Operation**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**03 Hr**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code4CH210PCChemical Engineering Operation-I is a Programme Core Course for Second Year B. Tech. Chemical Engineering.

Course Objectives:
To analyze the physical characteristics of particles like size, shape, and density, and how these properties affect mechanical operations and its separation by different means.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CH210PC1.1	Perform size reduction and screening operations to analyze industrial solid processing.	C-1
4CH210PC1.2	Understand the principles and operation of classifiers and thickeners to achieve effective solid separation.	C-2
4CH210PC1.3	Select appropriate solid transportation systems to ensure efficient material handling.	C-3
4CH210PC1.4	Understand filtration equipment to separate solids from liquids effectively.	C-2
4CH210PC1.5	Understand the principles of centrifuges and cyclones to enhance solid–fluid separation.	C-2
4CH210PC1.6	Understand adsorption mechanisms to apply adsorption in industrial separation processes.	C-2

Course Contents:

Unit 1	Size reduction, stages of reduction, Equipments operating variables, laws of energies, energy requirements. Screening: Screen analysis, Particle size distribution, Unit operation design, basis concepts.	7Hrs
Unit 2	Classification: Equal falling particles, equipments, jigging, tabling. Gravity settling, drag force, terminal settling velocity. . Sedimentation: Continuous thickeners.	8Hrs
Unit 3	Storage and handling of solids, transportation by means of positive and negative pressure Mixing principle, mixers, agitation, types of agitators,	7Hrs

Unit 4	Filtration: Theory, operation, types, flotation agents, flotation cells. Filter Calculations, filtration equation for compressible and non-compressible cakes, Specific cake resistance. Filtration: Constant pressure and constant rate and their equipment's.	08Hr
Unit 5	Centrifuges: Theory, Equipment's, types and calculations. . Cyclones: Hydro cyclones, liquid scrubbers and electrostatic precipitators.	7Hrs
Unit 6	Adsorption, theory, type and application, nature of adsorbents, industrial adsorbents. Adsorption in fixed bed, fluidized beds, adsorption equilibria calculations for vapor, gas and liquid adsorption. Adsorption, operation such as single stage, multi stage, cross current and multistage counter current operation and equipment's. Recent developments in mechanical operation equipment's.	8 Hrs

Text Books:

1. Gupta, S. K. (2006). Momentum Transfer Operations (2nd ed.). Tata McGraw-Hill.
2. McCabe, W. L., Smith, J. C., and Harriott, P. (2005). Unit Operations of Chemical Engineering (7th ed.). Tata McGraw-Hill.
3. Coulson, J. M., and Richardson, J. F. (1999). Chemical Engineering, Volume I (6th ed.). Pergamon Press.
4. Foust, A. S., Wenzel, L. A., Clump, C. W., Maus, L., and Andersen, L. B. (1980). Principles of Unit Operations (2nd ed.). John Wiley & Sons.

Reference Books:

1. Brown, C. G. (1950). Unit Operations. John Wiley & Sons.
2. Badger, W. L., and Banchero, J. T. (1955). Introduction to Chemical Engineering. McGraw-Hill.
3. Treybal, R. E. (1980). Mass Transfer Operations (3rd ed.). McGraw-Hill.
4. Hiremath, R. S., and Kulkarni, A. P. (2009). Mechanical Operations, Volume I. Nirali Prakashan.

E-resources:

1. http://digimat.in/nptel/courses/video/103107123/L03.html

Mapping of COs with Pos and PSO's:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CH210PC1.1	3	3	2	2	-	-	-	-	-	-	-	3	2	2
4CH210PC1.2	3	3	2	2	-	-	-	-	-	-	-	3	2	2
4CH210PC1.3	3	2	3	2	2	-	-	-	2	-	-	3	3	2
4CH210PC1.4	2	3	3	3	2	-	-	-	-	-	-	3	3	2
4CH210PC1.5	2	2	3	2	2	-	-	-	-	-	-	3	3	3
4CH210PC1.6	3	2	3	3	2	-	-	-	-	-	-	3	3	3

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CH214PC1**		Course Category: **PCC**		
Course Name	**Process Calculations**				
Credits	**02**	Total L:T:P Hours	3:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3CH212PC1 Process Calculation is a compulsory Program Core Course for Second Year B.Tech. Chemical Engineering.

Course Objectives:
The objective of this course is to develop students ability to apply fundamental chemical engineering principles such as unit operations, stoichiometry, material and energy balances, and combustion calculations to analysed, design, and evaluate chemical process systems.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CH212PC1.1	Analyze engineering problems using systematic process calculations and dimensional analysis to ensure accurate unit conversions and reliable quantitative results.	C-4
4CH212PC1.2	Apply the concepts of mole fraction and mass fraction to determine and represent the composition of solid, liquid, and gaseous mixtures in process systems.	C-3
4CH212PC1.3	Integrate mass conservation principles and material balance classifications to evaluate and solve unit operation problems related to phase behavior and product distribution.	C-6
4CH212PC1.4	Apply stoichiometric relationships to formulate material balance equations for analyzing reacting systems in chemical processes.	C-3
4CH212PC1.5	Interpret thermo chemical data to assess energy efficiency and optimize heat utilization for improved performance of chemical processes.	C-2
4CH212PC1.6	Evaluate fuel performance using calorific value and combustion efficiency to assess overall combustion quality and energy effectiveness.	C-5

Course Contents:

Unit 1	**Basic Chemical Calculations:** Introduction to process calculation, Dimensions and systems of units, Fundamental quantities of units, Derived quantities, Definition and units of force, volume, pressure, work, energy, power, heat, Unit conversions in SI systems, Numerical.	08 Hrs
Unit 2	**Molecular Concepts and Gas Laws:** Gram mole and molecular weight, mole and mass fraction, Composition of solids, liquids and gases, Concept of Normality, Molarity and Molality, PPM (Parts Per Million), Ideal Gas Law, STP and NTP conditions, Dalton's Law, Partial Pressure, Amagat's Law, Average Molecular Weight, Density of Gas Mixture, Raoult's Law, Henry's Law.	07 Hrs
Unit 3	**Material Balance without Chemical Reaction:** Law of conservation of mass, classification of Material balance problems, Distillation, Evaporation, Absorption, Extraction, Drying, Filtration, Mixing, Crystallization, Bypass Operations, Numerical.	08 Hrs
Unit 4	**Material Balance with Chemical Reaction:** Terms involved in Stoichiometry, Stoichiometric equation, stoichiometric coefficient, Limiting Reactant, Excess Reactant, Percent excess, and percentage Conversion, percentage Yield, and selectivity, Numerical.	07 Hrs
Unit 5	**Energy Balance:** Energy balance for open and closed systems, Sensible heat and heat capacities, Heat of reaction, energy balance during Phase Change Operations, Hess's law of constant Heat Summation, Numerical.	08 Hrs
Unit 6	**Fuel and Combustion:** Classification of fuel, Calorific value of fuel, GCV, NCV, Air requirement, Theoretical Air and Oxygen, Excess Air, heat and material balance of combustion processes. Numerical	07 Hrs

Text Books:

1. O.A. Hougen, K.M. Watson, R.A. Ragatz, Chemical Process Principles, (CBS publications New Delhi 1995 edition)- part-I
2. Narayanan K.V. and Lakshmikutty B, Stoichiometry and Process Calculations, PHI; 2nd edition, Year2016ISBN: 8120352890
3. R. M. Felder, Ronald W. Rousseau, Lisa G. Bullard, Elementary Principles of Chemical Processes, 4th Ed., John Wiley & Sons, Asia, 2017.
4. Felder, R. M. and Rousseau, R. W., Elementary Principles of Chemical Processes, 5th Edn., John Wiley & Sons, New York, 2005.
5. Himmelblau D.H., James B. Riggs, Basic Principles and Calculations in Chemical Engineering, Prentice Hall, 2012, 8th Edition.

Reference Books:

1. Bhatt, B. I., Vora, S. M., Stoichiometry, Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2004.
2. Narayanan K V and Lakshmikutty B, Stoichiometry and Process Calculations, Prentice Hall of India Pvt Ltd, New Delhi 2006.
3. Sikdar, D. C., Chemical Process Calculations, Prentice Hall of India.
4. Hougen. O. A, Watson K.M. and Ragatz R.A., Chemical Process Principles, Part -I, Material and Energy Balance".
5. N. Chopey, Handbook of Chemical Engineering Calculations, 4th Ed., Mc-Graw Hill, 2012.
6. Olaf, K.M. Watson and R. A. R. Hougen, Chemical Process Principles, Part 1: Material and Energy Balances, 2nd Ed., John Wiley & Sons, 2004.
7. Nayef Ghasem, Redhouane Henda, Principles of Chemical Engineering Processes: Material and Energy Balances, CRC Press, 2015, 2nd Edition.

E- Resources:

1. https://bietdvg.edu/media/department/BT/data/learning-materials/stoichometry1.pdf
2. https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SCHA1304.pdf
3. https://thechemgate.wordpress.com/wp-content/uploads/2019/01/process-calculation-by-watson.pdf
4. https://nptel.ac.in/courses/103103165
5. https://nptel.ac.in/courses/103105209
6. https://www.unitoperation.com/

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CH201PC1.1	3	3	-	2	2	-	-	-	-	-	2	3	2	-
3CH201PC1.2	3	2	-	2	2	-	-	-	-	-	2	3	2	-
3CH201PC1.3	3	3	-	2	2	-	-	-	-	-	3	3	3	-
3CH201PC1.4	3	3	-	2	3	-	-	-	-	-	3	3	3	-
3CH201PC1.5	3	2	-	2	2	2	-	-	-	-	3	3	3	2
3CH201PC1.6	3	2	-	2	2	2	-	-	-	-	3	3	3	2
3CH201PC1CO	3	3	-	2	2	1	-	-	-	-	3	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CH215MD1**		Course Category:		**MDM-II**
Course Name	**Air Pollution and Control**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**-**	PA Marks	**-**	Total Marks	**50**

Course Description:
Subject Code 4CH215MD1 Air Pollution and Control is a Multidisciplinary Minor Chemical Engineering Course for Second Year B. Tech.

Course Objectives:
The objective of this course is to provide an understanding of air pollution sources, characteristics, impacts, and control methods, enabling students to analyze sources and apply suitable control mechanisms.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CH215MD1.1	Perform identification and classification of major air pollutants to evaluate their sources and impacts on humans, materials, and vegetation.	C-5
4CH215MD1.2	Understanding of basic atmospheric elements and meteorological factors to explain fundamental principles of air sampling.	C-2
4CH215MD1.3	Perform analysis of simple air pollution control methods for particulate and gaseous pollutants to outline basic air quality standards.	C-4

Course Contents:

Unit 1	**Air Pollutants, Sources & Effects:** Classification of air pollutants, Particulate pollutants, Gaseous pollutants, Major sources of air pollution: Industrial, Vehicular, Domestic, Effects of air pollution on Human beings, Materials, Vegetation; Brief introduction to: Global warming, Ozone layer depletion	10 Hrs
Unit 2	**Basic Sampling, Analysis & Atmospheric Concepts :** Basic principles of air sampling, Source sampling (concept), Ambient sampling (concept); Basic analysis of common pollutants (principles only, Elements of atmosphere (simple) Meteorological factors influencing air pollution: Wind direction, Wind rose, Lapse rate (concept only)	10 Hrs
Unit 3	**Air Pollution Control & Basic Management:** Concept and basic principles of air pollution control, Simple particulate control methods: Settling chamber, Cyclone, Bag filter, Simple gaseous pollutant control: Absorption, Adsorption, Air quality standards (overview only), General preventive measures, Basic idea of zoning in urban air quality management	10 Hrs

Text Books:

1. Anjaneyulu, D., “Air Pollution and Control Technologies”, Allied Publishers, Mumbai, 2002 Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi,1996

Reference Books:

1. " Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.
2. “W.L.Heumann, Industrial Air Pollution Control Systems, McGraw- Hill, New Yark, 1997.
3. “Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi, 1991.
4. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985
5. Garg, S.K., “Environmental Engineering Vol. II”, Khanna Publishers, New Delhi

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ce14/preview

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CH215MD1.1	3	2	2	2	2	3	-	-	2	-	2	3	3	-
4CH215MD1.2	3	3	2	3	3	2	-	-	2	-	2	3	3	-
4CH215MD1.3	2	2	3	2	3	3	-	2	2	2	2	3	3	2
4CH215MD1 CO	3	2	2	2	3	3	-	-	2	-	2	3	3	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4SH216OE1**	Course Category:	**OE**
Course Name	**Quantitative and Logical Reasoning**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4SH216OE1Quantitative and Logical Reasoning is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the Course is to develop quantitative aptitude, logical reasoning, problem-solving efficiency, and decision-making skills for placements, competitive exams, and real-life applications

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE1.1	Apply arithmetic and numerical techniques to solve quantitative problems accurately.	C-3
4SH216OE1.2	Solve algebraic and equation-based problems using simplification and approximation methods to improve problem-solving efficiency.	C-3
4SH216OE1.3	Analyze logical reasoning problems using structured and critical thinking approaches to improve decision-making skills.	C-4
4SH216OE1.4	Interpret and analyze data using graphical and tabular methods for decision making for strategic planning.	C-4
4SH216OE1.5	Solve complex logical puzzles and advanced reasoning problems efficiently for competitive examination success.	C-3
4SH216OE1.6	Demonstrate effective aptitude test strategies integrating quantitative and logical reasoning skills for career advancement opportunities.	C-3

Course Contents:

Unit 1	**Number System & Arithmetic Foundations:** Number system fundamentals; LCM and HCF applications; divisibility rules; percentage calculations; ratio and proportion; averages; profit and loss; simple and compound interest; speed mathematics and shortcut techniques.	7Hrs
Unit 2	**Algebra, Equations & Simplification Techniques:** Linear and quadratic equations; algebraic expressions; simplification and approximation; indices and surds; inequalities; time and work; pipes and cisterns; time, speed and distance; mixtures and alligation.	7 Hrs

Unit 3	**Logical Reasoning: Analytical & Critical Thinking:** Coding–decoding; blood relations; direction sense; series and pattern recognition; analogies; ranking and ordering; syllogisms; statement and assumption; statement and conclusion; cause–effect reasoning.	7 Hrs
Unit 4	**Data Interpretation & Analytical Aptitude:** Tables; pie charts; line graphs; bar graphs; caselets; data sufficiency; DI shortcut techniques; approximation in data interpretation; comparative and predictive data analysis.	8Hrs
Unit 5	**Advanced Logical Reasoning & Puzzle Solving:** Seating arrangements (linear, circular, and complex); floor-based puzzles; scheduling puzzles; selection-based puzzles; Venn diagrams; logical grouping; critical reasoning frameworks	8 Hrs
Unit 6	**Placement Aptitude Mastery & Test Strategies:** Integrated quantitative and logical reasoning practice; decision-making and elimination strategies; speed improvement techniques; mock placement aptitude patterns (TCS, Infosys, Wipro, Accenture, Capgemini); common error analysis; test-taking strategies; aptitude and reasoning simulations.	8 Hrs

Text Books:

1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing
2. Arun Sharma, Logical Reasoning and Data Interpretation, McGraw Hill

Reference Books:

1Arun Sharma, How to Prepare for Quantitative Aptitude,published by McGraw Hill Education.
2. R.S. Aggarwal, A Modern Approach to Logical Reasoning, published by S. Chand Publishing
3. M.K. Pandey, Analytical Reasoning, published by BSC Publishing Co. Pvt. Ltd.
4. Rajesh Verma, Fast Track Objective Arithmetic, published by Arihant Publications

E Resources:

1. NPTEL – Quantitative Aptitude & Logical Reasoning Courses
2. IndiaBIX – Quantitative and Logical Reasoning Practice
3. CareerRide – Aptitude Preparation Modules
4. PrepInsta / HackerEarth – Placement Aptitude Practice Platforms

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4SH216OE1.1	3	3	2	–	–	–	–	–	–	–	–			
4SH216OE1.2	3	3	2	–	–	–	–	–	–	–	–			
4SH216OE1.3	–	3	3	–	–	–	–	–	–	–	–			
4SH216OE1.4	–	3	2	–	–	–	–	–	–	–	–			
4SH216OE1.5	–	3	3	–	–	–	–	–	–	–	–			
4SH216OE1.6	–	3	2	–	–	–	–	–	–	2	3			
4SH216OE1 CO	1	3	3	–	–	–	–	–	–	1	1			

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4SH216OE2**	Course Category:	**OE**
Course Name		**Critical Thinking & Decision Making**			
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 4SH216OE2 Critical Thinking & Decision Making is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:
The objective of this course is to develop critical thinking and decision-making competencies by strengthening analytical reasoning and structured problem-solving skills applicable to professional and real-world situations.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE2.1	Apply critical thinking frameworks to analyze problems systematically.	C-3
4SH216OE2.2	Evaluate information, assumptions, and arguments for logical consistency and validity.	C-5
4SH216OE2.3	Analyze complex situations and identify feasible alternatives for decision making.	C-4
4SH216OE2.4	Design rational and ethical decision-making strategies under uncertainty to ensure sustainable organizational outcomes.	C-6 A-3
4SH216OE2.5	Apply quantitative and qualitative tools to support decision-making processes.	C-3
4SH216OE2.6	Demonstrate effective decision making in simulated professional and team-based scenarios to resolve workplace challenges effectively	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundations of Critical Thinking:** Concept of critical thinking; elements of reasoning; logical vs illogical thinking; assumptions and inferences; inductive and deductive reasoning; common cognitive biases; barriers to critical thinking.	7Hrs
Unit 2	**Analytical Reasoning & Problem Framing:** Problem identification and structuring; root cause analysis; issue trees; questioning techniques; systems thinking; analytical reasoning models.	7 Hrs

Unit 3	**Decision Making Models & Techniques:** Rational decision-making model; intuitive decision making; bounded rationality; decision trees; cost–benefit analysis; risk and uncertainty; heuristics.	7 Hrs
Unit 4	**Data-Driven & Ethical Decision Making:** Use of data in decision making; qualitative vs. quantitative data; basic decision matrices; ethical frameworks; professional ethics; social and environmental considerations in decisions.	8Hrs
Unit 5	**Creativity, Innovation & Strategic Thinking:** Creative thinking techniques; lateral thinking; design thinking approach; scenario planning; strategic decision making; innovation in problem solving.	8 Hrs
Unit 6	**Applied Decision Making & Case Analysis:** Case studies from industry and management; individual and group decision simulations; conflict resolution through decision frameworks; decision-making under pressure; reflection and feedback	8 Hrs

Text Books:

1. Alec Fisher, Critical Thinking, published by Cambridge University Press.
2. John Adair, Decision Making and Problem Solving, published by Kogan Page.

Reference Books:

1. Daniel Kahneman, Thinking, Fast and Slow published by Farrar, Straus and Giroux.
2. Rolf Dobelli, The Art of Thinking Clearly, published by Sceptre.
3. John S. Hammond, Ralph L. Keeney, Howard Raiffa, Smart Choices, published by Harvard Business School Press.
4. Ken Watanabe, Problem Solving 101, published by Portfolio.

E Resources:

1. NPTEL – Critical Thinking &Decision Making Courses
2. Coursera – Critical Thinking and Decision-Making Modules
3. Harvard Business Review – Decision Making Articles
4. MIT OpenCourseWare – Decision Analysis

Mapping of COs with POs & PSO

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4SH216OE2.1	2	3	2	–	–	–	–	–	–	–	–			
4SH216OE2.2	–	3	3	–	–	–	–	–	–	–	–			
4SH216OE2.3	–	3	2	–	–	–	–	–	–	–	–			
4SH216OE2.4	–	3	3	–	–	2	3	–	–	–	–			
4SH216OE2.5	–	2	2	–	2	–	–	–	–	–	–			
4SH216OE2.6	–	2	2	–	–	2	–	2	2	–	2			
4SH216OE2. CO	1	3	3	-	1	1	1	1	1	-	1			

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CH217PC1**		Course Category: **PCC**		
Course Name	**Fluid Flow Operation Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code4CH218PC1 Fluid Flow Operation Lab is a compulsory Programme core Course for Second Year B. Tech. Chemical Engineering.

Course Objectives:

The objective of this course is to perform practical's on the concepts of Fluid Flow Operation and working of Flow measurement device.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CH218PC1.1	Operate Bernoulli-based flow instruments (orifice meter, Venturimeter, Pitot tube to determine discharge and pressure characteristics for fluid flow assessment.	C-3 & P-4
4CH218PC1.2	Differentiate and value laminar–turbulent flow behavior using Reynolds experiment to enhance conceptual understanding for engineering decision-making..	C-4 & A-3
4CH218PC1.3	Manipulate and test notches, valves, and flow meters to evaluate measurement accuracy and performance for process fluid operations.	C-5 & P-4

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Verification of Bernoulli's theorem.
2. Determination of Turbulent flow and Laminar flow by Reynolds apparatus.
3. To determine the coefficient of the discharge of Orifice meter.
4. To determine the coefficient of discharge of Venturimeter.
5. To determine the coefficient of velocity for Pitot tube.
6. To determine the coefficient of discharge of Rotameter.
7. To determine the coefficient of discharge for Rectangular notch.
8. To determine the coefficient of discharge for Triangular notch.
9. Experiment on characteristics of the Centrifugal pump.

10. To study the different types of Valves in chemical process industry.

List of Virtual Labs:

1. https://me.iitp.ac.in/Virtual-Fluid-
2. vlab.co.in/participating-institute-iiit-hyderabad
3. https://fm-nitk.vlabs.ac.in/List%20of%20experiments.html
4. vlab.co.in/participating-institute-nitk-surathkal

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4CH218PC1.1	3	2	-	3	3	1	-	-	-	-	-	3	2	-
4CH218PC1.2	3	3	-	2	-	-	-	1	-	-	-	2	3	-
4CH218PC1.3	3	2	3	3	3	-	-	-	1	-	2	3	3	-
4CH218PC1CO	3	2	1	3	2	-	-	-	-	-	1	3	3	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CH218PC1**		Course Category: **PCC**		
Course Name	**Chemical Engineering Mechanical Operation Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 4CH213PC1Chemical Engineering Operation-I Lab is a compulsory Programme core Course for Second Year B. Tech. Chemical Engineering.

Course Objectives:

The objective of this course is to perform practical's on the concepts of Chemical Engineering Operation-I.on size reduction of particles and its separation by different means of equipments.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CH213PC1.1	Perform crushing, grinding, screening, jigging, and sedimentation experiments to determine operational performance and equipment efficiency.	C-1& P-4
4CH213PC1.2	Analyze particle size distribution, cyclone separator efficiency, and transport equipment performance to assess separation and material handling effectiveness.	C-4& P-1
4CH213PC1.3	Apply experimental data to design basic unit operation equipment such as thickeners and to evaluate conveying and separation systems.	C-3 & P-5

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. To Understand the Law of Crushing & Grinding using Jaw Crusher.
2. To Understand the Law of Crushing & Grinding using the Ball Mill.
3. To Demonstrate to Design the Thickener using the Sedimentation Test.
4. To Understand to Determine the Efficiency of Cyclone Separator.
5. To Understand to Study the sieve analysis.
6. To Understand to study the operation of Trammel.
7. To Understand to Study the operation of Jigging.
8. To Understand to Study the Screw Conveyor.

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4CH213PC1.1	3	2	2	2	-	-	-	-	-	2	-	3	2	2
4CH213PC1.2	3	3	2	3	-	-	-	-	-	2	-	3	3	2
4CH213PC1.3	3	2	3	2	2	-	-	-	2	3	2	3	3	3
4CH213PC1CO	3	2	2	2	-	-	-	-	-	2	-	3	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CH219VS1**		Course Category: **VSC**		
Course Name	**Computer Application in Chemical Engineering**				
Credits	**02**	Total L:T:P etc. Hours	0:0:4 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**--**	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 4CH2119VS1 Computer Application in Chemical Engineering is a Vocational and Skill Enhancement Course for Second Year B. Tech. Chemical Engineering.

Course Objectives:

The objective of this course is to develop fundamental knowledge of computer applications and programming tools used in chemical engineering for data analysis, process calculations, simulation, and problem-solving.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CH2119VS1.1	Apply basic computer programming concepts and software tools for solving chemical engineering problems.	C-2 & P-2
4CH2119VS1.2	Analyze and interpret engineering data using computational and simulation techniques.	C-3 & P-5
4CH2119VS1.3	Develop computer-based solutions for process control, modelling, and optimization in chemical engineering applications.	C-4 & P-6

List of Practicals:
Minimum eight free hand drawing sheets from the list mentioned below.
1. Study of basic operations and functions in Microsoft Excel.
2. Curve fitting and graphical analysis using Microsoft Excel.
3. Statistical design and analysis of experiments using Microsoft Excel for engineering applications.
4. Study of MATLAB environment and basic programming commands.
5. Curve fitting and data analysis using MATLAB.
6. Modelling and simulation of process control systems using Simulink in MATLAB.
7. Study of Aspen Plus interface and simulation environment.
8. Estimation of thermodynamic properties of user-defined components such as vanillin and ibuprofen using the UNIFAC property method in Aspen Plus.
9. Determination of boiling point of n-butane at 1 bar and 10 bar using Gibbs free energy relations of vapour and liquid phases with the PR-BM property method in Aspen Plus.

10. Simulation and separation analysis of Benzene–Toluene–Xylene (BTX) mixture through distillation using Aspen Plus software.

Text Books:

1. Rao V. Dukkipati, MATLAB for Engineers, New Age International Publishers, 2010.
2. Richard Turton, Richard C. Bailie, Wallace B. Whiting and Joseph A. Shaeiwitz, Analysis, Synthesis and Design of Chemical Processes, Prentice Hall, 2018.
3. H. S. Kalsi, Computer Concepts and Applications, Wiley India, 2017.

Reference Books:

1. William L. Luyben, Process Modeling, Simulation and Control for Chemical Engineers, McGraw Hill, 1990.
2. Stanley I. Sandler, Chemical and Engineering Thermodynamics, Wiley, 2017.
3. Aspen Technology Inc., Aspen Plus User Guide and Documentation, AspenTech, 2023.
4. DWSIM Team, DWSIM Simulation Software Documentation, 2024.

E-Resources:

1. Smith, R., "Process Simulation and Design Using Aspen Plus," Chemical Engineering Research and Design, 2016.
2. Edgar, T. F., Himmelblau, D. M., and Lasdon, L. S., "Optimization of Chemical Processes Using MATLAB," Computers & Chemical Engineering, 2001.
3. Cutlip, M. B. and Shacham, M., "Problem Solving in Chemical and Biochemical Engineering with POLYMATH, Excel, and MATLAB," Prentice Hall, 2008.
4. Calçada, L. A. and de Medeiros, J. L., "Application of DWSIM in Chemical Process Simulation and Education," Computer Applications in Engineering Education, 2020.
5. Langtangen, H. P., "Python and MATLAB for Engineering Computations," Springer Journal of Scientific Computing, 2012.

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CH2119VS1.1	3	2	2	2	-	-	-	-	-	-	-	1	1	-
4CH2119VS1.2	2	2	3	-	2	3	-	-	-	-	-	1	1	-
4CH2119VS1.3	2	3	2	3	2	-	-	2	-	-	3	2	-	1
4CH219VS1CO	2	2	2	2	1	1	-	1	-	-	1	1	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**4SH220AE1**	Course Category:	**AEC**
Course Name	**Technical Writing**			
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours	**15 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**--**	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 4SH220AE1 Technical Writing is common Ability Enhancement Course for Second Year B. Tech.

Course Objectives:
The objective of the course is to enhance students' ability to write effective technical documents, professional correspondence, and research-oriented content with clarity, accuracy, and ethical standards.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH220AE1.1	Apply principles of technical writing in engineering documents.	C-3 P-2 A-2
4SH220AE1.2	Apply technical writing skills to prepare professional documents.	C-4 P-2 A-2
4SH220AE1.3	Create ethical, well-structured technical and research documents using IEEE referencing for professional and academic communication.	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Technical Writing:** Nature and importance of technical communication, characteristics of technical writing, audience analysis, technical vocabulary, grammar and style, clarity and conciseness, paragraph structure, coherence, technical descriptions, instructions and manuals.	7 Hrs
Unit 2	**Professional and Research Writing:** Technical reports and documentation, structure of reports, abstracts and summaries, research papers, project proposals, resumes and cover letters, business emails, documentation ethics, plagiarism, referencing styles (IEEE), editing and proofreading.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.
1. Analysis of Technical Communication to Identify the nature, purpose of given technical documents and evaluate their effectiveness.
2. Editing technical text for clarity and brevity
3. Technical description of an engineering device/system

4. Writing step-by-step technical instructions
5. Preparation of structured technical reports
6. Resume and cover letter drafting
7. Technical report writing based on laboratory work, case study, or project work
8. Abstract and executive summary writing for technical documents
9. Referencing and citation using IEEE format
10. Editing, proofreading, and plagiarism check of technical documents

Text Books:

1. Rizvi A. M. & Patnaik P., Effective Technical Communication, McGraw Hill Education (India), New Delhi (Second Edition).
2. Verma S., Technical Communication for Engineers, Vikas Publishing House Pvt. Ltd., New Delhi (First Edition).
3. Misra P. & Tyagi K., Advanced Technical Communication, PHI Learning Pvt. Ltd., New Delhi (Second Edition).

Reference Books:

1. Chauhan G. S., Kashiramka S. & Thimmesha L., Technical Communication, Cengage Learning India Pvt. Ltd., New Delhi (First Edition).
2. Alred G. J., Brusaw C. T. & Oliu B., Handbook of Technical Communication, Oxford University Press, New Delhi (Second Edition).
3. IEEE Editorial Style Manual, IEEE Standards Association, IEEE, USA (Latest Edition).
4. Joseph G. & Joseph B., Grammar and Usage for Technical Communication, Cambridge University Press India, Delhi (First Edition).

E Resources :

1. NPTEL–SWAYAM, IIT Roorkee, Technical Communication for Engineers.
2. https://owl.purdue.edu
3. https://ieeeauthorcenter.ieee.org

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH220AE1.1	-	-	-	-	-	-	-	-		3	-			
4SH220AE1.2	-	-	-	-	-	-	-	-	3	3	-			
4SH220AE1.3	-	-	-	-	-	-	-	3		3	3			
4SH220AE1 CO	-	-	-	-	-	-	-	1	1	3	1			

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3SH210VE1**	Course Category:	**VEC**
Course Name	**Constitutional Values and Fundamental Duties**			
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours **30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	**--**	SEE Time	**--**	CIA Marks **--**
EE Marks	**25**	PA Marks	**25**	Total Marks **50**

Course Description:
Subject Code 3SH210VE1 Constitutional Values and Fundamental Duties is a compulsory Valus enhancement Course for Second Year B. Tech.

Course Objectives:
The objective of the course is to introduce the Indian Constitution, its historical background, fundamental values, rights, and duties.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH210VE1.1	Explain the historical background, making, and significance of the Indian Constitution to Understand the Constitution, Preamble, and core values.	C2
3SH210VE1.2	Interpret Fundamental Rights and Duties (Articles 12–35, 51A) to evaluate their implications through case studies in professional and civic life.	C3
3SH210VE1.3	Apply constitutional principles to engineering ethics, sustainability concerns (Articles 48A, 51A(g)), and demonstrate social commitment, innovation, and inclusive growth as nation builders.	C3

Course Contents:

Unit 1	**Introduction to the Constitution and Fundamental Values**: Overview of the Indian Constitution – Historical background and making of the Constitution; Meaning of Constitution; Preamble – Meaning and significance. Core Constitutional Values – Justice (Social, Economic, Political); Liberty (thought, expression, belief, faith, worship); Equality (status and opportunity); Fraternity (dignity and unity of the nation). Relevance of constitutional values for professionals and citizens.	10 Hrs
Unit 2	**Fundamental Rights and Duties**: Fundamental Rights (Articles 12–35) – Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies. Fundamental Duties (Article	10 Hrs

	51-A) – Importance and implications; Role of youth and professionals in upholding duties. Case studies highlighting real-life significance of rights and duties.	
Unit 3	**Application of Constitutional Values in Engineering and Public Life**: Ethical Responsibilities and Constitutional Alignment – Engineering ethics and public interest; Environment and sustainability as constitutional concern (Articles 48A, 51A(g)); Engineers as nation builders – Social commitment, innovation, and inclusive growth.	10 Hrs

Text Books:

1. Basu D. D., Introduction to the Constitution of India, LexisNexis Publication, New Delhi (Twenty-Third Edition).
2. Jain M. P., Constitution of India, LexisNexis Publication, New Delhi (Eighth Edition).
3. Laxmikanth M., Indian Polity, McGraw Hill Education, New Delhi (Sixth Edition).
4. Austin Granville, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, New Delhi.
5. Shukla V. N., Constitution of India, Eastern Book Company, Lucknow (Twelfth Edition).
6. Government of India, Constitution of India (Bare Act), Government of India Publication, New Delhi.

Reference Books:

1. Subhash Kashyap, Our Constitution, National Book Trust, New Delhi.
2. Durga Das Basu, Shorter Constitution of India, LexisNexis Publication.
3. P. M. Bakshi, The Constitution of India, Universal Law Publishing.
4. J. N. Pandey, Constitutional Law of India, Central Law Agency.
5. Seervai H. M., Constitutional Law of India, N. M. Tripathi Pvt. Ltd. (Vols. I–III).
6. B. Shiva Rao, The Framing of India's Constitution: A Study, Indian Institute of Public Administration.
7. D. C. Wadhwa, Political Science and Constitutional Law, Eastern Book Company.
8. Madhav Khosla, The Indian Constitution: Oxford India Short Introductions, Oxford University Press.

E Resources :

1. NPTEL course on Constitutional Studies, Prof. Sudhir Krishnaswamy, National Law School of India University
2. Constitutional Values and Fundamental Duties (University of Delhi – aligned with NEP 2020, available via NPTEL/DU open learning) https://kmc.du.ac.in/kmcouter/collnews/download/40727448169063791359.pdf/LinkedContents/pdf/All/All

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH210VE1.1	3	2	-	1	-	-	-	-	-	-	-	2	2	
3SH210VE1.2	-	3	2	2	-	2	3	3	-	-	-	3	2	-
3SH210VE1.3	-	-	3	3	-	2	3	2	-	2	-	3	3	2
3SH210VE1CO	1	2	2	2	-	2	2	2	-	1	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CE222VE1**		Course Category: **VEC**		
Course Name	**Environmental Science**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**02 Hr**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 4CE222VE1 Environmental Science is a Value Educational Course for Second Year B. Tech. Chemical Engineering.

Course Objectives:

The objective of this course is to develop awareness of the environment, natural resources, and sustainability, including environmental issues, laws, and individual roles in promoting sustainable living.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CH214PC1.1	Explain environmental concepts, renewable and non-renewable resources, associated problems, and the role of individuals in conservation to promote responsible resource management for sustainable living.	C-2
4CH214PC1.2	Analyze major types of pollution, their causes, effects, and control measures along with disaster management strategies to develop awareness and proactive prevention skills.	C-4
4CH214PC1.3	Evaluate sustainable development practices, environmental protection acts, and the roles of NGOs and engineers to enhance legal understanding and responsible environmental decision-making.	C-5

Course Contents:

Unit 1	**Environmental Concept and Resource Management:** Environmental Science Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life styles.	10 Hrs

Unit 2	**Environmental Pollution:** Pollution: Definition, Causes, Effects and control measure of (a) Air Pollution, (b) Water Pollution, (c) Soil Pollution (d) Noise Pollution (e) Nuclear hazards. Solid waste Management: 3R's Principles (Reduce, Reuse, Recycle), Method and significance. Disaster Management: Floods, earth quake, cyclone and landslides.	10 Hrs
Unit 3	**Sustainable Development and the Environment:** Sustainable Development- Definition, need and importance, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people. Environment Protection Act. Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Role of Institutions, NGO's, Engineers in implementation.	10 Hrs

Text Books:

1. Erach Bharucha, Textbook for Environmental studies, Universities Press (India),1st Edition, 2005.
2. Dr. Shanta Satyanarayan, Dr. Suresh Zade, Dr. Sitre & Dr. Meshram, A Textbook of Environmental studies, Allied Publishers Pvt. Ltd., New Delhi First edition, 2009.

Reference Books:

1. Dr. S. V. S. Rana, Essentials of Ecology and Environmental Science, PHI Learning Pvt. Ltd, Delhi .
2. Anil Kumar De, Environmental Chemistry, Wiley Eastern Limited.
3. T.G. Miller, Environmental Science, Wadsworth Publishing Co, 13th edition.
4. P. D. Sharma, Ecology and Environment, P. D. Sharma, Rastogi publications .
5. Dr. D.D. Mishra, Fundamental concepts in Environmental studies, . S. Chand publications.
6. A. Kaushik and C. P. Kaushik, Perspectives in environmental Studies, New Age International (P) Limited.

E-Resources:

1. https://nptel.ac.in/courses/127105018 NPTEL
2. https://nptel.ac.in/courses/103107215 NPTEL
3. https://onlinecourses.nptel.ac.in/noc19_ge23/preview NPTEL
4. https://onlinecourses.nptel.ac.in/noc23_hs155/preview NPTEL

Mapping of COs with Pos:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4CH214PC1.1	3	2	-	-	-	3	-	-	-	-	-	3	2	-
4CH214PC1.2	3	3	-	2	-	3	-	-	-	-	-	3	3	-
4CH214PC1.3	3	2	3	-	-	3	-	-	1	-	-	3	3	-
4CH214PC1 CO	3	2	1	1	-	3	-	-	-	-	-	3	3	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CH223DH1**		Course Category: **DH**		
Course Name	**Biogas- Production Process Engineering**				
Credits	**04**	Total L:T:P etc. Hours	4:0:0 **60 Hrs**	Total SL Hours	**60 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4CH223DH1 Biogas- Production Process Engineering is a Double Minor / Honours in Chemical Engineering for Second Year B. Tech.

Course Objectives:

The objective of this course is to provide the knowledge about properties, composition, features of bio-fuels and uses of biomass and their environmental impacts.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CH223DH1.1	Explain the biological foundations and chemical reactions of anaerobic digestion and characterize common feedstocks for biogas production.	C-3
4CH223DH1.2	Analyze and model biogas production using mass and energy balances along with basic bio-kinetic models such as Monod-type to evaluate process performance and efficiency.	C-4
4CH223DH1.3	Select and size appropriate anaerobic reactor configurations (e.g., CSTR, UASB, plug-flow, covered lagoons) for a given feedstock and loading.	C-4
4CH223DH1.4	Propose pre-treatment, co-digestion and process-control strategies to maximize methane yield and operational stability.	C-3
4CH223DH1.5	Evaluate biogas cleaning, upgrading, and utilization to assess their performance and energy efficiencies.	C-4
4CH223DH1.6	Assess environmental, economic, safety, and regulatory aspects of biogas plants and conduct a basic techno-economic and environmental evaluation for sustainable project appraisal.	C-4

Course Contents:

Unit 1	**Introduction, Feedstocks & Biogas Fundamentals:** Global context: role of biogas in waste management and renewable energy Feedstock types: animal manure, sewage sludge, MSW (organic fraction), food waste, energy crops, agro-industrial residues	10 Hrs
Unit 2	**Characterization of feedstocks :** TS, VS, C:N ratio, biodegradability, inhibitors Biogas composition and properties, calorific value, energy content	10 Hrs
Unit 3	**Microbiology & Biochemical Pathways :** Stages of anaerobic digestion: hydrolysis, acidogenesis, acetogenesis, methanogenesis, Microbial groups and syntrophy Inhibitors and toxicity Batch and continuous biochemical kinetics	10 Hrs
Unit 4	**Reactor configurations and their applications:** CSTR, continuous stirred tank, plug-flow, UASB, fixed-film, anaerobic lagoons, dry digesters Key design parameters: HRT, OLR, SRT, mixing, gas hold-up, temperature regimes	10 Hrs
Unit 5	**Feedstock Handling, Pre-treatment & Co-digestion:** Collection, transport, storage and homogenization of substrates Mechanical, thermal, chemical and biological pre-treatments (e.g., grinding, steam explosion, alkaline treatment, enzymatic addition) Co-digestion principles and benefits; substrate compatibility and blend design Solids handling and digestate management	10 Hrs
Unit 6	**Biogas Cleaning, Upgrading & Utilization:** Gas cleaning: H_2S removal, moisture removal, siloxane removal, particulate filtration Upgrading for biomethane: water wash, pressure swing adsorption, membrane separation, chemical scrubbing Utilization: CHP systems, gas engines, boilers, fueling vehicles, pipeline injection basics Storage and compression; safety issues for handling gas	10 Hrs

Text Books:

1. D. Deublein & A. Steinhauser, Biogas from Waste and Renewable Resources: An Introduction, 2nd ed., Wiley, (latest edition).
2. A. Wellinger, J. D. Murphy & D. Baxter (eds.), The Biogas Handbook: Science, Production and Applications, Woodhead/Elsevier, 2013.
3. B. E. Rittmann & P. L. McCarty, Environmental Biotechnology: Principles and Applications, 2nd ed., McGraw-Hill, 2020.

Reference Books:

1. M. H. Gerardi, The Microbiology of Anaerobic Digesters, Wiley, 2003.
2. P. N. Hobson & A. Wheatley, Anaerobic Digestion: Modern Theory and Practice, Elsevier, 1993.
3. L. Appels, Review Articles on Principles and Potential of Anaerobic Digestion, Progress in Energy and Combustion Science, 2008.

E-Resources:

1. Bioenergy Resources – Manuals and global bioenergy databases. http://www.fao.org
2. TERI (The Energy and Resources Institute) – Case studies and publications on Indian biofuels. https://www.teriin.org

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CH223DH1.1	3	2	3	2	3	3	-	-	-	-	-	2	2	-
4CH223DH1.2	3	-	2	-	3	2	-	-	-	-	-	3	3	-
4CH223DH1.3	-	-	2	-	3	2	-	-	-	-	-	3	3	2
4CH223DH1.4	3	2	3	2	3	3	-	-	-	-	-	3	3	2
4CH223DH1.5	3	-	2	-	3	2	-	-	-	-	-	3	3	2
4CH223DH1.6	-	-	2	-	3	2	-	-	-	-	-	3	3	2
3CH211DH1 CO	2	1	2	1	3	2	-	-	-	-	-	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CH223DH2**		Course Category: **DH**		
Course Name	**Fire Safety & Explosion Control**				
Credits	**04**	Total L:T:P etc. Hours	4:0:0 **60 Hrs**	Total SL Hours	**60 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

Course Description:
Subject Code 4CH223DH2 Fire Safety & Explosion Control is a Double Minor / Honours in Chemical Engineering for Second Year B. Tech.

Course Objectives:
The objective of the course is to introduce the physical and chemical basis of fires and explosions, hazard assessment and control, and train students in fire protection, regulatory compliance, and emergency response for industry-ready safety and design skills.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CH223DH2.1	Perform explanation of fire fundamentals and key combustion properties to understand fire behavior.	C-2
4CH223DH2.2	Describe fire dynamics and heat transfer in industrial fires to understand industrial fire behavior	C-1
4CH223DH2.3	Differentiate of explosion types to outline their industrial consequences.	C-4
4CH223DH2.4	Identify fire detection and suppression systems to select appropriate agents.	C-3
4CH223DH2.5	Suggest explosion prevention and mitigation measures to minimize industrial hazards.	C-5
4CH223DH2.6	Interpretate lessons from major accidents to apply qualitative fire risk assessment.	C-3

Course Contents:

Unit 1	**Fire science & fundamentals:** Fire triangle & tetrahedron, stages of fire development; Fuel–oxidizer chemistry, heat of combustion, flammability, flash point & autoignition; Flammability limits (LEL/UEL), vapor pressure, ignition energy; Flame types (premixed, diffusion), flame temperature basics.	10 Hrs
Unit 2	**Combustion behavior, fire dynamics & heat transfer:** Heat transfer mechanisms in fires (conduction, convection, radiation) and their role in fire spread; Pool fires, jet fires and flash fires: physical characteristics, burning rates, flame height correlations; Thermal radiation: view factors, simple radiation flux estimation for pool fires; Fire growth in enclosures and venting	10 Hrs

	basics.	
Unit 3	**Explosion phenomena and effects :** Deflagration vs detonation; blast wave basics and overpressure effects on structures/people; BLEVE (Boiling Liquid Expanding Vapor Explosion) mechanism and consequences; Vapor cloud explosions (VCE) congested vs open areas; Dust explosions: ignition sources, K_{st} concept and dust layering hazards.	10 Hrs
Unit 4	**Fire detection, suppression & protection systems :** Detection technologies: smoke, heat, flame detectors; fire & gas detection networks; Extinguishing media: water (sprinklers), foam (types and selection), dry chemical, CO_2, clean agents — strengths & limitations; Fixed systems: deluge, pre-action, foam suppression for hydrocarbon fires; mobile extinguishers selection; Fire water demand (qualitative), hydrant & hose-reel basics.	10 Hrs
Unit 5	**Explosion prevention & mitigation :** Inerting and purging for flammables; atmosphere control; LFL avoidance; Explosion venting (conceptual), suppression, flame arrestors, isolation valves; Relief systems for overpressure: conceptual sizing considerations (API/ASME approach overview — qualitative), safe disposal (flares, recovery); Plant layout & spacing: separation, bunding, domino effect limitation.	10 Hrs
Unit 6	**Occupational Health Management & Legislation:** Overview of relevant standards & codes (NFPA, API/ASME guidance, IEC/ISO pointers basics); Industrial case studies (Flixborough, Piper Alpha, selected refinery fires); engineering failures and preventive measures; Fire & emergency planning basics: evacuation, mutual aid, drills and response roles; Introduction to fire risk assessment: qualitative screening credible.	10 Hrs

Text Books:

1. J. A. Purkiss, Long-Yuan Li, Fire Safety Engineering Design of Structures, Third Edition, Taylor & Francis, 2013.
2. Christopher J. Wieczorek, Daniel T. Gottuk, SFPE Handbook of Fire Protection Engineering, Springer, 2015.
3. A.K. Das, Principles of Fire Safety Engineering Understanding Fire and Fire Protection, PHI Learning Pvt. Ltd, 2020.

Reference Books:

1. Rolf K. Eckhoff, Dust Explosions in the Process Industries Identification, Assessment and Control of Dust Hazards, Gulf Professional Publishing, 2003.
2. Dennis P. Nolan, Handbook of Fire and Explosion Protection Engineering Principles for Oil, Gas, Chemical, and Related Facilities, Gulf Professional Publishing, 2018.
3. NFPA 921, Guide for Fire and Explosion Investigations, NFPA, 2008.

E-Resources:

https://onlinecourses.nptel.ac.in/noc24_me31/preview

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CH223DH2.1	3	2	2	2	3	2	-	-	2	-	-	3	2	-
4CH223DH2.2	3	3	2	3	3	2	-	-	2	-	-	3	2	-
4CH223DH2.3	3	3	3	2	2	3	-	-	2	-	-	3	3	2
4CH223DH2.4	2	2	3	2	3	2	-	2	3	2	-	3	3	2
4CH223DH2.5	2	2	3	2	3	3	-	2	2	2	-	3	3	2
4CH223DH2.6	2	3	3	3	2	3	-	2	3	-	-	3	3	2
4CH223DH2 CO	3	3	3	2	3	3	-	-	2	-	-	3	3	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **5CH224EC1**		Course Category: **EC**		
Course Name	**Fluidization Engineering**				
Credits	**04**	Total L:T:P etc. Hours	2:0:4 **90 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:
Subject Code 5CH224EC1 Fluidization Engineering is an Exit course in Chemical Engineering for Second Year B. Tech.

Course Objectives:
The objective of this course is to introduce the fundamentals of fluidization and fluidized bed hydrodynamics. It also covers heat and mass transfer characteristics and basic industrial applications of fluidized bed systems.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
5CH224EC1.1	Explain the basic concepts of fluidization to identify fluidization regimes and describe industrial applications of fluidized beds.	C-2
5CH224EC1.2	Interpret of bed hydrodynamics and the role of distributors to explain simple entrainment and elutriation behavior.	C-3
5CH224EC1.3	Describe mass transfer in fluidized beds to explain the working principles of major industrial fluidized bed systems.	C-2

Course Contents:

Unit 1	**Fundamentals of Fluidization:** Introduction to multiphase systems- Concept of fluidization & fluidized bed behavior- Fixed → Expanded → Fluidized bed transition- Types of fluidizations (particulate, aggregative – simple diagrams)- Minimum fluidization velocity (UMF): concept, significance, simple numerical- Fluidization regimes: bubbling, slugging, turbulent (qualitative only)- Industrial applications: fluidized bed dryer, FBC, FCC, gasifier	10 Hrs
Unit 2	**Hydrodynamics & Contacting in Fluidized Beds:** Pressure drop in fluidized beds- Bed expansion characteristics- Bubble formation in fluidized beds (simple explanation)- Particle mixing and segregation- Entrainment & elutriation: simple concept, cyclone role- Gas–solid contacting efficiency- Distributors: purpose, types, easy design considerations	10 Hrs

Unit 3	**Heat/Mass Transfer & Industrial Systems:** Better heat and mass transfer in fluidized beds: brief reasons- Gas–solid contact area and mixing: simple effects- Working principle of a fluidized bed dryer- Fluidized bed combustor (FBC): basic working- FCC reactor: simple catalyst circulation- Scale-up basics: avoiding slugging, selecting particle size- Short case examples: Dryer, FCC, Gasification	10 Hrs

List of Practicals:

Minimum Eight practical's from the list mentioned below.

1. Introduction to fluidization equipment and safety.
2. Visual study of fluidization behavior (fixed → bubbling → slugging).
3. Determination of minimum fluidization velocity (UMF).
4. Pressure drop in fixed bed.
5. Pressure drop in fluidized bed.
6. Bed expansion study with varying superficial velocities.
7. Effect of particle size on fluidization characteristics.
8. Effect of particle density on fluidization.
9. Study of bubble formation and regimes
10. Study of distributor plates (perforated vs nozzle types).

Textbooks:

1. D. Kunii, Octave Levenspiel., "Fluidization Engineering", Elsevier, 2013

Reference Books:

1. Wen-Ching Yang, "Handbook of Fluidization and Fluid-Particle Systems" Marcel Dekker, INC, 2003.
2. John R. Grace, "Essentials of Fluidization Technology" Wiley-VCH, 2020.
3. John G. Yates , Paola Lettieri, "Fluidized-Bed Reactors: Processes and Operating Conditions" Springer, 2016.
4. Howard, J.R. "Fluidized Bed Technology: Principles and Applications" Taylor & Francis, 1989

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc21_ch41/preview
2. http://kcl.digimat.in/nptel/courses/video/103103132/lec1.pdf
3. https://uorepc-nitk.vlabs.ac.in/exp/flow-through-fluidized-bed/
4. https://learncheme.com/virtual-laboratories/
5. https://www.vlab.co.in/broad-area-chemical-engineering

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
5CH224EC1.1	3	2	2	1	2	2	-	-	1	-	-	3	3	2
5CH224EC1.2	3	3	2	3	3	2	-	-	1	-	-	3	3	1
5CH224EC1.3	3	2	3	2	3	2	-	-	2	-	-	3	3	2
5CH224EC1 CO	3	2	2	2	3	2	-	-	1	-	-	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **5CH225EC1**		Course Category: **EC**		
Course Name	**Chemical Process Utilities**				
Credits	**02**	Total L:T:P Hours	2:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**30**	SEE Time	**3 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 5CH225EC1 Chemical Process Utilities is a compulsory Exit Course for Second Year B.Tech. Chemical Engineering.

Course Objectives:

The objective of this course is to impart fundamental knowledge of industrial utilities and to familiarize students with maintenance, equipment handling, and safety practices essential for efficient operation of chemical process plants.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5CH225EC1.1	Interpret the role of process utilities and the major treatment methods used for industrial water.	C-2
5CH225EC1.2	Analyze refrigeration systems, refrigerants, cooling towers, and psychrometric processes used in chemical industries.	C-4
5CH225EC1.3	Apply standard maintenance methods to ensure reliable and safe operation of chemical process plant equipment.	C-3

Course Contents:

Unit 1	**Introduction to Chemical Process Utilities and Water Utility:** Significance of Process Utilities, Classification, Selection criteria for utilities, Role of utilities in process design and operation. Water as a utility in process industries, types, Sources, Properties, and uses of water of industrial water, Methods of water softening processes, Lime soda process (cold and hot), Zeolite process, Ion exchange process and Reverse Osmosis.	10 Hrs
Unit 2	**Refrigeration, Air Conditioning & Cooling Systems:** Refrigeration principles, properties, selection, environmental impact of Refrigerants, Carnot and Reverse Carnot Cycle, Bell Coleman air refrigeration Cycle, Vapor compression, absorption refrigeration, Induced and forced draft Cooling Tower, Psychrometry, classification of Humidity, Sling Psychrometer, Psychrometric Chart, Psychrometric Process, Humidification and dehumidification.	10 Hrs

Unit 3	**Plant Maintenance & Safety Utilities:** Introduction to plant maintenance, Classification, Duties and responsibility of plant maintenance department, Electrical & instrumentation maintenance, Maintenance Planning and Scheduling, Maintenance of Mechanical Equipment, Compressors, Cooling towers and Boiler Online maintenance of pump and rotameter, Safety in Maintenance.	10 Hrs

Text Books

1. Lyle, O., Efficient Use of Steam, HMSO, 1963.
2. Stoccker, W.F., Refrigeration and Air Conditioning, Mc-Graw Hill, 1950. 5.
3. Kurl, W.F. J.H.M., Reuse of Water in Industry, Butterworth, London.
4. James K. Carson, Refrigeration, Theory and Applications Mc. Graw Hill, New York, 2009, ISBN: 078-87- 403-0363-6
5. Powel S. T., Industrial Water Mc. Graw Hill, New York, 2009, ISBN 9781118843727

Reference Books

1. Nordell,Eskel."Water Treatment for industrial and other uses" Reinhold Publishing Corporation, New York (1961).
2. Plant Utilities by Dr. Mujawar, Nirali Prakashan Publication.
3. Plant Utilities by D.B. Dhone, Nirali Prakashan Publication.
4. P.L.Balleney, Thermal Engineering, Khanna Publisher, New Delhi
5. Sathiyamoorthy Manickkam, Chemical Plant Utilities by Lambert Academic Publishing
6. R. K. Jain, Plant maintenance engineering and management by Khanna Publication
7. Efficient Use of Steam, Oilver Lyle Prentice Hall 1963

E- Resources

1. https://www.intarcon.com/en/refrigeration-system/
2. https://onlinecourses.nptel.ac.in/noc23_me31/preview
3. https://home.iitk.ac.in/~gtm/thermodynamics/ui/Course_home-3
4. https://onlinecourses.nptel.ac.in/noc23_me31/preview

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
5CH225EC1.1	3	2	-	-	-	3	-	-	-	-	2	3	2	-
5CH225EC1.2	3	3	2	2	2	2	-	-	-	-	2	3	3	-
5CH225EC1.3	2	2	3	-	2	3	2	-	-	-	2	3	3	2
5CH225EC1.CO	3	2	2	2	2	3	2	-	-	-	2	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

ANNEXURE –I

Syllabus of III and IV Semester Courses for Four-Year Multidisciplinary Undergraduate B.Tech. Degree Programme in Civil Engineering

(In view of NEP-2020)

For students admitted in academic session 2025-26 and onwards



03/09/2026

SHRI JAWAHARLAL DARDA EDUCATION SOCIETY'S
JAWAHARLAL DARDA
INSTITUTE OF ENGINEERING AND TECHNOLOGY, YAVATMAL
AN AUTONOMOUS INSTITUTE
Affiliated to Sant Gadge Baba Amravati University, Approved by AICTE, New Delhi and DTE Maharashtra
93VP+PWF: P6, MIDC Area, Lohara, Yavatmal - 445 001, Maharashtra (www.jdiet.ac.in)

1. Vision

To set recognition at regional and national level for excellence in Civil Engineering education, by means of disseminating knowledge to students through quality teaching learning process, best research practices and industry interaction.

2. Mission

1. To adopt compatible and quality teaching learning methodology for advantage of students.
2. To encourage faculty and students, for participating in various research activities and publications.
3. To have memorandum of understanding with industries for students and faculty, in order to meet employers, need.
4. To enhance the infrastructure and environment, for providing the desired Civil Engineering qualification.
5. To undertake real time Civil Engineering issues, as a project of the students to boon the society.

3. Programme Education Objectives

PEO 1: Development: Graduates of the program will have successful technical or professional careers.

PEO 2: Extent & Professional Expertise: Graduates will effectively peruse post graduate studies and will be involved in lifelong learning.

4. SDG of United Nation

1. **No Poverty:** End poverty in all its forms everywhere.
2. **Zero Hunger:** End hunger, achieve food security, improve nutrition, and promote sustainable agriculture.
3. **Good Health and Well-being:** Ensure healthy lives and promote well-being for all at all ages.
4. **Quality Education:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities.
5. **Gender Equality:** Achieve gender equality and empower all women and girls.
6. **Clean Water and Sanitation:** Ensure availability and sustainable management of water and sanitation for all.
7. **Affordable and Clean Energy:** Ensure access to affordable, reliable, sustainable, and modern energy.
8. **Decent Work and Economic Growth:** Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work.

9. **Industry, Innovation, and Infrastructure:** Build resilient infrastructure, promote sustainable industrialization, and foster innovation.
10. **Reduced Inequalities:** Reduce inequality within and among countries.

11. **Sustainable Cities and Communities:** Make cities and human settlements inclusive, safe, resilient, and sustainable.
12. **Responsible Consumption and Production:** Ensure sustainable consumption and production patterns.
13. **Climate Action:** Take urgent action to combat climate change and its impacts.
14. **Life Below Water:** Conserve and sustainably use oceans, seas, and marine resources.
15. **Life on Land:** Protect, restore, and promote sustainable use of terrestrial ecosystems, forests, and biodiversity.
16. **Peace, Justice, and Strong Institutions:** Promote peaceful and inclusive societies, provide access to justice, and build effective, accountable institutions.
17. **Partnerships for the Goals:** Strengthen the means of implementation and revitalize the global partnership for sustainable development.

5. WK: Washington Accord Knowledge Profile-Attributes for engineering program

WK1:A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Outcomes (NBA, Jan 2025)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

7. Programme Specific Indicators

Construction Industry

1. Plan and Design residential, commercial and industrial buildings.
2. Apply construction process for buildings and infrastructure.
3. Correlate details of Electrical, Plumbing and HVAC during construction work.
4. Apply practices for land surveying, mapping, and site layout also by using latest tools such as Total Station/GPS/GIS.
5. Demonstrate proficiency in design software such as AutoCAD, Rivet, Civil 3D, MS Project, Primavera, GIS etc.
6. Apply Building Information Modelling (BIM) tools for building planning, design and modelling.
7. Identify properties of materials used in construction with respect to IS Codes.
8. Analyse quantity of material and quantum of work.
9. Estimate cost of project, budgeting and Billing process.
10. Examine quality of construction work to ensure that materials and construction processes meet required specification, standards and regulations.
11. Apply building codes, standards, safety regulations and environmental laws.
12. Interpret contracts, terms, project specifications and legal requirements in construction project. Identify tendering and bidding process.
13. Apply project monitoring and scheduling tools for construction management.
14. Apply resource management technique 3M (Material, Manpower and Machines).

Structural Engineering Industry

15. Design and analyse RCC structures (Buildings, roads, bridges, dams etc.).
16. Design and analyse Steel Structures.
17. Design and analyse Precast Structures.

18. Develop structural plans/drawings and documents.
19. Demonstrate proficiency in structural design software such as AutoCAD, Rivet etc.
20. Use appropriate procedure for structural design in accordance to IS codes, norms and safety regulations.
21. Identify structural failures or damages, analysing causes and suggest improvements to prevent future occurrence.
22. Verify/Inspect quality and quantity of structural work compliance with structural design, quality of material, tests, workmanship, specifications and standards.
23. Perform material testing including NDT for structural design and analysis as per IS Codes.

Transportation Industry

24. Design and plan roads, highway, interchanges considering factors such as traffic flow, safety, standards, norms specifications and environmental impact.
25. Plan regarding construction of railways, stations, and supporting infrastructure.
26. Identify process involved in Airport Construction and maintenance, runway, terminals, and support facilities.
27. Identify process involved in design of Ports and Harbours (docks, pier etc.).
28. Identify process involved in construction of tunnels bridges for roads and rail.
29. Analyse traffic flow for design of traffic control systems to ensure safety and reduce congestions.

Environmental Engineering Industry

30. Design and maintenance of systems for treatment and distribution of potable water.
31. Design systems and its maintenance for sewage treatment, and disposal.
32. Identify practices for design and maintenance for stormwater management and flood control.
33. Identify systems for waste collection, recycling, and disposal including landfill management and incineration plants.
34. Describe green building practices, sustainable engineering practices, renewable energy systems and environmental friendly materials.
35. Analyse environmental impact of construction projects.
36. Ensure compliance with environmental and safety regulation in all aspects of projects.
37. Describe practices for air quality assessment and its control.

Geotechnical Engineering Industry

38. Analyse soil properties and conditions to recommend suitable material and technique for construction.

39. Examine soil, rocks and groundwater to design safe and stable foundation structures.
40. Ensure suitability through proper foundation type such as shallow and deep foundation.
41. Identify applicability of deep foundation, retaining wall and pile foundations.
42. Identify geotechnical work for landfills, including stability and environmental protection measures.
43. Apply techniques to improve soil properties such as soil stabilization and compaction.

Water Resources Industry

44. Analyse rainfall, runoff and other water availability sources on that area.
45. Identify flood control measures and systems.
46. Understand ground water hydrology.
47. Analyse watersheds for soil and water conservation.
48. Classify dams, reservoirs, spillways, diversion heads and canals.
49. Identify components of water power engineering.
50. Classify different methods of irrigation and drainage systems.
51. Understand effect/causes of water logging and its remedial measures.

Urban Planning and Development / Real Estate and Development Industry

52. Plan and development of urban area to design residential, commercial, industrial and recreational purpose.
53. Plan roads, utilities (water, sewage, power) and public spaces to support urban life considering environmental sustainability.
54. Identify components of smart city.
55. Demonstrate proficiency in design of Residential construction, Commercial and industrial buildings.

Mining and Materials Industry

56. Manage and optimise the extraction of construction materials like stone, sand, gravel ensuring minimum environment impact.
57. Verify and test properties of construction materials as per IS Codes and applicable norms.

Consultancy Engineering Firms

58. Understand the design solutions given by experts and correlate it with safety, sustainability, planning, and execution of project.
59. Understand the need of client and tailoring solutions that are economically feasible, timely and meet regulatory standards.
60. Identify and describe innovative engineering solutions for the real time situation.

Fire Protection

61. Identify applicable fire safety regulation system and ensuring its incorporation in building design.

62. Plan and design exit routes, fire safety systems (detection, alarm, extinguishers, sprinklers etc.).

Basic Science

63. Apply mathematical techniques such as algebra, trigonometry, calculus, differential equations, linear algebra, probability and statistics to solve problems.
64. Apply physical principles such as motion, forces, energy and materials to solve problems.
65. Apply knowledge of chemical properties and reactions for construction material and environment (Corrosion, polymer, electrochemistry etc.).

Engineering Science Courses

66. Demonstrate proficiency in basic workshop operations (fitting, carpentry, welding, sheet metal, plumbing and machining etc.).
67. Apply the principles of engineering mechanics to analyse and solve problems involving forces, moment, equilibrium, friction, centred and MOI etc.
68. Apply the principles electrical engineering to analyse and maintain electrical systems, circuits, machines and power systems.
69. Demonstrate ability to interpreted and create drawings using geometric constructions, orthographic projections, isometric projections and CAD tools.
70. Demonstrate ability to apply fundamental principals of algorithms, programming, data structures and computing system to solve conceptual problems.

Generic Competencies (Civil Engineering)

A. Problem-Solving Skills

71. Analytical Thinking: Ability to analyze complex problems, break them down into smaller components, and find effective solutions.
72. Critical Thinking: Ability to evaluate multiple solutions to a problem and choose the best course of action based on available data, safety, and cost-efficiency.

B. Communication Skills

73. Oral Communication: Ability to communicate complex technical information clearly to a variety of audiences, including clients, stakeholders, contractors, and team members.
74. Written Communication: Proficiency in drafting reports, proposals, technical specifications, and documentation that are clear, concise, and accurate.
75. Interpersonal Communication: Ability to collaborate effectively with multidisciplinary teams, clients, and project stakeholders.

C. Project Management

76. Time Management: Efficiently managing time and prioritizing tasks to meet deadlines in a dynamic project environment.
77. Resource Management: Ability to plan, allocate, and manage resources such as labour, materials, and equipment to ensure project efficiency.

78. Budgeting and Cost Control: Skills in estimating project costs, monitoring budgets, and ensuring projects are completed within financial constraints.
79. Risk Management: Ability to identify, assess, and mitigate risks during the planning and execution of engineering projects.

D. Teamwork and Leadership

80. Team Collaboration: Working effectively as part of a team, contributing to the success of the project through collaboration, open communication, and respect for others' expertise.
81. Leadership Skills: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
82. Conflict Resolution: Ability to resolve conflicts between team members, clients, or contractors, ensuring that project objectives are still achieved.

E. Attention to Detail

83. Accuracy: Ensuring all engineering calculations, designs, and project plans are accurate and align with building codes, regulations, and standards.
84. Quality Assurance: Ensuring that the materials and processes used in construction adhere to high standards of quality and safety.

F. Ethical and Professional Integrity

85. Ethical Decision Making: Adhering to a strict code of ethics, ensuring public safety, environmental protection, and transparency in all dealings.
86. Accountability: Taking responsibility for the success or failure of a project, being proactive in addressing issues, and delivering results.

G. Adaptability and Flexibility

87. Openness to Change: Being able to adapt to new technologies, tools, and methods, as well as evolving project requirements or environmental conditions.
88. Learning and Development: Actively seeking opportunities for professional growth, staying current with industry trends, and acquiring new skills to remain competitive.

H. Technical Competency

89. Understanding of Engineering Principles: A strong foundation in the core principles of civil engineering, including structural, geotechnical, environmental, transportation, and water resources engineering.
90. Technology Proficiency: Proficiency in using engineering software, such as AutoCAD, Civil 3D, and BIM tools, to design, model, and manage projects.
91. Data Analysis: Ability to analyze large amounts of technical data and make informed decisions based on this information.

I. Creativity and Innovation

92. Creative Problem Solving: Thinking outside the box and coming up with novel solutions to engineering challenges.
93. Innovative Design: Contributing new ideas for designs and processes that can improve efficiency, reduce costs, or make better use of resources.

J. Cultural and Environmental Awareness

94. Sustainability Awareness: Knowledge of sustainable construction methods, green building practices, and the importance of reducing the environmental impact of engineering projects.

95. Cultural Sensitivity: Understanding and respecting cultural differences when working in diverse teams or international projects.
96. Environmental Impact Understanding: Considering the environmental consequences of engineering decisions and striving to minimize negative impacts through design and construction methods.

K. Decision-Making Skills

97. Data-Driven Decisions: Using available data, facts, and technical analysis to make informed decisions about the design, execution, and management of projects.
98. Prioritizing Decisions: Knowing which decisions need immediate attention and which can be deferred, especially in a high-pressure environment.

L. Regulatory and Legal Knowledge

99. Familiarity with Building Codes and Standards: Understanding and ensuring compliance with local, national, and international building codes, safety regulations, and legal standards.
100. Health and Safety: Knowledge of safety regulations and best practices for ensuring the health and safety of workers, the public, and the environment throughout the project lifecycle.

M. Client-Focused Mindset

101. Client Management: Building and maintaining strong relationships with clients, understanding their needs, and ensuring their expectations are met throughout the project.
102. Customer Service Orientation: Ensuring that client concerns are addressed promptly, and working toward providing value-added solutions that meet their goals.

8. Scheme of Civil Engineering Department

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Civil Engineering Degree Programme

Semester - I (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - I	BSC	1SH101BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Physics	BSC	1SH102BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Programming for Problem Solving	ESC	1CS103ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Mechanics	ESC	1CE104ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Applied Physics Lab	BSC	1SH105BS1	0	0	2	0	2	1					25	25	50	25	50	
6	Programming for Problem Solving Lab	ESC	1CS106ES1	0	0	2	0	2	1					25	25	50	25	50	
7	Engineering Mechanics Lab	ESC	1CE107ES1	0	0	2	0	2	1					25	25	50	25	50	
8	Workshop	ESC	1ME108ES1	0	0	2	0	2	1					25	25	50	25	50	
9	MS Excel for Civil Engineering	VSC	1CE109VS1	1	0	2	1	4	2						50	50	25	50	
10	Communication Skills	AEC	1SH110AE1	1	0	2	1	4	2					25	25	50	25	50	
11	Sports & Yoga	CC	1SH111CC1	0	0	4	0	4	2						50	50	25	50	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Civil Engineering Degree Programme

Semester - II (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - II	BSC	2SH112BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Chemistry	BSC	2SH113BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Basic Electrical Engineering	ESC	2EE114ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Graphics	ESC	2ME115ES1	2	0	0	2	4	2	60	40	100	40					100	4 Hrs.
5	Basics of Civil Engineering & Building Construction	PCC	2CE116PC1	1	0	2	1	4	2						50	50	25	50	
6	Fundamentals of Vastushastra	IKS	2CE117IK1	1	0	2	1	4	2						50	50	25	50	
7	Applied Chemistry - Lab	BSC	2SH118BS1	0	0	2	0	2	1					25	25	50	25	50	
8	Basic Electrical Engineering - Lab	ESC	2EE119ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Engineering Graphics/CAD Lab	ESC	2ME120ES1	0	0	2	0	2	1					25	25	50	25	50	
10	Universal Human Values	SEC	2CE121VS1	1	0	2	1	4	2						50	50	25	50	
11	Digital Wellness	CC	2SH122CC1	1	0	2	1	4	2						50	50	25	50	
Total				**15**	**0**	**14**	**15**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 15x15 = 225 Hrs]

Exit Option (Level 4.5) for Undergraduate Certificate in Odd Semester of next Academic Year as approved by BOS																			
12	Site Supervision and Surveying	EC	3CE123EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Bar Bending Schedule and material Testing	EC	3CE124EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	3CE125EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	3CE126OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Civil Engineering Degree Programme

Semester - III (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Strength of Material	PCC	3CE201PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Transportation Engineering	PCC	3CE202PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Building Planning and Design	PCC	3CE203PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - I	MDM	3__204MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - I	OE	3__205OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Strength of Material - Lab	PCC	3CE206PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Transportation Engineering - Lab	PCC	3CE207PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Computer Aided Planning and Design-Lab	PCC	3CE208PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Entrepreneurship in Civil Engineering	EEM	3CE209EM1	2	0	0	2	4	2						50	50	25	50	
10	Constitutional Values and Fundamental Duties	VEC	3SH210VE1	2	0	0	2	4	2						50	50	25	50	
11	Field Project	FP	3CE400FP1	0	0	4	0	4	2					25	25	50	25	50	
12	Disaster Management and Preparedness	NC	3AL001NC1	2	0	0	0	2	-						50	50	25	50	
Total				**19**	**0**	**10**	**17**	**46**	**22**			**450**				**300**		**750**	

Notional Learning Hours : [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 17x15 = 255 Hrs]

Optional Course for Double Minor / Honours Degree																			
13	Double Minor / Honours Course - I	DH	3__211DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Civil Engineering Degree Programme
Semester - IV (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Surveying	PCC	4CE212PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Concrete Technology	PCC	4CE213PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Fluid Mechanics	PCC	4CE214PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - II	MDM	4__215MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - II	OE	4__216OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Concrete Technology - Lab	PCC	4CE217PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Fluid Mechanics - Lab	PCC	4CE218PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Surveying and Geomatics-Lab	VSC	4CE219VS1	0	0	4	0	4	2						50	50	25	50	
9	Technical Writing	AEC	4SH220AE1	1	0	2	1	4	2						50	50	25	50	
10	Fundamentals of Book Keeping and Accounting	EEM	4SH221EM1	1	0	2	1	4	2						50	50	25	50	
11	Environmental Science	VEC	4CE222VE1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
Total				**16**	**0**	**12**	**16**	**44**	**22**			**500**				**250**		**750**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 28x15 = 420 Hrs] + [Learner-engaged time 16x15 = 240 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
12	Double Minor / Honours Course - II	DH	4__223DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5) for Undergraduate Diploma in Odd Semester of next Academic Year as approved by BOS																			
13	Fundamentals of Structural Design	EC	5CE224EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
14	Quantity Survey and Estimation	EC	5CE225EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
15	Internship / Apprenticeship in Industry	EI	5CE226EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
16	Two MOOC/NPTEL Courses	EC	5CE227OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Civil Engineering Degree Programme

Semester - V (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Geotechnical Engineering	PCC	5CE228PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Structural Analysis	PCC	5CE229PC1	3	1	0	4	8	4	60	40	100	40					100	3 Hrs.
3	Environmental Engineering	PCC	5CE230PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - I	PEC	5CE231PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - III	MDM	5__232MD_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Open Elective - III	OE	5__233OE_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Geotechnical Engineering - Lab	PCC	5CE234PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Environmental Engineering - Lab	PCC	5CE235PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - I - Lab	PEC	5CE236PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Multidisciplinary Minor - III - Lab	MDM	5__237MD_	0	0	2	0	2	1					25	25	50	25	50	
Total				**17**	**1**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - III	DH	5__238DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Civil Engineering Degree Programme

Semester - VI (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Surveying and Geomatics	PCC	6CE239PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Hydrology and Water Resources Engineering	PCC	6CE240PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Structural Design - I	PCC	6CE241PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - II	PEC	6CE242PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Programme Elective Course - III	PEC	6CE243PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Multidisciplinary Minor - IV	MDM	6__244MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Surveying and Geomatics - Lab	PCC	6CE245PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Hydrology and Water Resources Engineering- Lab	PCC	6CE246PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - II - Lab	PEC	6CE247PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Personal Skills (GD& PI)	SEC	6SH248VS1	1	0	2	1	4	2						50	50	25	50	
Total				**18**	**0**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]

Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - IV	DH	6__249DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5.5) for B. Voc in Odd Semester of next Academic Year as approved by BOS																			
12	Design of RCC & Steel Structure	EC	7CE250EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Water Resources Management	EC	7CE251EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	7CE252EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	7CE253OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Civil Engineering Degree Programme

Semester - VII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Engineering Economics, Estimation & Costing	PCC	7CE301PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Hydraulic Engineering	PCC	7CE302PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Programme Elective Course - IV	PEC	7CE303PE_	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - V	PEC	7CE304PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - V	MDM	7__305MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
6	Hydraulic Engineering- Lab	PCC	7CE306PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Programme Elective Course -IV-Lab	PEC	7CE307PE_	0	0	2	0	2	1					25	25	50	25	50	
8	Research Methodology	RM	7CE401RM1	2	0	4	2	8	4	30	20	50	20		50	50	25	100	2 Hrs.
9	Project	PR	7CE402PR1	0	0	8	0	8	4					50	100	150	75	150	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**500**				**300**		**800**	
Optional Course for Double Minor / Honours Degree																			
10	Double Minor / Honours Course - V	DH	7__308DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
Optional Course for Honours with Research Degree																			
11	Research Project	RP	7CE403RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Civil Engineering Degree Programme
Semester - VIII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Construction Engineering and Management (Online)	PCC	8CE309PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Programme Elective Course - VI (Online)*	PEC	8CE310PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Multidisciplinary Minor - VI (Online)	MDM	8__311MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
4	On Job Training (Internship/Apprenticeship)	OJT	8CE404IN1	0	0	24	0	24	12					100	100	200	100	200	
Total				**8**	**0**	**24**	**8**	**40**	**20**			**250**				**200**		**450**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 32x15 = 480 Hrs] + [Learner-engaged time 8x15 = 120 Hrs]

Optional Course for Honours with Research Degree																			
5	Research Project	RP	8CE405RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

* Can be considered for MOOCS/NPTEL courses.

9. List of Programme Elective Courses

Students will have an option to choose the PEC offered by their respective Major Discipline offered during semester V to VIII

Programme Elective Courses offered by Civil Engineering

Sr. No.	Semester	Programme Elective Course/Subjects Name	Course Code
1	V	Highway Construction and Management (PEC-I)	5CE231PE1
2		Highway Construction and Management-Lab (PEC-I Lab)	5CE236PE1
		OR	
3		Irrigation and Drainage (PEC-I)	5CE231PE2
4		Irrigation and Drainage Lab (PEC-I Lab)	5CE236PE2
5	VI	Industrial Waste Water Management (PEC-II)	6CE242PE1
6		Industrial Waste Water Management-Lab (PEC-II Lab)	6CE247PE1
		OR	
7		Sustainable Construction Methods Lab (PEC-II)	6CE242PE2
8		Sustainable Construction Methods- Lab (PEC-II Lab)	6CE247PE2
9		Design of Fire Fighting System in Buildings (PEC-III)	6CE243PE1
		OR	
10		Plumbing (Water and Sanitation) (PEC-III)	6CE242PE2
11	VII	Structural Design-II(PEC-IV)	7CE303PE1
12		Structural Design-II-Lab (PEC-IV Lab)	7CE307PE1
		OR	
13		Foundation Engineering (PEC-IV)	7CE303PE2
14		Foundation Engineering-Lab (PEC-IV Lab)	7CE307PE1
15		Advanced Structural Analysis (PEC-V)	7CE304PE1
		OR	
16		Environmental Laws and Policies (PEC-V)	7CE304PE2
17	VIII	*Rehabilitation/Restoration of structures (PEC-VI)	8CE310PE1
		OR	
18		*Structural Audit of a Building (PEC-VI)	8CE310PE2

10. Syllabus for Semester III & IV

Level: **5**	Course Code: **3CE201PC1**		Course Category: **PCC**		
Course Name	**Strength of Materials**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3CE201PC1 Strength of Materials is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop the ability to analyze stresses, strains, and deformation in structural elements such as beams, shafts, and bars, enabling safe and effective structural design.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE201PC1.1	Analyze direct and shear stresses, strains, and stress–strain behaviour of materials to understand elastic behaviour and mechanical performance.	C-4
3CE201PC1.2	Generate shear force and bending moment diagrams for beams under various loads to evaluate internal forces for structural analysis.	C-6
3CE201PC1.3	Calculate bending stresses and section modulus for solid and hollow sections to determine moment of resistance and safe beam design.	C-5
3CE201PC1.4	Apply torsion theory for circular shafts and compute power transmission to analyze shaft performance under twisting loads effectively.	C-3
3CE 201PC1.5	Determine principal stresses and maximum shear stress in compound bars to assess failure conditions under complex stress states.	C-3
3CE201PC1.6	Evaluate slopes and deflections in loaded beams using appropriate methods to ensure structural serviceability and deformation control.	C-5

Course Contents:

Unit 1	**Introduction and Basic Concepts:** Overview of Strength of Materials and its applications : Concept of direct and shear stresses and strains, elastic constants, stress-strain types and relationship, Stress-strain diagrams and their characteristics for mild steel, Generalized Hook's law, Mechanical properties of materials.	7 hrs
Unit 2	**Basics of Beam Analysis:** Types of beams, Shear force and bending moment diagrams (SFD & BMD) for different loading conditions, relation between shear forces, bending moment and loading intensity.	8 hrs
Unit 3	**Bending Stress in Beams:** Bending stress and its distribution across a cross-section, Moment of inertia and section modulus calculations, Simple bending theory, section modulus, moment of resistance, bending stresses in different section (solid and hollow)	7 hrs
Unit 4	**Torsion of Circular Shafts** Assumption for derivation of shaft and torsion equation, Torsion, angle of twists and power transmission of shaft.	8 hrs
Unit 5	**Analysis of stress and strain** Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, Principal stresses and maximum shear stress,	7 hrs
Unit 6	**Study of deflection and slope in beam** Determination of beam's deflection and slopes for beams subjected to different load conditions.	8 hrs

Text Books:

1. R. K. Bansal, Strength of Materials, Laxmi Publications.
2. S. Ramamrutham, Strength of Materials, Dhanpat Rai & Sons.
3. F. P. Beer, E. R. Johnston Jr., (and J. T. DeWolf), *Mechanics of Materials*, McGraw-Hill Education.

Reference Books:

1. S. K. Mondal, Strength of Materials, PHI Learning / Prentice Hall of India.
2. R. K. Rajput, Strength of Materials, S. Chand & Company.

E Recourses:

1. https://onlinecourses.nptel.ac.in/noc23_me140

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE201PC1.1	3	2	-	-	-	-	-	-	-	-	-	1	-	-
3CE201PC1.2	3	3	-	2	-	-	-	-	-	-	-	-	3	-
3CE201PC1.3	3	3	-	-	-	-	-	-	-	-	-	-	3	1
3CE201PC1.4	3	2	-	-	-	-	-	-	-	-	-	-	2	-
3CE201PC1.5	3	2	-	2	-	-	-	-	-	-	-	-	2	-
3CE201PC1.6	3	2	-	2	-	-	-	-	-	-	-	-	2	1
3CE201PC1.CO	3	2	-	1	-	-	-	-	-	-	-	1	2	1

Correlation levels-1: Slight (Low), 2:Moderate (Medium), 3:Substantial (High)

Level: **5**	Course Code: **3CE202PC1**		Course Category: **PCC**		
Course Name	**Transportation Engineering**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3CE202PC1 Transportation Engineering is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to provide knowledge of transportation systems, highway and pavement design, railway, airport, waterway, and bridge engineering for efficient infrastructure planning and development.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE202PC1.1	Explain various transport modes, scope and economic role of transportation systems to understand system-level planning of infrastructure.	C-2
3CE202PC1.2	Design highway alignment and geometric elements including cross-section, gradient and sight distances to enable safe and efficient road infrastructure layout.	C-6
3CE202PC1.3	Evaluate pavement components, materials and design methodologies (flexible/rigid) to develop long-lasting pavement structures	C-5
3CE202PC1.4	Analyse railway track components, alignment and station/yard planning to ensure operational reliability and safety in rail infrastructure.	C-4
3CE202PC1.5	Assess airport and waterway infrastructure components including runways, docks and navigation aids to cater for capacity, demand and multimodal logistics requirements.	C-5
3CE202PC1.6	Justify bridge structural parameters including scour, afflux, foundations, and classify structural types to facilitate safe bridge design	C-5

Course Contents:

Unit 1	**Introduction to Transportation Systems** Definition, scope, and importance of transportation engineering, Types of transportation modes: Road, Rail, Air and Water, Transportation and its role in economic development.	4 hrs
Unit 2	**Highway Engineering** Principles of highway planning and alignment, Geometric design of highways: cross-section, gradient, sight distances, Materials and construction methods for pavements.	5 hrs
Unit 3	**Pavement Design** Components of pavements, Pavement Types and Materials: Flexible and rigid pavements, Materials used in pavement construction (bitumen, cement concrete, aggregates), Pavement design considerations (subgrade, traffic load, climatic conditions). Pavement Design Methods: IRC, Structural design of flexible and rigid pavements.	6 hrs
Unit 4	**Railway Engineering** Fundamentals of railway track components: rails, sleepers, ballast, and fastenings, Track geometry and alignment, stations and yard planning.	5 hrs
Unit 5	**Airport and Waterway Engineering** Components of an airport: Runways, taxiways, terminals, and aprons, Airport layout and air traffic control systems, Airport capacity and demand forecasting, Basics Sof ports, harbours, and shipping logistics,	5 hrs
Unit 6	**Bridge Engineering** Bridge Engineering-Components, classification and identification, data collection, site selection, economic span, Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board,	5 hrs

Text Books:

1. K. K. Khanna & C. E. G. Justo, Highway Engineering, Nem Chand & Bros.
2. S. P. Chandola, A Textbook of Transportation Engineering, S Chand & Co.

Reference Books:

1. Handbook of Transportation Engineering, Publisher: McGraw-Hill
2. L. R. Kadiyali, Transportation Engineering, Publisher: Khanna Publishers.

E Recourses:

1. https://books.google.co.in/books/about/A_Textbook_of_Transportation_Engineering.

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE202PC1.1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
3CE202PC1.2	3	3	3	-	-	-	-	-	-	-	-	1	3	2
3CE202PC1.3	3	3	3	-	-	2	2	-	-	-	-	1	3	2
3CE202PC1.4	3	2	-	-	-	-	2	-	-	-	-	1	1	2
3CE202PC1.5	3	2	-	-	-	-	2	-	-	-	-	-	1	1
3CE202PC1.6	3	2	-	-	-	-	2	-	-	-	-	1	3	2
3CE202PC1.CO	3	2	1	-	-	1	2	-	-	-	-	1	2	2

Correlation levels-1: Slight (Low), 2:Moderate (Medium), 3:Substantial (High)

Level: **5**	Course Code: **3CE203PC1**		Course Category: **PCC**		
Course Name	**Building Planning and Design**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3CE203PC1Building Planning and Design is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to familiarize students with principles of planning, building regulations, structural systems, services, and drafting tools for designing functional, safe, and code-compliant buildings.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE203PC1.1	Explain planning principles and architectural elements like balance, proportion, scale, and aesthetics to create functional and appealing buildings.	C2
3CE203PC1.2	Classify building types and structural systems including load-bearing, framed, composite structures to select suitable construction approaches effectively.	C4
3CE203PC1.3	Apply NBC guidelines, zoning laws, FSI, setbacks, and fire safety requirements to ensure buildings comply with essential regulations effectively.	C3
3CE203PC1.4	Develop layouts for residential and public buildings using functional space standards to prepare efficient architectural plans meeting user needs.	C6
3CE203PC1.5	Illustrate plumbing, ventilation, lighting, electrical and HVAC basics with fire planning to integrate essential building services ensuring occupant safety.	C3

3CE203PC1.6	Demonstrate manual and digital drafting using AutoCAD and Revit with conceptual design to produce professional architectural building drawings effectively.	C3

Course Contents:

Unit 1	**Introduction to Building Planning:** Principles of Planning: Aspect, Prospect, Orientation, Circulation, Privacy, Architectural Principles: Balance, Proportion, Scale, Aesthetics.	7 hrs
Unit 2	**Building Components and Structural Overview:** Classification of Buildings: Residential, Commercial, Institutional, Industrial, Functional Requirements of Buildings, Overview of Structural Systems: Load-Bearing, Framed, Composite Structures.	8 hrs
Unit 3	**Building Bye-Laws and Regulation:** Introduction to National Building Code: NBC, Zoning Laws, Floor Space Index (FSI), Setbacks, Basics of Fire Safety Regulations.	7 hrs
Unit 4	**Planning of Residential and Public Buildings:** Residential Buildings: Apartments, Bungalows, Row Houses, Functional Space Requirements and Room Layout Design, Layout, Public Buildings: Schools, Hospitals, Offices, Auditoriums, Preparation of Residential & Commercial Building Plans.	8 hrs
Unit 5	**Building Services and Safety Considerations:** Plumbing Applications: Water Supply and Drainage Systems, Ventilation and Natural Lighting, Introduction to Electrical &HVAC Systems. Fire Safety Planning.	7 hrs
Unit 6	**Design and Drafting of Buildings:** Introduction to AutoCAD and Revit for Building Design, Basics of Manual and Digital Building Drawings, Overview of Conceptual Design and Presentation of Architectural Plans.	8 hrs

Text Books:

1. Shah, Kale & Patki, Building Drawing, Tata McGraw-Hill
2. Bindra & Arora, Building Construction, Dhanpat Rai Publications

Reference Books:

1. National Building Code of India, BIS Publications
2. Chudley R. & Greeno R., Building Construction Handbook, Pearson

E Recourses:

1. https://learn.autodesk.com

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3CE203PC1.1	3	2	-	-	-	-	-	-	-	-	-	-	2	-
3CE203PC1.2	3	2	-	-	-	-	-	-	-	-	-	-	2	2
3CE203PC1.3	3	2	-	-	-	-	-	-	-	-	-	-	2	2
3CE203PC1.4	3	2	2	-	-	-	-	-	-	-	-	-	3	-
3CE203PC1.5	3	2	-	-	-	-	-	-	-	-	-	-	2	3
3CE203PC1.6	3	2	-	-	-	-	-	-	-	-	-	-	3	2
3CE203PC1.CO	3	2	1	-	-	-	-	-	-	-	-	-	2	2

Correlation levels-1: Slight (Low), 2:Moderate (Medium), 3:Substantial (High)

Level: **5**	Course Code: **3CE204MD1**		Course Category: **MDM**		
Course Name	**Basic Civil Engineering**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 3CE204MD1 Basic Civil Engineering is a Multidisciplinary Minor course for Second Year B. Tech Textile/Mechanical/Electrical/Computer Science/EXTC/Chemical Engineering.

Course Objectives:

The objective of this course is to provide students with a insights in the field of Civil Engineering, its history, significance, basic concepts, and the various branches and applications of the discipline.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE204MD1.1	Explain evolution, scope and interdisciplinary domains of civil engineering to understand its contribution in national infrastructure development and society.	C-2
3CE204MD1.2	Classify structural components and construction materials including foundation, beams, slabs and bricks to evaluate suitability for building applications.	C-4
3CE204MD1.3	Apply surveying principles using conventional and modern instruments including total station and GPS to measure distances, angles and elevations accurately.	C-3

Course Contents:

Unit 1	**Introduction to Civil Engineering:** Overview of Civil Engineering, History and Evolution of Civil Engineering, Definition and Scope, Role & importance of Civil Engineers in nation-building and infrastructure development, various disciplines of Civil Engineering, Introduction to types of buildings as per NBC.	10 hrs

Unit 2	**Elements of Building and Materials:** Basic Principles of Structures, Types of Structures, Introduction to Materials; Components in building- Need, function and types of foundation, beams, columns, slabs, walls and roofs, Construction Materials- uses and properties of bricks, sand cement, aggregates and steel.	10 hrs
Unit 3	**Basics of Surveying and Measurement:** Fundamentals of Surveying: Principles, Importance, Applications, Types of Surveys: Chain, Compass, Plane Table, Theodolite, Total Station, Basic Measurement Techniques: Linear, Angular, Levelling, Modern Surveying Techniques: GIS, GPS, Drones, Remote Sensing.	10 hrs

Text Books:

1. S. S. Bhavikatti, Basic Civil Engineering, New Age International Publishers
2. B. C. Punmia, Ashok Kumar Jain & Arun Jain, Surveying (Vol. I & II), Laxmi Publications
3. B. C. Punmia, Building Construction, Laxmi Publications
4. S. K. Duggal, Building Materials, New Age International Publishers

Reference Books:

1. S. V. Deodhar, Civil Engineering Materials & Construction, Nirali Prakashan
2. P. C. Varghese, Building Construction, Prentice Hall India

E Recourses:

1. https://www.bis.gov.in/?lang=hi

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE204MD1.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
3CE204MD1.2	3	2	-	-	-	-	-	-	-	-	-	-	2	2
3CE204MD1.3	3	2	-	-	-	-	-	-	-	-	-	3	2	1
3CE204MD1.CO	3	2	-	-	-	-	-	-	-	-	-	-	-	-

Correlation levels-1: Slight (Low), 2:Moderate (Medium), 3:Substantial (High)

Level:	**5**	Course Code:	**3SH205OE1**	Course Category:	**OE**
Course Name	**Soft Skills & Profile Building**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3SH205OE1 Soft Skills & Profile Building is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The objective of this course is to focus on developing advanced communication skills, leadership qualities and professional etiquette among engineering graduates.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE1.1	Apply advanced interpersonal, analytical, and persuasive communication techniques in professional contexts for effective professional interactions.	C-3
3SH205OE1.2	Demonstrate professional workplace etiquette, business communication, and group discussion skills to enhance employability.	C-3 A-3
3SH205OE1.3	Analyze leadership styles, emotional intelligence, and team dynamics for effective collaboration.	C-4 A-3
3SH205OE1.4	Design a structured and realistic career plan aligned with industry expectations and personal goals for professional growth.	C-6
3SH205OE1.5	Create ATS-friendly résumés, professional portfolios, and digital profiles for personal branding.	C-6 P-4
3SH205OE1.6	Perform effectively in interviews, workplace simulations, and job-search processes with professional confidence for enhanced employability.	C-3 P-3 A-3

Course Contents:

Unit 1	**Advanced Communication Dynamics:** Advanced interpersonal communication strategies; speech articulation; structuring thoughts and fluency techniques; analytical and critical communication; storytelling techniques for impactful presentations; persuasive communication models.	7 Hrs
Unit 2	**Global Workplace Etiquettes, Email Writing & GD–PI Perspective:** Professional greetings and workplace conduct; giving and receiving feedback; handling criticism and adaptability issues; professional values such as punctuality and attire; types of handshakes and significance; effective business email writing; types of Group Discussions, purpose of GDs; mock GDs (video-based); interview strategies and techniques.	8 Hrs
Unit 3	**Leadership, Team Dynamics & Corporate Skills:** Personality types using 9/9 matrix; leadership styles; emotional intelligence and leadership relationship; conflict resolution and negotiation techniques; team-building skills (Johari Window perspective); cross-cultural communication; creativity and design thinking; structured problem-solving and decision-making**.**	7 Hrs
Unit 4	**Strategizing Career Planning:** SMART goal setting; mapping skills to career paths; understanding industry expectations; emerging futuristic soft and hard skills (domain-wise); personalized career roadmap; certification planning (technical and non-technical); networking skills and participation in professional communities	7 Hrs
Unit 5	**Profile Building, Portfolio & Personal Branding:** ATS-friendly résumé preparation and common mistakes; video résumé creation and self-marketing pitch; LinkedIn profile optimization and networking strategies; developing online portfolios using platforms such as GitHub, Behance, Google Sites, and Toastmasters	8 Hrs
Unit 6	**Employment Readiness & Industry Integration:** Workplace simulation activities (mock emails, meetings, discussions); mock personal interviews; understanding sector-specific industry dynamics; unconventional career opportunities after engineering; job-hunting strategies and popular job platforms	8 Hrs

Text Books:

1. Alex K., Soft Skills, S. Chand Publishing
2. Meenakshi Raman & Prakash Singh, Business Communication, Oxford University Press

Reference Books:

1. Stephen R. Covey,The 7 Habits of Highly Effective People, Free Press Publication
2. Daniel Goleman, Emotional Intelligence, published by Bantam Books.
3. Shiv Khera, You Can Win, published by Bloomsbury Publishing
4. Richard N. Bolles, What Color Is Your Parachute? Published by Ten Speed Press, Crown Publishing Group

E Resources:

1. NPTEL: Soft Skills and Personality Development
2. LinkedIn Learning – Communication & Career Development Courses
3. Harvard Business Review – Communication & Leadership Articles
4. Coursera /edX – Career Development & Employability Skills Modules

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE1.1	2	3	2	–	–	–	–	2	3	–	–	1	2	1
3SH205OE1.2	–	2	–	–	–	2	3	3	3	–	–	1	2	2
3SH205OE1.3	–	3	2	–	–	2	2	3	–	–	–	1	2	2
3SH205OE1.4	–	3	3	–	–	2	–	–	–	2	3	–	3	–
3SH205OE1.5	–	2	3	–	3	–	–	–	2	–	2	–	3	1
3SH205OE1.6	–	2	2	–	2	2	–	2	3	–	2	1	2	2
3SH205OE1CO	1	3	2	-	1	2	1	2	2	1	1	1	2	2

Correlation levels-1: Slight (Low), 2:Moderate (Medium), 3:Substantial (High)

Level:	5	Course Code:	3SH205OE2	Course Category:	OE
Course Name	**Team Building & Management**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3SH205OE2 Team Building & Management is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the course is to develop teamwork capabilities, leadership and managerial skills, collaborative problem-solving abilities, conflict management techniques, and effective decision-making skills required in professional and organizational settings.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE2.1	Explain the principles and importance of effective team building in organizations to foster collaborative work culture.	C-2
3SH205OE2.2	Apply team dynamics and collaboration strategies to achieve common goals.	C-3 A-3
3SH205OE2.3	Analyze leadership styles and managerial roles for effective team performance.	C-4
3SH205OE2.4	Demonstrate conflict resolution, negotiation, and interpersonal management skills for effective team performance.	C-3 A-3
3SH205OE2.5	Apply motivation and performance management techniques in team-based environments for achieving organizational goals.	C-3
3SH205OE2.6	Perform effectively as a team member or leader in simulated managerial scenarios to develop leadership competencies	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Team Building:** Concept of teams; types of teams; stages of team development; characteristics of effective teams; roles and responsibilities of team members; barriers to effective teamwork; team norms and values.	7Hrs
Unit 2	**Team Dynamics & Interpersonal Relationships:** Group behavior and dynamics; interpersonal communication in teams; trust and collaboration; listening as a team skill; diversity and inclusion in teams; cross-cultural team management	8Hrs
Unit 3	**Leadership in Teams:** Leadership concepts; leadership styles; emotional intelligence and leadership; situational leadership; influence and power in teams; leadership ethics and responsibilities.	7 Hrs
Unit 4	**Conflict Management & Negotiation:** Sources and types of conflict; conflict resolution techniques; negotiation strategies; managing difficult team members; stress management; maintaining team harmony	7 Hrs
Unit 5	**Motivation, Performance & Team Effectiveness:** Motivation theories; team motivation techniques; goal setting and performance measurement; feedback and appraisal systems; decision-making in teams; problem-solving techniques.	8 Hrs
Unit 6	**Managerial Skills & Team-Based Applications:** Managerial roles and functions; planning, organizing, and controlling teams; delegation and coordination; workplace simulations (team meetings, role plays); case studies on team management; team performance evaluation.	8 Hrs

Text Books:

1. Stephen P. Robbins, Organizational Behavior, Pearson Education
2. L.M. Prasad, Management Principles and Practices, published by Sultan Chand & Sons

Reference Books:

1. Patrick Lencioni, The Five Dysfunctions of a Team, published by Jossey-Bass
2. Peter G. Northouse, Leadership, published by SAGE Publications
3. Daniel Goleman, Emotional Intelligence, published by Bantam Books

E Resources:

1. NPTEL – Organizational Behavior & Management Courses
2. LinkedIn Learning – Team Leadership & Management Modules
3. Harvard Business Review – Teamwork & Leadership Articles

4. Coursera / edX – Team Management and Leadership Courses

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE2.1	2	–	–	–	–	–	–	–	–	–	–	1	2	2
3SH205OE2.2	–	2	2	–	–	–	–	3	2	–	–	1	2	3
3SH205OE2.3	–	3	3	–	–	–	–	2	–	–	–	–	2	3
3SH205OE2.4	–	2	2	–	–	2	3	3	–	–	–	–	2	3
3SH205OE2.5	–	2	2	–	–	–	–	2	–	2	–	–	2	3
3SH205OE2.6	–	2	2	–	–	2	–	3	2	–	2	1	2	3
3SH205OE2 CO	1	2	2	-	-	1	1	2	1	1	1	1	2	3

Correlation levels-1: Slight (Low), 2:Moderate (Medium), 3:Substantial (High)

Level: **5**	Course Code: **3CE206PC1**		Course Category: **PCC**		
Course Name	**Strength of Materials Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	--
Total Credit Hours	**30 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3CE206PC1Strength of Materials Lab is a compulsory Laboratory Program Core Course for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to provide hands-on experience on the mechanical properties of materials through tension, compression, shear, impact, hardness, torsion tests, and structural analysis of beams, springs, and columns.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE206PC1.1	Perform tensile, compression, shear, impact, and hardness tests on engineering materials to evaluate mechanical behaviour and material performance accurately	C-5 & P-4
3CE206PC1.2	Proficiently perform experimental test on UTM, CTM, Izod, and Charpy setups to measure strength parameters and compare material properties scientifically.	C-5& P-4
3CE206PC1.3	Demonstrate testing skills including torque and deflection measurement using laboratory instruments to develop hands-on competency and practice professional laboratory.	C-5, P-5 & A-5

List of Practicals:

Minimum Eight of mentioned below:

1. Determination of Tensile Strength of Steel Bar using Universal Testing Machine (UTM).
   (As per IS 1608 – Tensile Testing of Metals)
2. Determination of Compressive Strength of Burnt Clay Building Bricks using CTM/UTM.
   (As per IS 3495 (Part 1))

3. Determination of Compressive Strength of Timber Specimen (As per IS 1708 (Part 7))
4. Determination of Shear Strength of Mild Steel Bar (General mechanical testing procedure)
5. Determination of Impact Strength of Metal by Izod Impact Test. (As per IS 1598)
6. Determination of Impact Strength of Metal by Charpy Impact Test. (As per IS 1757)
7. Determination of Hardness of Metal Specimen (Brinell/Rockwell/Vickers Method). (As per IS 1500 / IS 1586 / IS 1501)
8. Determination of Torsional Strength of Metal Specimen using Torsion Testing Machine.
9. Determination of Deflection of Beam under Loading using Universal Testing Machine (UTM).

E Recourses:

1. https://sm-nitk.vlabs.ac.in/

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3CE206PC1.1	3	-	-	2	3	-	-	-	-	-	-	3	-	2
3CE206PC1.2	3	2	-	3	3	-	-	-	-	-	-	3	-	2
3CE206PC1.3	3	-	-	3	3	-	2	-	1	-	-	3	-	2
3CE206PC1.CO	3	1	1	3	3	-	1	-	1	-	-	3	-	2

Correlation levels-1: Slight (Low), 2:Moderate (Medium), 3:Substantial (High)

Level: **5**	Course Code: **3CE207PC1**		Course Category: **PCC**		
Course Name	**Transportation Engineering - Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	--
Total Credit Hours	**30 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3CE207PC1 Transportation Engineering Lab is a compulsory Laboratory Program Core Course for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to provide hands-on experience in material testing, pavement evaluation, traffic studies, and total station surveying for effective transportation engineering and infrastructure planning.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE207PC1.1	Perform pavement material tests including abrasion, impact, crushing, softening point and marshal stability to evaluate suitability for road construction.	C-5 & P-5
3CE207PC1.2	Analyze pavement performance by performing Benkelman beam testing, traffic volume study and pavement condition rating to assess structural and service conditions.	C-4 & P-5
3CE207PC1.3	Execute field surveys using total station and origin–destination methods to plan road alignment and transportation improvements effectively participating in teams or individual.	C-2, P-5 & A-2

List of Practicals:

Minimum Eight of mentioned below:

1. Determination of Abrasion Value of Aggregates using Deval's Machine. (As per IS 2386 (Part 4))
2. Determination of Aggregate Impact Value (AIV). (As per IS 2386 (Part 4))
3. Determination of Flakiness Index and Elongation Index of Aggregates. (As per IS 2386 (Part 1))

4. Benkelman Beam Test for Measurement of Deflection of Flexible Pavements.
   (As per IRC: 81)
5. Determination of Softening Point of Bituminous Material (Ring and Ball Method).
   (As per IS 1205)
6. Determination of Aggregate Crushing Value (ACV)
   (As per IS 2386 (Part 4))
7. Traffic Volume Study using Manual or Automatic Traffic Counters
   (As per IRC: 9)
8. Determination of Marshall Stability and Flow Value of Bituminous Mix.
   (As per ASTM D1559 / IRC: 111)
9. Pavement Condition Survey and Pavement Rating
   (As per IRC: 82)
10. Origin–Destination (O–D) Survey and Transportation Planning Study. (As per IRC: 102)
11. Survey of Road Alignment using Total Station
    (As per IS 12858)
12. Field Visit to Railway Station and Study of Railway Infrastructure Components.

E Recourses:

1. https://ts-nitk.vlabs.ac.in/

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3CE207PC1.1	3	2	-	2	3	-	-	-	-	-	-	3	1	2
3CE207PC1.2	3	2	-	3	3	-	-	-	-	-	-	2	2	2
3CE207PC1.3	2	2	-	3	3	-	2	3	2	-	-	3	2	1
3CE207PC1.CO	3	2	-	2	2	-	1	1	1	-	-	3	2	2

Correlation levels-1: Slight (Low), 2:Moderate (Medium), 3:Substantial (High)

Level: **5**	Course Code: **3CE208PC1**		Course Category: **PCC**		
Course Name	**Computer Aided Planning and Design-Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	--
Total Credit Hours	**30 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3CE208PC1 Computer Aided Planning and Design Lab is a compulsory Vocational Science Course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop skills in drafting building elements, interpreting drawings, creating residential and public building plans, operating CAD software, and designing multi-storeyed buildings, adhering to standards and regulatory requirements.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE208PC1.1	Apply building planning principles, zoning regulations, FSI calculations, and functional space standards to prepare accurate residential and public building layouts effectively.	C-3 & P-2
3CE208PC1.2	Develop CAD/Revit drawings including floor plans, elevations, sections, service layouts, lighting, ventilation, and fire safety elements to produce professional-quality architectural drawings.	C-6 & P-7
3CE208PC1.3	Appreciate the importance of safety, sustainability, circulation efficiency, and service integration by analyzing building orientations, sun-path, fire routes, and preparing site-planning checklists.	C-3, P-2 & A-3

List of Practicals:

Minimum Eight of mentioned below:

1. Creating a basic floor plan, elevation, and section using CAD or Revit tools.
2. Drawing water supply and drainage layout for a small residential unit.

3. Drawing of a 2-BHK or 3-BHK plan with proper dimensions and circulation.
4. Preparing a complete residential or commercial site layout including pathways, parking, services, and open spaces.
5. Identification of fire escape routes, staircases, and fire-safe design elements from sample plans.
6. Preparation of a checklist for residential, commercial, institutional, and industrial buildings.
7. Preparing natural lighting, ventilation, and basic electrical points layout.
8. Solving problems based on zoning laws and FSI as per local bye-laws or NBC guidelines.
9. Case Study on Sun-path analysis and ventilation mapping for different building orientations.
10. Preparing layout of a school/hospital/office based on functional space standards.
11. Study and interpretation of fire safety symbols and their placement in building plans.
12. Preparation of water supply and drainage line diagrams for a small residential building

E Recourses:

1. https://www.nfpa.org
2. https://learn.autodesk.com

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE208PC1.1	3	2	2	-	3	-	-	-	-	-	-	-	3	-
3CE208PC1.2	3	2	3	-	3	-	-	-	-	-	-	-	3	2
3CE208PC1.3	3	2	2	-	3	-	-	2	1	-	-	-	2	2
3CE208PC1.CO	3	2	3	-	3	-	-	1	1	-	-	-	3	2

Correlation levels-1: Slight (Low), 2:Moderate (Medium), 3:Substantial (High)

Level: **5**	Course Code: **3CE209EM1**		Course Category: **EEM**		
Course Name	**Entrepreneurship in Civil Engineering**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 3CE202PC1 Entrepreneurship in Civil Engineering an Entrepreneurship/Economics Management Course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop an ability to identify and convert civil engineering problems into business opportunities.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE209EM1.1	Explain entrepreneurship concepts, characteristics, and relevance in civil engineering to understand its role in national infrastructure development.	C-2
3CE209EM1.2	Apply idea generation techniques such as mind-mapping and SCAMPER to identify business opportunities in construction domains effectively.	C-3
3CE209EM1.3	Create start-up establishment plans including legal registrations and tendering basics to prepare executable business plans for civil enterprises.	C-6

Course Contents:

Unit 1	**Fundamentals of Entrepreneurship in Civil Engineering** Definition and characteristics of entrepreneurs, Types of entrepreneurship, Relevance of entrepreneurship in civil engineering, Role of entrepreneurship in national infrastructure development, Entrepreneurship ecosystem in India, Overview of Startup India, MSME sector, government support schemes, financial assistance and incubation centres, Differences between employment, freelancing, and entrepreneurship.	10 hrs

Unit 2	**Idea Generation & Business Model Development:** Problem identification in construction projects, Brainstorming tools and Ideation methods (mind-mapping, SCAMPER), Opportunity mapping in construction, consultancy, material supply, and project management. Business Model Canvas – value proposition, customer segments, channels, key partners, resources, cost & revenue structure.	10 hrs
Unit 3	**Business Planning & Startup Establishment:** Steps to start a civil-based enterprise: Proprietorship, Partnership, LLP, Pvt. Ltd., registration basics (GST, PAN, UDYAM/MSME), Contractor Licensee Registration, Overview of tenders and E- Tendering Process, bidding procedures, local business rules. Validating business ideas through market surveys, customer feedback, competitive analysis, Pricing strategies, basics of estimating cost, working capital, profit and break-even concepts.	10 hrs

Text Books:

1. Dr. S. S. Khanka, Entrepreneurial Development, S. Chand Publishing.
2. Vasant Desai, Dynamics of Entrepreneurship Development, Himalaya Publishing House.
3. Niraj Kumar, Entrepreneurship Development and Management, Himalaya Publishing House.

Reference Books:

1. Peter F. Drucker, Innovation and Entrepreneurship, Harper Business.
2. S. K. Sahu, Entrepreneurship in Economic Development, RBSA Publishers.

E Recourses:

1. https://www.startupindia.gov.in/learning-program
2. https://cii.in

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE209EM1.1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
3CE209EM1.2	3	2	-	-	-	2	-	-	-	2	-	-	1	-
3CE209EM1.3	3	2	-	-	-	2	-	-	-	-	-	-	2	2
33CE209EM1.CO	3	2	1	1	-	1	-	-	-	1	-	-	1	1

Correlation levels- 1:Slight (Low), 2:Moderate (Medium), 3:Substantial (High)

Level: **5**	Course Code:	**3SH210VE1**	Course Category:	**VEC**
Course Name	**Constitutional Values and Fundamental Duties**			
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks		PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 3SH210VE1 Constitutional Values and Fundamental Duties is a compulsory Values enhancement Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to introduce the Indian Constitution, its historical background, fundamental values, rights, and duties.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH210VE1.1	Explain the historical background, making, and significance of the Indian Constitution to Understand the Constitution, Preamble, and core values.	C2
3SH210VE1.2	Interpret Fundamental Rights and Duties (Articles 12–35, 51A) to evaluate their implications through case studies in professional and civic life.	C3
3SH210VE1.3	Apply constitutional principles to engineering ethics, sustainability concerns (Articles 48A, 51A(g)), and demonstrate social commitment, innovation, and inclusive growth as nation builders.	C3

Course Contents:

Unit 1	**Introduction to the Constitution and Fundamental Values**: Overview of the Indian Constitution – Historical background and making of the Constitution; Meaning of Constitution; Preamble – Meaning and significance. Core Constitutional Values – Justice (Social, Economic, Political); Liberty (thought, expression, belief, faith, worship); Equality (status and opportunity); Fraternity (dignity and unity of the nation). Relevance of constitutional values for professionals and	10 Hrs

	citizens.	
Unit 2	**Fundamental Rights and Duties**: Fundamental Rights (Articles 12–35) – Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies. Fundamental Duties (Article 51-A) – Importance and implications; Role of youth and professionals in upholding duties. Case studies highlighting real-life significance of rights and duties.	10 Hrs
Unit 3	**Application of Constitutional Values in Engineering and Public Life**: Ethical Responsibilities and Constitutional Alignment – Engineering ethics and public interest; Environment and sustainability as constitutional concern (Articles 48A, 51A(g)); Engineers as nation builders – Social commitment, innovation, and inclusive growth.	10 Hrs

Text Books:

1. Basu D. D., Introduction to the Constitution of India, LexisNexis Publication, New Delhi (Twenty-Third Edition).
2. Jain M. P., Constitution of India, LexisNexis Publication, New Delhi (Eighth Edition).
3. Laxmikanth M., Indian Polity, McGraw Hill Education, New Delhi (Sixth Edition).
4. Austin Granville, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, New Delhi.
5. Shukla V. N., Constitution of India, Eastern Book Company, Lucknow (Twelfth Edition).
6. Government of India, Constitution of India (Bare Act), Government of India Publication, New Delhi.

Reference Books:

1. Subhash Kashyap, Our Constitution, National Book Trust, New Delhi.
2. Durga Das Basu, Shorter Constitution of India, LexisNexis Publication.
3. P. M. Bakshi, The Constitution of India, Universal Law Publishing.
4. J. N. Pandey, Constitutional Law of India, Central Law Agency.
5. Seervai H. M., Constitutional Law of India, N. M. Tripathi Pvt. Ltd. (Vols. I–III).
6. B. Shiva Rao, The Framing of India's Constitution: A Study, Indian Institute of Public Administration.
7. D. C. Wadhwa, Political Science and Constitutional Law, Eastern Book Company.
8. Madhav Khosla, The Indian Constitution: Oxford India Short Introductions, Oxford University Press.

E Resources:

1. NPTEL course on Constitutional Studies, Prof. Sudhir Krishnaswamy, National Law School of India University
2. Constitutional Values and Fundamental Duties (University of Delhi – aligned with NEP 2020, available via NPTEL/DU open learning) https://kmc.du.ac.in/kmcouter/collnews/download/40727448169063791359.pdf/LinkedContents/pdf/All/All

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH210VE1.1	3	2	-	1	-	-	-	-	-	-	-	1	2	1
3SH210VE1.2	-	3	2	2	-	2	3	3	-	-	-	1	2	1
3SH210VE1.3	-	-	3	3	-	2	3	2	-	2	-	1	2	2
3SH210VE1CO	1	2	2	2	-	2	2	2	-	1	-	1	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	3CE400FP1	Course Category:	FP
Course Name	Field Project				
Credits	02	Total L:T:P Hours	0:0:4 60 Hrs	Total SL Hours	--
Total Credit Hours	60 Hrs				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	25	PA Marks	25	Total Marks	50

Course Description:

Subject Code 3CE400FP1 Field Project is a compulsory Experiential Learning Course for Second Year B. Tech Civil Engineering

Course Objectives:

To develop students' ability to analyze community infrastructure issues and design sustainable, socially responsible civil engineering solutions through field engagement.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE400FP1.1	Examine infrastructure systems, soil parameters, drinking water quality, and climate change impacts for sustainable planning and assessment.	C-3
3CE400FP1.2	Perform field-based activities like site inspection, sample collection, field testing, systematic data recording, and preliminary analysis for hands-on experience in real-world.	P-5
3CE400FP1.3	Demonstrate awareness and ethical concern towards sustainable management for fostering community engagement and social responsibility.	C-3, P-5 A-3

Course Contents:

Module	Description	Hours
Module 1	Orientation & Sensitization	4
Module 2	Field Visit & Problem Identification	24
Module 3	Problem–Solution Design & Implementation	20
Module 4	Documentation, Presentation & Reflection	12

Note:

1. Students must perform collaboratively within their assigned practical batch groups only.
2. **Projects**
    1. Field Visit to Swach Bharat Project Sites
    2. Soil Health Testing and Drinking Water Quality Analysis

3. Climate Change Awareness and Community Impact Assessment

3. Suggested Civil Project Themes

1. Sustainable Rural Infrastructure & Livelihood Engineering
2. Water, Sanitation & Public Health Engineering
3. Climate Resilient & Disaster-Prepared Communities
4. Rural Resource Management & Environmental Engineering
5. Urban & Rural Governance Infrastructure Study
6. Community-Based Construction & Quality Control
7. Educational & Social Infrastructure Audit

4. Documentation /Project Report Format:

The Documentation /Project Report shall contain the following sections:

1. Title Page
2. Certificate & Declaration
3. Abstract
4. Introduction (Community + E&TC relevance)
5. Objectives
6. Literature Survey
7. Methodology (Survey + Technical)
8. Problem Identification
9. Proposed E&TC Solution
10. Implementation / Simulation
11. Results & Analysis
12. Community Feedback & Social Impact
13. Conclusion & Future Scope
14. References
15. Appendices (Photos, questionnaires, certification letter issued by the Gram Panchayat office)

Course Plan:

Lecture No.	Module Title	Topic	Hours
1	**Module1: Orientation & Sensitization**	NEP 2020: Community Engagement & Role of Engineers, Ethics, Social Responsibility & SDGs for Civil Engineers, Overview of Rural & Urban Communication Infrastructure, Identification of Community Institutions (GP, School, Self Help Group (SHG), Health Centre), Field Safety, Team Formation, Area & Theme Allocation, Reorganization	4
2	**Module 2:**	Pre-Visit Study, Permissions & Planning	24

3	**Field Visits & Problem Identification**	Site Identification & Layout Documentation	
4		Field Data Collection & Technical Observation	
5		Laboratory/Field Testing & Data Recording	
6		Analysis & Comparison with Standards	
7		Problem Identification & Engineering Solutions	
8	**Module3: Engineering Problem–Solution Design & Implementation-**	Analysis of Collected Field Data and Identification of Problems	20
9		Preparation of Simple Layout Sketches of Existing Facilities, Preparation of Basic Improvement Plan	
10		Identification of Basic Civil Engineering Deficiencies in Infrastructure	
11		Preparation of Quantity and Cost Estimate	
12		Evaluation of Feasibility and Expected Community Benefits	
13	**Module4: Documentation, Presentation & Reflection**	Data Analysis & Graphical Representation, Writing Methodology & Analysis Sections, Results, Discussion & Conclusion	12
14		Project Report Structure & Guidelines, Report Finalization, Presentation Preparation	
15		Evaluation and Viva	

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE400FP1.1	3	-	2	3	3	3	2	3	3	-	3	3	3	1
3CE400FP1.2	3	-	-	3	3	-	-	3	3	3	3	3	3	1
3CE400FP1.3	3	-	-	-	-	3	3	3	3	2	3	3	3	1
3CE400FP1CO	3	-	1	2	2	2	2	3	3	2	3	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3AL001NC1**		Course Category: **NC**		
Course Name	**Disaster Management and Preparedness**				
Credits	--	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	--
Total Credit Hours	--				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	--	Total Marks	--

Course Description:

Subject Code 3CE001NC1 Disaster Management and Preparedness is a Compulsory Non-Credit course for Second Year B. Tech all disciplines.

Course Objectives:

The objective of this course is to provide students with a comprehensive understanding of disasters, their types, impacts, the complete disaster management cycle, and the roles of various agencies in Disaster Risk Reduction.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE001NC1.1	Identify the concepts of disaster, hazard, vulnerability and risk, and classify disasters to understand the basic nature, causes and profiles of disasters in India.	C-2
3CE001NC1.2	Analyze the disaster management cycle for risk assessment, mitigation, preparedness, response, recovery, and international disaster management frameworks.	C-4
3CE001NC1.3	Apply disaster management practices, including stakeholder roles, national policies, engineers' responsibilities, and preparedness measures for effective disaster risk reduction.	C-3

Course Contents:

Unit 1	**Introduction to Disaster Management:** Concepts and definitions – disaster, hazard, vulnerability, risk, severity, frequency, exposure, capacity, and impact; classification of disasters- Natural disasters: earthquakes, tsunami, landslides, mining, Hydro-Meteorological Disasters: floods, draught, cyclones, coastal erosion. Biological Disaster: epidemics, pest attacks, forest fire, Manmade disasters: Industrial pollution, artificial flooding in	10 hrs

	urban areas, nuclear radiation, chemical spills, transportation accidents, vulnerability profile of India, ecological fragility; principles of disaster prevention and mitigation	
Unit 2	**Disaster Management Cycle and Framework:** Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development. Awareness During Disaster – Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation. Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action Phases of disaster management; vulnerability and capacity assessment, post-disaster environmental response	12 hrs
Unit 3	**Disaster Management practices:** Roles and responsibilities of government, community, local bodies, NGOs, and other stakeholders, National Policy on Disaster Management Act 2005 Mega Disasters of India and Lessons Learnt, Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster.	8 hrs

Textbooks:

1. Sharma, S. C. (2022). Disaster Management, Khanna Publication.
2. Subramanian, R. (2024). Disaster Management. Vikas Publication.

Reference Books:

1. Gaur, R. C. (2018). Environmental Engineering and Disaster Management. New Age International.
2. Pradeep Sahni, 2024, Disaster Risk Reduction in South Asia, Prentice Hall.
3. Mondal, D. (2022). Disaster Management. New Delhi: CBS Publishers & Distributors
4. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
5. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
6. Natural Disaster Management Policy , 2009,GOI
7. H.N. Shrivastava& G.D. Gupta, Management of Natural Disasters in developing Countries, Daya Publishers , Delhi
8. S.L. Goyal, Encyclopedia of disaster Management, Vol I,II & III Disaster Managemnt Policy and administration, Deep & Deep, New Delhi,2006

9. Coppola D P, Introduction to International Disaster Management, Elsevier Science (B/H), London, 2007
10. Disaster Mitigation in Asia & Pacific, Asian Development Bank

Course Assignments

Internal Assessment at Institute level will be based on following assignments:

1) Study of Recent Disasters (at local, state and national level)
2) Preparation of Disaster Risk Management Plan of and Area or Sector
3) A Case study on Disaster Management

E Recourses:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed61/preview

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3CE001NC1.1	3	2	-	-	-	3	2	-	-	-	3	-	-	-
3CE001NC1.2	3	3	-	-	-	3	3	-	-	-	3	2	2	-
3CE001NC1.3	3	3	-	-	-	3	3	-	-	3	3	1	2	2
3CE001NC1.CO	3	3	-	-	-	3	3	-	-	1	3	1	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CE211DH1**		Course Category: **DH**		
Course Name	**Smart Cities and Urban Innovation**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3CE211DH1 Smart Cities and Urban Innovation is an Honours / Double minor course (L 5) offered by department of Civil Engineering for Second Year B. Tech., all disciplines.

Course Objectives:

The objective of this course is to develop foundational understanding of smart city concepts, dimensions, policies, stakeholders, and global best practices for sustainable and digitally enabled urban development.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE211DH1.1	Describe the concept, evolution, characteristics, and need of smart cities, for digital transformation in modern urban systems.	C-2
3CE211DH1.2	Analyze the six core dimensions of smart cities and their inter linkages for achieving sustainable urban development.	C-4
3CE211DH1.3	Interpret urbanization trends and major urban challenges, including inclusivity and resilience requirements in Indian and global contexts.	C-2
3CE211DH1.4	Describe the objectives, structure, financing mechanisms, and ICT integration for the Smart Cities Mission in India, including the role of SPVs and ULBs.	C-2
3CE211DH1.5	Examine the roles and interactions of stakeholders in the smart city ecosystem and assess Public-Private Partnership (PPP) models for collaborative urban development.	C-3
3CE211DH1.6	Compare global smart city case studies and identify best practices applicable to Indian urban development strategies.	C-5

Course Contents:

Unit 1	**Introduction to Smart Cities:** Definition and origin of smart cities, importance of smart city, Characteristics of a smart city, smart cities: Need and benefits, Historical evolution of cities toward smart urbanism, Introduction to urban systems and digital transformation	7 hrs
Unit 2	**Core Dimensions Smart Cities:** Introduction to six dimensions and their importance: Smart Governance, Smart People, Smart Economy, Smart Living, Smart Mobility, Smart Environment, Interlinking of dimensions for sustainable development, Examples from real-life projects	8 hrs
Unit 3	**Urbanization Trends and Challenges:** Urbanization in India and the world: Current trends, Common urban challenges: Traffic, waste, energy, housing, services, The digital divide and inclusive development, Urban-rural linkages and peri-urban development, Need for resilience and disaster preparedness in cities	7 hrs
Unit 4	**Smart Cities Mission:** Overview of the Smart Cities Mission (India), Vision, planning model (pan-city and area-based development), Introduction to Financing and implementation mechanisms, Use of ICT, IoT, and e-Governance tools in Indian smart cities, Role of Smart City SPVs and Urban Local Bodies (ULBs)	8 hrs
Unit 5	**Stakeholders in Smart City Ecosystem:** Role of government (local, state, central), Role of private sector: Investors, developers, and tech providers, Citizen engagement: Awareness, participation, and innovation, Academia and research institutions in urban innovation, Public-Private Partnership (PPP) models and collaboration tools	7 hrs
Unit 6	**Best Practices and Case Studies:** Smart city models from: Barcelona – Citizen engagement and governance, Singapore – Urban mobility and digital services, Amsterdam – Environmental and energy solutions, Lessons for Indian smart cities, Comparative analysis of strategies and outcomes	8 hrs

Text Books

1. Smart Cities: Foundations, Principles, and Applications by Houbing Song, Ravi Srinivasan
2. Smart Cities Unbundled: Ideas and Strategies for Urban India by Sameer Sharma

Reference Books:

1. Designing Smart and Resilient Cities for a Post-Pandemic World by Anthony M. Townsend

E Resourses:

1. https://upskilldevelopment.com/urban-innovation-management-and-smart-cities-course

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3CE211DH1.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
3CE211DH1.2	3	-	-	-	-	-	2	-	-	-	-	-	-	-
3CE211DH1.3	3	-	-	-	-	-	2	-	-	-	1	-	2	-
3CE211DH1.4	3	-	-	-	-	-	2	-	-	-	-	-	3	-
3CE211DH1.5	3	-	-	-	3	-	2	-	-	-	-	-	-	-
3CE211DH1.6	3	-	-	-	-	-	2	-	-	-	3	-	3	-
3CE211DH1.CO	3	-	-	-	1	-	2	-	-	-	1	-	2	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CE211DH2**		Course Category: **DH**		
Course Name	**Basics of HVAC**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3__211DH2 Basics of HVAC is an Honours / Double minor course (L 5) offered by department of Civil Engineering for Second Year B. Tech., all disciplines.

Course Objectives:

The objective of this course is to provide a foundational understanding of HVAC (Heating, Ventilation, and Air Conditioning) systems relevant to building and industrial applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3__211DH2.1	Explain various HVAC systems and their role in building development to enhance sustainability, indoor air quality (IAQ), and smart HVAC integration.	C2
3__211DH2.2	Apply the principles of thermodynamics to evaluate and improve the efficiency and thermal performance of HVAC systems.	C3
3__211DH2.3	Interpret psychrometric charts and calculate air properties to analyze air-conditioning and HVAC process problems.	C3
3__211DH2.4	Calculate heating and cooling loads to determine the required system capacity by identifying influencing factors using standard load estimation methods.	C3
3__211DH2.5	Explain the working principles of refrigeration and heating equipment and differentiate between HVAC configurations to select appropriate systems for specific applications.	C4

3__211DH2.6	Design air distribution systems and demonstrate the application of HVAC controls and BMS to achieve improved energy efficiency and sustainable building performance.	C6

Course Contents:

Unit 1	**Introduction to HVAC Systems:** Definition, scope, and classification of HVAC systems, Role of HVAC in buildings and industries, Historical background and current trends (e.g., sustainability, IAQ, smart HVAC),Components and subsystems of HVAC systems.	7 hrs
Unit 2	**Thermodynamics and Heat Transfer Fundamentals:** Review of first and second laws of thermodynamics, Heat transfer modes (conduction, convection, and radiation), Heat transfer through building materials, Energy balance and efficiency in HVAC systems.	8 hrs
Unit 3	**Psychrometrics and Air Properties:** Moist air properties, Dalton's law, Psychrometric chart: dry bulb, wet bulb, relative humidity and enthalpy. Air conditioning processes: sensible and latent heating/cooling, dehumidification, mixing, bypass factor, Application of psychrometrics in HVAC calculations	7 hrs
Unit 4	**Cooling and Heating Load Estimation:** Factors affecting heating/cooling load, Internal and external heat gains, Solar radiation and ventilation loads, Load estimation procedures (CLTD, TETD, and RTS methods), Design conditions and selection of equipment capacity.	8 hrs
Unit 5	**HVAC Equipment and System Configuration:** Refrigeration cycles: vapour compression and absorption systems. HVAC equipment: compressors, condensers, evaporators, expansion devices. Heating equipment: boilers, heat pumps, fans, blowers, air filters. HVAC system types: all-air, all-water, air-water, split and packaged units	7 hrs
Unit 6	**Air Distribution and Controls:** Duct design: friction loss, pressure drop, duct sizing methods - Diffusers, grilles, dampers. Air distribution layouts. Basic controls: thermostats, sensors, actuators. Introduction to Building Management Systems (BMS), Energy efficiency considerations and green building concepts.	8 hrs

Text Books

1. C.P. Arora – Refrigeration and Air Conditioning, Tata McGraw-Hill Education.

2. S.C. Arora & Domkundwar – A Course in Refrigeration and Air Conditioning, Dhanpat Rai & Sons
3. Ananthanarayanan, P.N. – Basic Refrigeration and Air Conditioning, McGraw Hill Education.

Reference Books:

1. ASHRAE Handbook Series – Fundamentals, HVAC Applications, HVAC Systems and Equipment.
2. Carrier Air Conditioning Co. – Handbook of Air Conditioning System Design, McGraw Hill.
3. Jones, W.P. – Air Conditioning Engineering, Butterworth-Heinemann.

E Recourses:

1. https://pdhonline.com/courses/m135/m135content.pdf?utm
2. https://www.aaon.com/resources/navigating-psychrometric-charts-a-beginners-guide?utm.
3. https://www.engproguides.com/hvac-psychrometrics-problems.html?utm.

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE211DH2.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
3CE211DH2.2	3	-	-	-	-	-	2	-	-	-	-	-	-	-
3CE211DH2.3	3	-	-	-	-	-	2	-	-	-	1	-	2	-
3CE211DH2.4	3	-	-	-	-	-	2	-	-	-	-	-	3	-
3CE211DH2.5	3	-	-	-	3	-	2	-	-	-	-	-	-	-
3CE211DH2.6	3	-	-	-	-	-	2	-	-	-	3	-	3	-
3CE211DH2.CO	3	-	-	-	1	-	2	-	-	-	1	-	2	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE212PC1**		Course Category: **PCC**		
Course Name	**Surveying**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3CE203PC1 Surveying is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to equip students with the knowledge and skills to perform land surveys, measure distances, and create accurate maps for construction projects using modern and traditional methods.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE212PC1.1	Explain surveying concepts, principles, and applications across civil engineering domains to understand spatial measurement relevance in infrastructure planning.	C-2
4CE212PC1.2	Apply linear and angular measurement procedures using chains, tapes, EDM and compasses to minimize errors and improve field measurement accuracy.	C-3
4CE212PC1.3	Demonstrate levelling operations and contouring techniques with appropriate adjustments to determine elevations and represent surface terrain effectively.	C-3
4CE212PC1.4	Demonstrate setup, operation, and data collection using Total Station instruments for layout, and civil engineering surveying applications.	C-3
4CE212PC1.5	Interpret principles of photogrammetry and drone surveying to plan aerial surveys and generate spatial data for mapping and construction monitoring.	C-2
4CE212PC1.6	Explain the use of Remote Sensing, GPS, and GIS technologies including QGIS software for modern geospatial data collection, and decision-making in civil engineering projects.	C-2

Course Contents:

Unit 1	**Introduction to Surveying**: Definition and scope of surveying, Surveying Principles, Importance of surveying in civil engineering, Applications of surveying in urban planning, transportation, construction, and environmental engineering, Types of surveying (topographical, cadastral, engineering, geodetic, etc.), Surveying units and conversions.	6 hrs
Unit 2	**Measurement Techniques:** Introduction to linear measurement, Types of tapes/chains/EDM used in surveying, Procedures for chain surveying, Types of errors in surveying (systematic, random, and gross errors), Measurement errors and correction techniques, Importance of angular measurements in surveying, Use of prismatic and surveyor's compass Bearings and angles, local attraction errors and adjustments.	7 hrs
Unit 3	**Levelling Techniques and Contour Mapping**: Various terms, Methods of height determination, Spirit leveling, different types of levels, booking and reduction of data, profile leveling and cross sectioning, and collimation errors, reciprocal leveling. Contours and its characteristics, uses and methods of contouring.	7 hrs
Unit 4	**Modern Surveying using Total Station:** Introduction to Total Station, Definition and concept of Total Station, Components of Total Station, Advantages and limitations, Working Principle, Measurement of Horizontal & Vertical Angles, Distance measurement, Data collection and storage, Field Operations with Total Station, Applications in Civil Engineering	7 hrs
Unit 5	**Photogrammetry and Drone Surveying:** Definition and principles of photogrammetry, Types: Terrestrial and Aerial Photogrammetry, Types of photographs: Vertical & Oblique photos, Scale of vertical photograph, Drone Integration, Types of drone cameras, Camera calibration in drones, Ground Control Points (GCPs) for drone mapping, Flight Planning and Image Acquisition, Drone-Based Survey Applications, Introduction to photogrammetry software (Pix4D / Drone Deploy).	8 hrs
Unit 6	**Geospatial Technologies:** Remote Sensing: Definition and principles of Remote Sensing, Remote Sensing Systems, Characteristics of major Indian Remote Sensing Satellites, Global Positioning System (GPS): Introduction and definition of GPS, Types of GPS surveying, Advantages of GPS in Civil Engineering, Geographic Information System (GIS): Definition and History of GIS, Components of GIS, Spatial and Non-spatial data, Applications of RS, GPS, GIS, Overview of QGIS software.	10 hrs

Text Books:

1. B. C. Punmia, Surveying Vol. I, Laxmi Publications.
2. S. K. Duggal, Surveying Vol. I & II, McGraw-Hill Education.
3. K. R. Arora, Surveying Vol. I, Standard Book House.

Reference Books:

1. Charles D. Ghilani& Paul R. Wolf, Elementary Surveying: GPS, GIS and Geomatics, Pearson Education.
2. A. M. Chandra, Plane Surveying, New Age International Publishers.

E Resources:

1. https://nptel.ac.in/courses/105/104/105104101
2. https://opentextbc.ca/geomatics

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE212PC1.1	3	2	-	-	-	-	-	-	-	-	-	2	2	-
4CE212PC1.2	3	2	-	2	3	-	-	-	-	-	-	3	2	-
4CE212PC1.3	3	2	-	2	3	-	-	-	-	-	-	3	2	1
4CE212PC1.4	3	2	-	2	3	-	-	-	-	-	-	3	2	1
4CE212PC1.5	3	2	-	2	3	-	-	-	-	-	-	2	3	-
4CE212PC1.6	3	2	-	2	3	3	-	-	-	-	-	2	3	-
4CE212PC1.CO	3	2	-	2	2	1	-	-	-	-	-	3	3	1

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE213PC1**		Course Category: **PCC**		
Course Name	**Concrete Technology**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4CE213PC1Concrete Technology is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to provide students insights of concrete materials, mix design, properties, testing, special concretes, and quality control practices essential for durable and efficient construction applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE213PC1.1	Explain concrete composition, water-cement ratio, properties, and influencing factors to understand behavior of concrete in construction applications effectively.	C-2
4CE213PC1.2	Discuss cement types, aggregate properties, testing methods, water quality, and admixture functions to evaluate material suitability for producing quality concrete mixes.	C-2
4CE213PC1.3	Apply IS 10262:2019 mix design steps considering workability, strength, durability, and material variations to achieve required concrete performance reliably.	C-3
4CE213PC1.4	Analyze workability, segregation, bleeding, durability factors, and measurement methods to assess fresh and hardened concrete behavior under varying construction conditions.	C-4
4CE213PC1.5	Analyze the production, batching, transportation, and quality control processes of Ready-Mix Concrete to evaluate its compliance with IS 456 and IS 4926 standards.	C-4

4CE213PC1.6	Interpret concrete types, acceptance criteria, protection techniques, and repair practices to maintain consistent concrete quality and ensure structural durability.	C-2

Course Contents:

Unit 1	**Fundamentals of Concrete and Constituent Materials** Introduction to concrete technology, classification of concrete, ingredients of concrete, types and characteristics of cement, hydration of cement and heat of hydration, water-cement ratio, properties of concrete, factors affecting strength and durability.	4 hrs
Unit 2	**Properties and Testing of Concrete Materials** Testing on cement, classification and properties of aggregates, water quality requirements and impurities affecting concrete, types of chemical and mineral admixtures, IS standards and specifications related to concrete materials.	5 hrs
Unit 3	**Concrete Mix Design** Introduction to mix design, factors influencing mix design, guidelines of IS 10262: 2019, calculation of target mean strength, selection of water content and water-cement ratio, determination of cement content and aggregate proportions, preparation of trial mixes and necessary adjustments, compressive, tensile and flexural strength of concrete, curing methods and their importance, shrinkage and creep of concrete.	6hrs
Unit 4	**Fresh and Hardened Concrete** Properties of fresh concrete including workability, segregation bleeding, and temperature effect, measurement methods of workability, properties of hardened concrete including strength development, modulus of elasticity, durability of concrete: sulphate attack, carbonation, chloride attack, alkali-aggregate reaction and abrasion resistance.	5 hrs
Unit 5	**Ready Mix Concrete (RMC) and Production Technology** Introduction to Ready Mix Concrete, types of RMC plants including transit mix, central mix and shrink mix plants, batching and mixing operations, transportation and placement of RMC, quality control measures at plant and site, acceptance criteria as per IS 456 and IS 4926.	6 hrs
Unit 6	**Special Concretes and Quality Control** High-performance concrete, high-strength concrete and lightweight concrete, quality control in concrete production, acceptance criteria and statistical quality control, concrete protection techniques, repair and retrofitting of concrete structures.	4 hrs

Text Books:

1. Shetty M.S., Concrete Technology, S. Chand Publishing
2. Neville A.M., Properties of Concrete, Pearson Education
3. Gambhir M.L., Concrete Technology, Tata McGraw-Hill

Reference Books:

1. Mehta P.K. & Monteiro P.J.M., Concrete: Microstructure, Properties and Materials, McGraw-Hill
2. Rajput R.K., Engineering Materials, S. Chand Publishing

E Resources:

1. https://civiconcepts.com/
2. https://engineeringcivil.com

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE213PC1.1	3	2	-	-	-	-	-	-	-	-	-	1	-	-
4CE213PC1.2	3	2	-	-	-	-	-	-	-	-	-	-	3	-
4CE213PC1.3	3	2	-	-	-	-	-	-	-	-	-	-	3	1
4CE213PC1.4	3	2	-	-	-	-	-	-	-	-	-	-	2	-
4CE213PC1.5	3	2	-	-	-	-	-	-	-	-	-	-	2	-
4CE213PC1.6	3	2	-	-	-	-	-	-	-	-	-	-	2	1
4CE213PC1.CO	3	2	-	-	-	-	-	-	-	-	-	1	2	1

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE214PC1**		Course Category: **PCC**		
Course Name	**Fluid Mechanics**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4CE214PC1 Fluid Mechanics is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop understanding of fundamental fluid properties, hydrostatics, fluid kinematics, flow measurement, dimensional analysis and open channel hydraulics for solving real civil engineering flow problems.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE214PC1.1	Explain physical properties of fluids, viscosity, capillarity and pressure measurement to understand fluid behaviour under different conditions.	C-2
4CE214PC1.2	Determine total pressure and centre of pressure on submerged surfaces to design hydraulic structures effectively.	C-3
4CE214PC1.3	Apply the principles of buoyancy and floatation to determine metacentric height for analyzing stability and equilibrium of floating and submerged bodies.	C-3
4CE214PC1.4	Apply Euler's and Bernoulli's equations along streamlines to solve practical hydraulic and energy distribution problems.	C-3
4CE214PC1.5	Examine pipe combinations in series and parallel for planning efficient water transportation systems.	C-3
4CE214PC1.6	Explain uniform and non-uniform open channel flow characteristics to classify flow behaviour accurately.	C-2

Course Contents:

Unit 1	**Properties of Fluids:** Introduction, Physical properties of fluids, viscosity, capillarity, Pressure and its measurement: Fluid pressure at a point, Pascal's Law, pressure variation in a fluid at rest, absolute gauge, atmospheric & vacuum pressures, measurement of pressure, simple manometers, differential manometers, related problems.	5 hrs
Unit 2	**Hydrostatic forces on surfaces**: Introduction, total pressure &center of pressure, vertical plane and Inclined Plane surface submerged in liquid.	5 hrs
Unit 3	**Buoyancy & floatation:** Introduction, buoyancy, centre of buoyancy, metacentre, metacentric height, analytical method of metacentric height, conditions of equilibrium of a floating & submerged body, related problems.	5 hrs
Unit 4	**Dynamics of Flow:** Eulers equation of motion along a streamline and its integration to prove Bernoulli's equation, its assumptions, HGL, EGL, related problems	5 hrs
Unit 5	**Measurement of fluid flow:** Flow through pipes, Velocity Distribution law, Hydrodynamically smooth and rough pipe, Darcy's equation (no proof), major and minor losses in pipes, pipes in series and parallel.	5 hrs
Unit 6	**Open channel flow:** Uniform flow, Open channel flow, Types of flow, geometric elements of rectangular & trapezoidal sections, Chezy's& Mannings equations, most efficient rectangular & trapezoidal section	5 hrs

Text Books:

1. R.K. Bansal, Fluid Mechanics, Laxmi Publications.
2. R. Jain & S.S. Kori, Fluid Mechanics and Hydraulics, Dhanpat Rai Publications.

Reference Books:

1. F.M. White, Fluid Mechanics, McGraw Hill
2. K. Subramanya, Flow in Open Channels, McGraw Hill Education

E Resources:

1. https://nptel.ac.in/courses/112/105/112105174

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE214PC1.1	3	2	-	-	-	-	-	-	-	-	-	2	-	-
4CE214PC1.2	3	2	-	-	-	-	-	-	-	-	-	2	2	-
4CE214PC1.3	3	2	-	-	-	-	-	-	-	-	-	-	1	-
4CE214PC1.4	3	2	-	-	2	-	-	-	-	-	-	-	1	-
4CE214PC1.5	3	2	-	-	-	-	-	-	-	-	-	-	2	-
4CE214PC1.6	3	2	-	-	3	-	-	-	-	-	-	-	-	-
4CE214PC1.CO	3	2	-	-	1	-	-	-	-	-	-	2	2	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE215MD1**		Course Category: **MDM**		
Course Name	**Surveying**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 4CE215MD1 Surveying is a Multidisciplinary Minor course for Second Year B. Tech Textile/Mechanical/Electrical/Computer Science/EXTC/Chemical Engineering.

Course Objectives:

The objective of this course is to equip students with the knowledge and skills to perform land surveys, measure distances, and create accurate maps for construction projects using modern and traditional methods.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE215MD1.1	Explain advanced surveying principles, applications, and modern techniques like GIS, GPS, and remote sensing to support multidisciplinary engineering tasks effectively.	C-2
4CE215MD1.2	Apply precise linear, angular, and elevation measurement methods with error adjustments to obtain reliable field observations for practical surveying works.	C-3
4CE215MD1.3	Interpret total station, GPS, and digital mapping outputs to prepare accurate spatial data representations supporting planning and design decision-making.	C-3

Course Contents:

Unit 1	**Surveying Concepts and Instruments:** Overview of advanced principles of surveying, scope and applications in civil engineering and planning, classification of land surveys, detailed study of linear and angular measurements, use of chains, tapes, prismatic compass, surveyor's compass, sources of errors and correction methods, local attraction and its	12 hrs

	adjustments, field procedures for chain and compass surveying, introduction to plane table operations and accuracy considerations.	
Unit 2	**Elevation Determination and Contouring** Concepts related to height measurement, spirit leveling principles, types of levels and leveling staff, field procedures for differential, profile, and cross-section leveling, booking of readings and reduction of levels using both height of instrument and rise and fall methods, identification and adjustment of collimation errors, reciprocal leveling for accuracy improvement, concept, characteristics, uses, and generation methods of contour maps for terrain representation.	12 hrs
Unit 3	**Modern Surveying Technologies** Introduction to total station operation and data acquisition, fundamentals of GPS positioning and its surveying applications, role of GIS, remote sensing, and UAV or drone-based surveying in mapping, planning, and land information systems.	6 hrs

Text Books:

1. B. C. Punmia, Surveying Vol. I, Laxmi Publications.
2. S. K. Duggal, Surveying Vol. I & II, McGraw-Hill Education.
3. K. R. Arora, Surveying Vol. I, Standard Book House.

Reference Books:

1. Charles D. Ghilani & Paul R. Wolf, Elementary Surveying: GPS, GIS and Geomatics, Pearson Education.
2. A. M. Chandra, Plane Surveying, New Age International Publishers.

E Resources:

1. https://nptel.ac.in/courses/105/104/105104101
2. https://opentextbc.ca/geomatics

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
4CE215MD1.1	3	2	-	-	-	-	-	-	-	-	-
4CE215MD1.2	3	2	-	-	-	-	-	-	-	-	-
4CE215MD1.3	3	2	-	-	-	-	-	-	-	-	-
4CE215MD1.CO	3	2	-	-	-	-	-	-	-	-	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code:		**4SH216OE1**	Course Category:	**OE**
Course Name	**Quantitative and Logical Reasoning**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4SH216OE1Quantitative and Logical Reasoning is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the Course is to develop quantitative aptitude, logical reasoning, problem-solving efficiency, and decision-making skills for placements, competitive exams, and real-life applications

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE1.1	Apply arithmetic and numerical techniques to solve quantitative problems accurately.	C-3
4SH216OE1.2	Solve algebraic and equation-based problems using simplification and approximation methods to improve problem-solving efficiency.	C-3
4SH216OE1.3	Analyze logical reasoning problems using structured and critical thinking approaches to improve decision-making skills.	C-4
4SH216OE1.4	Interpret and analyze data using graphical and tabular methods for decision making for strategic planning.	C-4
4SH216OE1.5	Solve complex logical puzzles and advanced reasoning problems efficiently for competitive examination success.	C-3
4SH216OE1.6	Demonstrate effective aptitude test strategies integrating quantitative and logical reasoning skills for career advancement opportunities.	C-3

Course Contents:

Unit 1	**Number System & Arithmetic Foundations:** Number system fundamentals; LCM and HCF applications; divisibility rules; percentage calculations; ratio and proportion; averages; profit and loss; simple and compound interest; speed mathematics and shortcut techniques.	7Hrs

Unit 2	**Algebra, Equations & Simplification Techniques:** Linear and quadratic equations; algebraic expressions; simplification and approximation; indices and surds; inequalities; time and work; pipes and cisterns; time, speed and distance; mixtures and alligation.	7 Hrs
Unit 3	**Logical Reasoning: Analytical & Critical Thinking:** Coding–decoding; blood relations; direction sense; series and pattern recognition; analogies; ranking and ordering; syllogisms; statement and assumption; statement and conclusion; cause–effect reasoning.	7 Hrs
Unit 4	**Data Interpretation & Analytical Aptitude:** Tables; pie charts; line graphs; bar graphs; caselets; data sufficiency; DI shortcut techniques; approximation in data interpretation; comparative and predictive data analysis.	8Hrs
Unit 5	**Advanced Logical Reasoning & Puzzle Solving:**Seating arrangements (linear, circular, and complex); floor-based puzzles; scheduling puzzles; selection-based puzzles; Venn diagrams; logical grouping; critical reasoning frameworks	8 Hrs
Unit 6	**Placement Aptitude Mastery & Test Strategies:** Integrated quantitative and logical reasoning practice; decision-making and elimination strategies; speed improvement techniques; mock placement aptitude patterns (TCS, Infosys, Wipro, Accenture, Capgemini); common error analysis; test-taking strategies; aptitude and reasoning simulations.	8 Hrs

Text Books:

1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing
2. Arun Sharma, Logical Reasoning and Data Interpretation, McGraw Hill

Reference Books:

1Arun Sharma, How to Prepare for Quantitative Aptitude,published by McGraw Hill Education.

2. R.S. Aggarwal, A Modern Approach to Logical Reasoning, published by S. Chand Publishing
3. M.K. Pandey, Analytical Reasoning, published by BSC Publishing Co. Pvt. Ltd.
4. Rajesh Verma, Fast Track Objective Arithmetic, published by Arihant Publications

E Resources:

1. NPTEL – Quantitative Aptitude & Logical Reasoning Courses
2. IndiaBIX – Quantitative and Logical Reasoning Practice
3. CareerRide – Aptitude Preparation Modules

4. PrepInsta / HackerEarth – Placement Aptitude Practice Platforms

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4SH216OE1.1	3	3	2	–	–	–	–	–	–	–	–	1	2	1
4SH216OE1.2	3	3	2	–	–	–	–	–	–	–	–	1	2	1
4SH216OE1.3	–	3	3	–	–	–	–	–	–	–	–	1	2	2
4SH216OE1.4	–	3	2	–	–	–	–	–	–	–	–	1	3	2
4SH216OE1.5	–	3	3	–	–	–	–	–	–	–	–	2	2	2
4SH216OE1.6	–	3	2	–	–	–	–	–	–	2	3	1	2	2
4SH216OE1 CO	1	3	3	–	–	–	–	–	–	1	1	1	2	2

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level:	**5**	Course Code:	**4SH216OE2**	Course Category:	**OE**
Course Name	**Critical Thinking & Decision Making**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4SH216OE2 Critical Thinking & Decision Making is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The objective of this course is to develop critical thinking and decision-making competencies by strengthening analytical reasoning and structured problem-solving skills applicable to professional and real-world situations.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE2.1	Apply critical thinking frameworks to analyze problems systematically.	C-3
4SH216OE2.2	Evaluate information, assumptions, and arguments for logical consistency and validity.	C-5
4SH216OE2.3	Analyze complex situations and identify feasible alternatives for decision making.	C-4
4SH216OE2.4	Design rational and ethical decision-making strategies under uncertainty to ensure sustainable organizational outcomes.	C-6 A-3
4SH216OE2.5	Apply quantitative and qualitative tools to support decision-making processes.	C-3
4SH216OE2.6	Demonstrate effective decision making in simulated professional and team-based scenarios to resolve workplace challenges effectively	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundations of Critical Thinking:** Concept of critical thinking; elements of reasoning; logical vs illogical thinking; assumptions and inferences; inductive and deductive reasoning; common cognitive biases; barriers to critical thinking.	7Hrs

Unit 2	**Analytical Reasoning & Problem Framing:** Problem identification and structuring; root cause analysis; issue trees; questioning techniques; systems thinking; analytical reasoning models.	7 Hrs
Unit 3	**Decision Making Models & Techniques:** Rational decision-making model; intuitive decision making; bounded rationality; decision trees; cost–benefit analysis; risk and uncertainty; heuristics.	7 Hrs
Unit 4	**Data-Driven & Ethical Decision Making:** Use of data in decision making; qualitative vs. quantitative data; basic decision matrices; ethical frameworks; professional ethics; social and environmental considerations in decisions.	8Hrs
Unit 5	**Creativity, Innovation & Strategic Thinking:** Creative thinking techniques; lateral thinking; design thinking approach; scenario planning; strategic decision making; innovation in problem solving.	8 Hrs
Unit 6	**Applied Decision Making & Case Analysis:** Case studies from industry and management; individual and group decision simulations; conflict resolution through decision frameworks; decision-making under pressure; reflection and feedback	8 Hrs

Text Books:

1.Alec Fisher, Critical Thinking, published by Cambridge University Press.

2. John Adair, Decision Making and Problem Solving, published by Kogan Page.

Reference Books:

1. Daniel Kahneman, Thinking, Fast and Slow published by Farrar, Straus and Giroux.
2. Rolf Dobelli, The Art of Thinking Clearly,published by Sceptre.
3. John S. Hammond, Ralph L. Keeney, Howard Raiffa, Smart Choices, published by Harvard Business School Press.
4. Ken Watanabe, Problem Solving 101, published by Portfolio.

E Resources:

1. NPTEL – Critical Thinking &Decision Making Courses
2. Coursera – Critical Thinking and Decision-Making Modules
3. Harvard Business Review – Decision Making Articles
4. MIT OpenCourseWare – Decision Analysis

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH216OE2.1	2	3	2	–	–	–	–	–	–	–	–	1	2	2
4SH216OE2.2	–	3	3	–	–	–	–	–	–	–	–	1	2	2
4SH216OE2.3	–	3	2	–	–	–	–	–	–	–	–	1	2	2
4SH216OE2.4	–	3	3	–	–	2	3	–	–	–	–	-	3	2
4SH216OE2.5	–	2	2	–	2	–	–	–	–	–	–	2	3	2
4SH216OE2.6	–	2	2	–	–	2	–	2	2	–	2	1	2	2
4SH216OE2. CO	1	3	3	-	1	1	1	1	1	-	1	1	3	2

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE217PC1**		Course Category: **PCC**		
Course Name	**Concrete Technology - Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	--
Total Credit Hours	**30 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 4CE217PC1Concrete Technology Lab is a compulsory Laboratory Program Core Course for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to develop the ability to perform various tests and interpret results of ingredients of concrete and properties of fresh and hardened concrete.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE217PC1.1	Interpret cement and aggregate test results, workability measures, and concrete strength parameters to recognize material suitability and overall concrete performance effectively.	C-2 & P-1
4CE217PC1.2	Perform standardized procedures for material testing, workability evaluation, concrete mix design, and strength testing to develop accurate hands-on laboratory skills in concrete technology.	C-2 & P-4
4CE217PC1.3	Demonstrate responsibility and professional ethics during laboratory work and site visits by following safety norms and quality procedures to promote good construction practices	C-2, P-5 & A-1

List of Practicals:

Minimum Eight of mentioned below:

1. Determination of Fineness of Hydraulic Cement by Dry Sieving.
2. Determination of Soundness of Hydraulic Cement by Le-Chatelier Method.
3. Determination of Standard Consistency of Cement Paste.
4. Determination of Initial and Final Setting Time of Cement.
5. Determination of Compressive Strength of Hydraulic Cement.

6. Determination of Fineness Modulus of Fine and Coarse Aggregates by Sieve Analysis.
7. Determination of Bulking of Fine Aggregate.
8. Determination of Workability of Fresh Concrete by Slump Test.
9. Determination of Workability of Fresh Concrete by Compaction Factor Test.
10. Determination of Compressive Strength of Hardened Concrete.
11. Concrete Mix Proportioning by IS Method.
12. Study Visit to Ready Mix Concrete (RMC) Plant and Preparation of Technical Report.

E Resources:

1. https://ms-nitk.vlabs.ac.in/

References

1. IS 4031 (Part 1) – Methods of Physical Tests for Hydraulic Cement: (PR1).
2. IS 4031 (Part 3) – Methods of Physical Tests for Hydraulic Cement: (PR2).
3. IS 4031 (Part 4) – Methods of Physical Tests for Hydraulic Cement: (PR3).
4. IS 4031 (Part 5) – Methods of Physical Tests for Hydraulic Cement: (PR4).
5. IS 4031 (Part 6) – Methods of Physical Tests for Hydraulic Cement: (PR5).
6. IS 2386 (Part 1) – Methods of Test for Aggregates for Concrete: (PR6).
7. IS 2386 (Part 3) – Methods of Test for Aggregates for Concrete: (PR7).
8. IS 1199 – Methods of Sampling and Analysis of Concrete: (PR8, PR9).
9. IS 516 – Methods of Tests for Strength of Concrete (PR10).
10. IS 10262 – Concrete Mix Proportioning – Guidelines (PR11).
11. IS 4926 – Ready Mixed Concrete – Specification (PR12).

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4CE217PC1.1	3	2	-	2	3	-	-	-	-	-	-	3	1	2
4CE217PC1.2	3	2	-	3	3	-	-	-	-	-	-	3	2	2
4CE217PC1.3	3	2	-	-	-	2	3	2	2	-	-	3	2	3
4CE217PC1.CO	3	2	-	2	2	1	1	1	1	-	-	3	2	2

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE218PC1**		Course Category: **PCC**		
Course Name	**Fluid Mechanics Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	--
Total Credit Hours	**30 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 4CE218PC1Fluid Mechanics Lab is a compulsory Laboratory Program Core Course for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to experimentally determine fluid flow characteristics and hydraulic parameters using laboratory instruments, analyze discharge and energy principles, and validate theoretical fluid mechanics concepts essential for practical engineering applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE218PC1.1	Perform experiments such as Bernoulli's theorem verification, venturimeter, etc. to enhance hands-on fluid mechanics measurement and instrumentation competence.	P-5
4CE218PC1.2	Analyze discharge coefficients, friction factors, deflections and flow regimes to demonstrate experimental data and fluid flow behaviour accurately.	C-4 &P-5
4CE218PC1.3	Demonstrate calibration, experimental documentation and virtual simulation usage for developing ethical practice and collaborative skills in hydraulics.	P-5 & A-5

List of Practicals:

Minimum Eight of mentioned below:

1. Verification of Bernoulli's Theorem for Steady Incompressible Flow.
2. Determination of Coefficient of Discharge of a Venturimeter. (As per IS 8419)
3. Determination of Coefficient of Discharge of an Orifice Meter. (As per IS 2952 / IS 2378)
4. Determination of Metacentric Height of a Floating Body
5. Determination of Friction Factor for Flow through a GI Pipe

6. Determination of Coefficient of Discharge of a Triangular Notch (V-Notch Weir). (As per IS 6062)
7. Determination of Coefficient of Discharge of a Rectangular Notch (Rectangular Weir). (As per IS 6062)
8. Determination of Chezy's Coefficient for Uniform Flow in an Open Channel
9. Determination of Coefficient of Discharge of a Venturiflume. (As per IS 6062)
10. Verification of Momentum Equation for Impact of Jet on Vanes
11. Demonstration of Laminar and Turbulent Flow by ReynoldsExperiment.
12. Calibration of Pressure Measuring Devices (Bourdon Gauge / U-Tube Manometer). (As per IS 3624 / IS 2952)

E Resources:

1. https://fm-nitk.vlabs.ac.in/
2. https://www.pvgcoet.ac.in/virtual-lab

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE218PC1.1	3	-	-	2	3	-	-	-	-	-	-	3	1	-
4CE218PC1.2	3	-	-	2	3	-	-	-	-	-	-	3	-	-
4CE218PC1.3	3	-	-	2	3	3	3	-	-	-	2	3	-	-
4CE218PC1.CO	3	-	-	2	3	1	1	-	-	-	1	3	1	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE219VS1**		Course Category: **VSC**		
Course Name	**Surveying & Geomatics - Lab**				
Credits	**02**	Total L:T:P Hours	0:0:4 **60 Hrs**	Total SL Hours	--
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 4CE219VS1 Surveying & Geomatics Lab is a compulsory Vocational Science Course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to demonstrate hands-on experience with instruments and techniques for accurate field measurements, data collection, and map creation.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE219VS1.1	Perform chain, tape, EDM, compass and levelling measurements to determine distances, elevations and bearings accurately in field conditions	C-3 & P-5
4CE219VS1.2	Operate total station for angle measurement, traversing and contouring to generate precise survey data and maps.	C-6 & P-5
4CE219VS1.3	Analyze surveyed field data by performing profile levelling, cross-sections and GPS, to compute areas and interpret terrain effectively while participating in team or individual.	C-4, P-5 & A-2

List of Practicals:

Minimum Eight of mentioned below:

1. Measurement of Distance using Chain, Tape, and Electronic Distance Measurement (EDM).
2. Measurement of Bearings using Prismatic Compass**and**detection and correction of Local Attraction in Compass Surveying.
3. Determination of Reduced Levels (RL) by Differential Levelling Method.
4. Conducting Levelling Survey for Proposed Road Alignment (Profile Levelling).
5. Conducting Contour Survey and Preparation of Contour Map

6. Closed Traverse Survey using Total Station
7. Measurement of Horizontal and Vertical Angles using Total Station.
8. Drone Survey of Campus / Open Land for Mapping.
9. Establishment of GPS Control Points for Infrastructure Projects.
10. Preparation of Land Use Map using GIS Software

E Resources:

1. https://sl-iitr.vlabs.ac.in/

References

1. IS 1492 – Code of Practice for Surveying (PR1, PR2, PR3, PR4, PR5, PR6, PR7).
2. IS 12858 – Electronic Total Station – Specifications (PR1, PR7, PR8).
3. IS 1200 (Part 1) – Method of Measurement of Building and Civil Engineering Works (General Guidelines for Levelling) (PR4).
4. DGCA UAV Regulations (India) – Guidelines for Drone Survey and Mapping (PR9).

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE219VS1.1	3	-	-	2	3	-	-	-	-	-	-	3	-	2
4CE219VS1.2	3	-	-	3	3	-	-	-	-	-	-	3	2	2
4CE219VS1.3	3	2	-	3	3	2	-	1	2	-	1	3	2	2
4CE219VS1.CO	3	1	-	3	3	1	-	1	1	-	1	3	2	2

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code:	**4SH220AE1**	Course Category:	**AEC**
Course Name	**Technical Writing**			
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours	**15 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 4SH220AE1 Technical Writing is common Ability Enhancement Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to enhance students' ability to write effective technical documents, professional correspondence, and research-oriented content with clarity, accuracy, and ethical standards.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH220AE1.1	Apply principles of technical writing in engineering documents.	C-3 P-2 A-2
4SH220AE1.2	Apply technical writing skills to prepare professional documents.	C-4 P-2 A-2
4SH220AE1.3	Create ethical, well-structured technical and research documents using IEEE referencing for professional and academic communication.	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Technical Writing:** Nature and importance of technical communication, characteristics of technical writing, audience analysis, technical vocabulary, grammar and style, clarity and conciseness, paragraph structure, coherence, technical descriptions, instructions and manuals.	7 Hrs
Unit 2	**Professional and Research Writing:** Technical reports and documentation, structure of reports, abstracts and summaries, research papers, project proposals, resumes and cover letters, business emails, documentation ethics, plagiarism, referencing styles (IEEE), editing and proofreading.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Analysis of Technical Communication to Identify the nature, purpose of given technical documents and evaluate their effectiveness.
2. Editing technical text for clarity and brevity
3. Technical description of an engineering device/system
4. Writing step-by-step technical instructions
5. Preparation of structured technical reports
6. Resume and cover letter drafting
7. Technical report writing based on laboratory work, case study, or project work
8. Abstract and executive summary writing for technical documents
9. Referencing and citation using IEEE format
10. Editing, proofreading, and plagiarism check of technical documents

Text Books:

1. Rizvi A. M. & Patnaik P., Effective Technical Communication, McGraw Hill Education (India), New Delhi (Second Edition).
2. Verma S., Technical Communication for Engineers, Vikas Publishing House Pvt. Ltd., New Delhi (First Edition).
3. Misra P. & Tyagi K., Advanced Technical Communication, PHI Learning Pvt. Ltd., New Delhi (Second Edition).

Reference Books:

1. Chauhan G. S., Kashiramka S. & Thimmesha L., Technical Communication, Cengage Learning India Pvt. Ltd., New Delhi (First Edition).
2. Alred G. J., Brusaw C. T. & Oliu B., Handbook of Technical Communication, Oxford University Press, New Delhi (Second Edition).
3. IEEE Editorial Style Manual, IEEE Standards Association, IEEE, USA (Latest Edition).
4. Joseph G. & Joseph B., Grammar and Usage for Technical Communication, Cambridge University Press India, Delhi (First Edition).

E Resources:

1. NPTEL–SWAYAM, IIT Roorkee, Technical Communication for Engineers.
2. https://owl.purdue.edu
3. https://ieeeauthorcenter.ieee.org

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH220AE1.1	-	-	-	-	-	-	-	-		3	-			
4SH220AE1.2	-	-	-	-	-	-	-	-	3	3	-			
4SH220AE1.3	-	-	-	-	-	-	-	3		3	3			
4SH220AE1 CO	-	-	-	-	-	-	-	1	1	3	1			

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code:	4SH221EM1	Course Category:	**EEM**
Course Name	**Fundamentals of Book Keeping and Accounting**			
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours **15 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	--	SEE Time	--	CIA Marks --
EE Marks	--	PA Marks	**50**	Total Marks **50**

Course Description:

Subject Code 4SH221EM1 Fundamentals of Book Keeping and Accounting is an Ability Enhancement Course for Second Year B. Tech students that introduce basic accounting principles, bookkeeping processes, and financial statements for business applications.

Course Objectives:

The objective of the course is to develop students' skills in recording and analyzing financial transactions and to enable effective use of accounting information for decision-making.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH221EM1.1	Apply basic principles of bookkeeping and accounting for recording and maintaining financial transactions accurately.	C-3 P-2 A-2
4SH221EM1.2	Analyze financial statements such as income statement, balance sheet, and cash flow statement for supporting financial understanding and business decision-making.	C-4 P-2 A-2
4SH221EM1.3	Apply accounting tools and techniques for evaluating financial performance and improving business efficiency.	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundation of Book keeping and Accounting** Definition, objectives, and importance of accounting, Difference between accounting and bookkeeping, accounting equation, double entry system, Debit vs credit, accrual vs cash accounting, Terminology- depreciation, armotisation, CapEx vs OpEx. Source of Document (invoice, receipt, Purchase Order), Work Flow (Journal, posting to the ledger), Preparing trial balance, Software Integration- A brief overview of ERP (SAP/ oracle and tools like a tally/ quick book).	8 Hrs

Unit 2	**Financial Statements & Decision Making** Income Statement, Balance Sheet, Cash flow Statement. Ratio Analysis (Current Ratio, Debt to equity, ROI), Cost Accounting (Fixed vs Variable, Break-even), Taxation Basics (Corporate IT)	7 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Categories a list of items (Laptop, Office Rent Deposit, Cash, Bank Loan, Software Licenses) into Assets, Liabilities, or Equity.
2. Use the Double-Entry System to record buying raw materials, paying technician wages, and receiving a client advance.
3. Identify discrepancies like uncashed cheques, bank charges, or direct deposits from clients.
4. Compare the Straight-Line Method vs. the Written Down Value (WDV) method (as per Indian Income Tax rules).
5. Distinguish between Direct Costs (raw materials, factory power) and Indirect Costs (office salary, marketing).
6. Analyze the Annual Report of an Indian tech giant (e.g., L&T or Tata Motors).
7. Calculate the Current Ratio (liquidity), Debt-to-Equity (solvency), and Return on Investment (ROI).
8. Input Fixed Costs (Rent, Machinery) and Variable Costs (Material per unit) into a spreadsheet to find the Break-Even Point.
9. Value the remaining stock after several purchases and sales using the First-In, First-Out (FIFO) method.
10. Enter 5 basic transactions into a trial version of Tally Prime or a cloud-based tool like Zoho Books.

Text Books:

1. S.N. Maheshwari S.K. Maheshwari & S.K. Maheshwari., Financial Accounting, Vikas Publishing House (Eleventh Edition)
2. N. Ramachandran, Ramkumar Kakani., Financial Accounting for Management, McGraw Hill Education (Sixth Edition)

Reference Books:

1. R. L. Gupta & U. K. Gupta., Financial Accounting, Sultan Chand & Sons, (Ninth revised Edition)
2. Dr. Santanu Chakrabarty & Dr. Nilanjan Singha Roy., Accounting & Finance for engineering, Lawpoint Publications (Second Edition)
3. Bhushan Kumar Goyal., Accounting for Everyone, Taxmann Publications Pvt. Ltd (First Edition)

E Resources:

1. SWAYAM, Financial Accounting / Business Accounting
2. National Digital Library of India, https://ndl.iitkgp.ac.in
3. Tally Education, https://tallyeducation.com

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH221EM1.1	2	2	-	-	-	-	-	-	-	-	-			
4SH221EM1.2	3	3	-	-	-	-	-	-	-	3	-			
4SH221EM1.3	2	3	-	-	3	-	-	-	-	3	-			

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE222VE1**		Course Category: **VEC**		
Course Name	**Environmental Science**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 4CE222VE1 Environmental Science is a Value Education course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop understanding of environmental systems, natural resource management, ecological balance, and sustainable development practices to promote awareness and responsibility toward environmental protection and societal well-being.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE222VE1.1	Analyze renewable and non-renewable natural resources and associated problems to promote sustainable utilization for future generations.	C-4
4CE222VE1.2	Analyze food chains, webs, and ecological pyramids to evaluate ecological interactions and succession processes.	C-4
4CE222VE1.3	Examine shift from unsustainable to sustainable development to promote responsible resource planning for society.	C-3

Course Contents:

Unit 1	**Renewable and non-renewable resources**: Environmental Science, Definition, scope and importance, Need for public awareness, Renewable and non-renewable resources, Natural resources and associated problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life styles.	10 hrs

Unit 2	**Ecosystem:** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem.	10 hrs
Unit 3	**Social Issues & Environment:** From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions, Environment Protection Act. Air (Prevention and Control of Pollution) Act., Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, public awareness.	10 hrs

Text Books:

1. Suresh K. Dhameja, Environmental Studies, Katson Books
2. Benny Joseph, Environmental Studies, McGraw Hill Education

Reference Books:

1. Gilbert M. Masters & Wendell Ela, Introduction to Environmental Engineering and Science, Pearson Education
2. William Cunningham & Mary Cunningham, Environmental Science, McGraw Hill

E Resources:

1. https://www.vlab.co.in/broad-area-civil-engineering

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE222VE1.1	3	2	-	-	-	2	2	-	-	-	-	-	-	-
4CE222VE1.2	3	2	-	-	-	3	2	-	-	-	-	-	1	-
4CE222VE1.3	3	2	-	-	-	3	3	-	-	-	-	-	1	-
4CE222VE1.CO	3	2	-	-	-	3	3	-	-	-	-	-	1	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE223DH1**		Course Category: **DH**		
Course Name	**Smart City Infrastructure and Digital Integration**				
Credits	**04**	Total L:T:P Hours	4:0:0 **60 Hrs**	Total SL Hours	**60 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4CE223DH1 Smart City Infrastructure and Digital Integration is an Honours / Double minor course (L 5) offered by department of Civil Engineering for Second Year B. Tech., all disciplines.

Course Objectives:

The objective of this course is to provide students with fundamental knowledge of smart city infrastructure technologies, including IoT, communication systems, data analytics, GIS, AI/ML, and cybersecurity, for planning, monitoring, and managing modern digital civil infrastructure systems.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE223DH1.1	Apply knowledge of IoT, sensors, actuators, and monitoring systems for smart bridges, buildings, roads, and pavements.	C-3
4CE223DH1.2	Analyze communication requirements in civil infrastructure systems for applications such as smart lighting, storm water monitoring, and smart grids.	C-4
4CE223DH1.3	Interpret real-time urban infrastructure data using IoT, SCADA, cloud, and edge computing platforms for decision-making and alert generation.	C-2
4CE223DH1.4	Apply GIS and remote sensing tools for land-use planning, site selection, drainage mapping, and flood risk assessment.	C-3
4CE223DH1.5	Illustrate civil engineering datasets for applications such as crack detection, traffic prediction, and structural failure forecasting through AI/ML.	C-4
4CE223DH1.6	Explain cybersecurity principles and disaster recovery strategies for smart public infrastructure systems.	C-2

Course Contents:

Unit 1	**IoT Applications in Civil Infrastructure:** Role of IoT in civil engineering and smart cities, Types of sensors used in civil systems: Strain gauges, accelerometers, tilt sensors, temperature and humidity sensors, Applications: Smart bridges (structural health monitoring), Buildings (energy management, occupancy), Roads and pavements (traffic sensing, rutting detection), Basics of actuators in smart construction	10 hrs
Unit 2	**Communication Technologies for Infrastructure Connectivity:** Communication needs in infrastructure systems: remote monitoring, alerts, automation, Selection of communication protocols for civil systems (MQTT, Zigbee, Modbus), Applications: Smart lighting systems, connected stormwater sensors, smart grids, Challenges: range, power consumption, signal interference in real-world construction sites	10 hrs
Unit 3	**Data Management for Urban Civil Systems:** Introduction to civil data sources: IoT sensors, cameras, GPS, SCADA systems, Basics of cloud computing in smart city platforms (examples: AWS, Bhuvan, SmartNet), Edge computing for latency-sensitive systems: Traffic signals, flood alerts, Urban infrastructure analytics: Patterns, trends, and alerts in real-time data	10 hrs
Unit 4	**GIS and Remote Sensing for Civil Engineering:** Basics of GIS for civil engineers: map layers, attributes, spatial queries, Data sources: Satellite images, drones, LiDAR, GIS applications: Land-use planning, site selection, Utility and drainage network mapping, Flood risk zoning, urban expansion studies, Remote sensing for environmental monitoring, Hands-on introduction to open tools: QGIS, Google Earth Engine	10 hrs
Unit 5	**Artificial Intelligence and Machine Learning in Civil Systems:** Basics of AI and ML: civil-friendly definitions, Data preprocessing and civil-relevant datasets, Applications: Crack detection in pavements and buildings (image-based ML), Traffic flow prediction and congestion analysis, Structural failure prediction using past data	10 hrs
Unit 6	**Cyber security and Data Privacy in Public Infrastructure:** Data privacy concerns in public surveillance, citizen services, Encryption, firewalls, and secure data transmission techniques, Legal frameworks: Indian IT Act, ISO 27001, BIS smart infrastructure standards, Disaster recovery and data backup plans in critical urban systems (e.g., metro control)	10 hrs

Text Books

1. Internet of Things (IoT): Architecture and Applications by Raj Kamal
2. Remote Sensing and GIS by B.C. Punmia, Ashok Jain
3. Applications of Artificial Intelligence in Civil Engineering by Mohd. Shadab, Ankit Kumar

Reference Books:

1. Artificial Intelligence and Machine Learning by Vinod Chandra S.S., Anand Hareendran
2. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, Sunit Belpure

E Resourses:

1. https://upskilldevelopment.com/urban-innovation-management-and-smart-cities-course

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE223DH1.1	3	-	2	-	-	-	-	-	-	-	-	-	-	-
4CE223DH1.2	2	3	2	-	-	-	-	-	-	-	-	-	2	-
4CE223DH1.3	2	3	2	-	2	-	-	-	-	-	1	-	2	-
4CE223DH1.4	3	3	3	-	2	2	-	-	-	-	-	-	3	-
4CE223DH1.5	2	3	2	-	2	-	-	-	-	-	-	-	-	-
4CE223DH1.6	1	-	-	-	-	2	-	-	-	-	3	-	-	-
4CE223DH1.CO	2	2	2	-	2	1	-	-	-	-	1	-	2	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE223DH2**		Course Category: **DH**		
Course Name	**Electrical Systems in Building**				
Credits	**04**	Total L:T:P Hours	4:0:0 **60 Hrs**	Total SL Hours	**60 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4__223DH2 Electrical Systems in Building is an Honours / Double minor course (L 5) offered by department of Civil Engineering for Second Year B. Tech., all disciplines.

Course Objectives:

The objective of this course is to apply principles of lighting design, energy efficiency, and electrical services to ensure safety, reliability, and sustainability.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4__223DH2.1	Apply electrical engineering principles and standards to design safe and reliable electrical systems in buildings.	C-3
4__223DH2.2	Analyse load requirements and develop single-line diagrams for efficient power distribution.	C-4
4__223DH2.3	Categorize appropriate wiring methods, cables, and protection devices to ensure proper installation based on building requirements.	C-4
4__223DH2.4	Analyse electrical services including lighting, illumination levels, emergency, and automation systems to improve building functionality and occupant safety.	C-4
4__223DH2.5	Examine commercial and residential electrical systems with backup power solutions to perform basic testing and performance evaluation of electrical equipment.	C-3
4__223DH2.6	Incorporate renewable energy options, energy efficiency measures, and sustainability practices to enhance modern building electrical system performance.	C-4

Course Contents:

Unit 1	**Fundamentals of Building Electrical Systems:** Introduction to building electrification, Standards, codes, and regulations (NEC, NBC, IEC, IS codes), Estimation of electrical loads in residential, commercial, and industrial buildings, Diversity factor, demand factor, load factor, maximum demand estimation	10 hrs
Unit 2	**Power Distribution in Building:** Single-line diagrams (SLD) for building power distribution, Substations for large buildings (11 kV/433 V), transformer sizing, Low-voltage (LV) and medium-voltage (MV) distribution systems, Panel boards, distribution boards, feeders, bus-bars, rising mains, Earthing and grounding methods in buildings	10 hrs
Unit 3	**Wiring Systems and Protection:** Types of wiring (conduit, casing-capping, concealed, raceways, cable trays), Selection of wires and cables (IS/IEC standards), Protection devices: MCB, MCCB, RCCB, ELCB, fuses, surge protection, Short-circuit & overload protection, coordination of protective devices, Energy metering and billing in buildings	10 hrs
Unit 4	**Electrical Services in Buildings:** Lighting systems: design principles, Lumen method, energy-efficient lighting, LED technology, Indoor and outdoor lighting types, Emergency power supply and evacuation lighting, Lighting automation: Sensors, dimmers, smart lighting	10 hrs
Unit 5	**Power systems and equipment:** Power outlets and socket distribution, UPS, DG sets, battery banks for backup power , Electrical Installation Testing (Insulation, continuity, earth resistance, etc.), Case study: Electrical layout of a commercial/residential building	10 hrs
Unit 6	**Modern Trends and Sustainability:** Renewable energy integration in buildings: rooftop solar PV, hybrid systems, Green building concepts (LEED, GRIHA), Energy auditing and conservation techniques in buildings, Smart grids and IoT-based building energy management, Case studies: Intelligent and net-zero energy buildings	10 hrs

Text Books

1. Electrical Wiring, Estimation & Costing by S. L. Uppal, J. B. Gupta, Khanna Publishers
2. Design of Electrical Installation by H. P. Garg, Khanna Publishers
3. Electrical Installation Design Guide by Institution of Engineering and Technology

4. Electrical Systems in Buildings by S. David Hughes

Reference:

1. Handbook on Electrical Design Details by R. B. Gupta, Katson Books
2. Building Services Handbook by Fred Hall & Roger Greeno, Pearson
3. Electrical Power Systems by C. L. Wadhwa , New Age International
4. Energy Efficiency in Electrical Systems by J. Parameshwaran, CRC Press, India edition
5. IS Codes (BIS standards): IS 732 (Electrical wiring installations), IS 3043 (Earthing), IS 1646 (Fire safety of electrical systems), National Building Code (NBC), National Electrical Code (NEC India).

E Resourses:

1. vlab.co.in
2. OpenStax: Introduction to Electricity and Magnetism

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE223DH2.1	3	-	2	-	-	-	-	-	-	-	-	-	-	-
4CE223DH2.2	2	3	2	-	-	-	-	-	-	-	-	-	2	-
4CE223DH2.3	2	3	2	-	2	-	-	-	-	-	1	-	2	-
4CE223DH2.4	3	3	3	-	2	2	-	-	-	-	-	-	3	-
4CE223DH2.5	2	3	2	-	2	-	-	-	-	-	-	-	-	-
4CE223DH2.6	1	-	-	-	-	2	-	-	-	-	3	-	-	-
4CE223DH2.CO	2	2	2	-	2	1	-	-	-	-	1	-	2	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **5CE224EC1**		Course Category: **EC**		
Course Name	**Fundamentals of Structural Design**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:

Subject Code 5CE224EC1 Fundamentals of Structural Design is an Optional Exit Course (L 5) for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to build foundational skills in structural systems, analysis of beams/columns, and design of RCC and steel members to prepare students for practical structural engineering applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5CE224EC1.1	Apply load combinations per IS 875 and SFD/BMD basics to assess structural member behaviour under design loads.	C-3
5CE224EC1.2	Generate SFD & BMD for beams under various loads to measure internal forces and structural behaviour.	C-6 & P-4
5CE224EC1.3	Design singly and doubly reinforced beams and axial tension/compression members to develop safe RCC structural elements by appreciating to safety norms.	C-6 & A-3

Course Contents:

Unit 1	**Introduction to Structural Systems & Loads:** Structural Systems: Types of structures: load-bearing, framed, truss, shell, and composite systems, Structural components, Structural behavior: bending, shear, torsion, axial compression/tension. Loads and Load Combinations (as per IS 875), Shear Force & Bending Moment (SFD/BMD) basics with simple problems.	10 hrs
Unit 2	**Analysis of Structural Members:** Analysis of Beams: Bending stress and shear stress concepts.	10hrs

	SFD & BMD for beams with various loads. Deflection calculation (standard formulae), Analysis of Columns: Short and long columns. Euler's buckling, effective length. Axial, eccentric loading. Introduction to Structural Analysis Software Basic usage of tools (STAAD Pro / ETABS / SAP2000 or open-source alternatives).	
Unit 3	**Fundamentals of Design (RCC & Steel):** Limit State Design Concepts: Working Stress Method vs. Limit State Method, Partial safety factors, Design of singly reinforced and doubly reinforced beams. Design of axial tension/compression members. Introduction to slab design. Steel Design (as per IS 800): Bolted and welded joints basics.	10 hrs

List of Practicals:

Minimum ten practicals from the list mentioned below:

1. Study of Structural Systems and Components
2. Study of Structural Behavior Under Loads
3. Determination of Design Loads as per IS 875
4. Study of Preparation of Shear Force and Bending Moment Diagrams
5. Determination of Bending and Shear Stresses in Beams
6. Study of Shear Force and Bending Moment Diagrams for Complex Loading
7. Determination of Beam Deflections Using Analytical Methods
8. Study of Column Behavior and Buckling Analysis
9. Determination of Behavior of an Eccentrically Loaded Column
10. Study of Structural Analysis Software (STAAD/ETABS/SAP)
11. Study of Design of RCC Beam by Limit State Method
12. Study of Design of Steel Structural Components

Text Books:

1. R. S. Khurmi & J. K. Gupta – Theory of Structures – S. Chand Publishing
2. C. K. Wang & K. M. Salmon – Reinforced Concrete Designer's Handbook – Wiley
3. S. K. Duggal – Structural Steel Design – McGraw-Hill Education

Reference Books:

1. G. B. Junnarkar, Basic& Applied Soil Mechanics & Foundation Engineering / Structural Engineering – Everest Publishing House
2. Subramanian N. – Design of Steel Structures – Oxford University Press

E Resourses:

1. https://bmtpc.org
2. ps://www.coursera.org/courses?query=structural%20engineering

Mapping of COs with POs and PSOs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
5CE224EC1.1	3	2	-	-	-	-	-	-	-	-	-
5CE224EC1.2	3	2	-	3	-	-	-	-	-	-	-
5CE224EC1.3	3	2	3	3	3	2	2	-	-	-	-
5CE224EC1.CO	3	2	1	2	1	1	1	-	-	-	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **5CE225EC1**		Course Category: **EC**		
Course Name	**Quantity Survey and Estimation**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:

Subject Code 5CE225EC1 Quantity Survey and Estimation is an Optional Exit Course (L 5) for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to develop fundamental skills in quantity surveying, estimation of building components, rate analysis, costing, and preparation of essential documentation required for construction projects using standard procedures and tools.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5CE225EC1.1	Compose accurate measurement and abstract sheets using standard rules of quantity take-off to enable systematic documentation and quantity control.	C-6
5CE225EC1.2	Calculate quantities for major components using building drawings for efficient preparation of complete building estimates.	C-5 & P-2
5CE225EC1.3	Perform rate analysis for common construction items using market data to determine fair and competitive project costing.	C-3 & P-5

Course Contents:

Unit 1	**Basics of Quantity Surveying & Units of Measurement** Introduction to Quantity Surveying – roles and responsibilities, Types of estimates: Preliminary, Plinth area, Cubical, Detailed estimates, Principles of taking out quantities, Types of drawings needed, Measurement sheets, abstract sheets, Introduction to SSR/DSR/Local Schedule of Rates.	10 hrs
Unit 2	**Estimation of Building Components** Estimation of: Earthwork for buildings, roads, dams etc. Brick &	10 hrs

	Stone masonry, Concrete works (PCC, RCC), Flooring, plastering, painting, Doors and windows, Bar Bending Schedule (BBS) for RCC building.	
Unit 3	**Rate Analysis, Costing & Practical Documentation** Concept of rate analysis, Rate analysis for basic items (Earthwork, Concrete, Masonry, Plastering), Market survey basics, Introduction to tendering & contracts, Use of simple estimation tools/software (Excel templates/Open-source QS tools).	10 hrs

List of Practicals:

Minimum ten practicals from the list mentioned below:

1. Reading & interpretation of civil engineering drawings (plans, elevations, sections).
2. Preparation of a measurement sheet for a sample room/building.
3. Taking quantities of earthwork (cut/fill) from a simple plan.
4. Estimating foundation works – excavation, PCC, masonry, RCC.
5. Estimation of brick masonry for walls in a small building.
6. Estimation of concrete works—slab/beam/column.
7. Estimation of finishes—plastering, flooring, painting for a room.
8. Preparation of Bar Bending Schedule (BBS) for a slab or beam.
9. Preparing Abstract Sheet & BOQ for a building portion.
10. Rate Analysis (earthwork, masonry, concrete).
11. Market rate survey (materials & labour) and preparation of rate sheet.
12. Complete estimate (quantity + cost) for a small residential unit using Excel or QS tool.

Text Books:

1. B.N. Dutta, Estimating and Costing in Civil Engineering, UBS Publishers
2. Rangwala, Estimating and Costing, Charotar Publishing House
3. M. Chakraborti, Estimating, Costing, Specification and Valuation, S. Chand Publishing

Reference Books:

1. P.S. Gahlot & B.M. Dhir, Construction Planning and Management, New Age International
2. Peurifoy & Oberlender, Estimating Construction Costs, McGraw-Hill
3. M. Akhtar, Quantity Surveying & Contract Management, McGraw Hill

E Resources:

1. https://cpwd.gov.in
2. https://mahapwd.com
3. https://etenders.gov.in

Mapping of COs with POs and PSOs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
5CE225EC1.1	3	2	2	-	-	-	-	-	-	2	-
5CE225EC1.2	3	2	2	-	-	-	-	-	-	-	-
5CE225EC1.3	3	2	-	3	-	2	2	-	-	-	-
5CE225EC1.CO	3	2	2	1	-	1	1	-	-	1	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

ANNEXURE –I

Syllabus of III and IV Semester Courses for Four-Year Multidisciplinary Undergraduate B.Tech. Degree Programme in Computer Science Engineering

(In view of NEP-2020)

For students admitted in academic session 2025-26 and onwards



03/09/2026

SHRI JAWAHARLAL DARDA EDUCATION SOCIETY'S
JAWAHARLAL DARDA
INSTITUTE OF ENGINEERING AND TECHNOLOGY, YAVATMAL
AN AUTONOMOUS INSTITUTE
Affiliated to Sant Gadge Baba Amravati University, Approved by AICTE, New Delhi and DTE Maharashtra
93VP+PWF: P6, MIDC Area, Lohara, Yavatmal - 445 001, Maharashtra (www.jdiet.ac.in)

1. Vision

To emerge as a centre of excellence in Computer Science and Engineering education, innovation, and research, producing competent professionals and responsible citizens who contribute to sustainable development and digital transformation.

2. Department Mission

1. To impart quality technical education in Computer Science and Engineering that prepares students for successful careers, higher education, and entrepreneurship.
2. To foster a learner-centric environment through outcome-based curriculum, continuous assessment, and industry-aligned teaching methodologies.
3. To promote research, innovation, and collaboration that address real- world challenges and societal needs.
4. To instill ethical values, leadership skills, and a lifelong learning attitude to enable graduates to adapt to emerging technologies and global demands.

3. Programme Education Objectives

PEO1: Graduates will have successful careers in industry, academia, or entrepreneurship by applying foundational and advanced knowledge in Computer Science and Engineering.

PEO2: Graduates will engage in continuous learning, research, and innovation to keep pace with evolving technologies**.**

PEO3: Graduates will demonstrate ethical values, leadership qualities, teamwork, and effective communication skills in their professional practices.

PEO4: Graduates will contribute to solving real-world problems by developing sustainable and socially responsible technological solutions.

4. SDG of United Nation

1. **No Poverty** – End poverty in all its forms everywhere.
2. **Zero Hunger** – End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
3. **Good Health and Well-being** – Ensure healthy lives and promote well- being for all at all ages.
4. **Quality Education** – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
5. **Gender Equality** – Achieve gender equality and empower all women and girls.
6. **Clean Water and Sanitation** – Ensure availability and sustainable

management of water and sanitation for all.

7. **Affordable and Clean Energy** – Ensure access to affordable, reliable, sustainable, and modern energy for all.
8. **Decent Work and Economic Growth** – Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.
9. **Industry, Innovation, and Infrastructure** – Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
10. **Reduced Inequalities** – Reduce inequality within and among countries.
11. **Sustainable Cities and Communities** – Make cities and human settlements inclusive, safe, resilient, and sustainable.
12. **Responsible Consumption and Production** – Ensure sustainable consumption and production patterns.
13. **Climate Action** – Take urgent action to combat climate change and its impacts.
14. **Life Below Water** – Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.
15. **Life on Land** – Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.
16. **Peace, Justice, and Strong Institutions** – Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.
17. **Partnerships for the Goals** – Strengthen the means of implementation and revitalize the global partnership for sustainable development.

5. WK: Washington Accord Knowledge Profile-Attributes for engineering program

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Outcomes (NBA, Jan 2025)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools,

including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

7. Programme Specific Indicators

Software Development

1. Demonstrate proficiency in programming languages such as Java, Python, and C++.
2. Apply software engineering principles across all stages of the SDLC.
3. Utilize algorithms and data structures to solve complex problems.
4. Develop, debug, test, and maintain software applications.
5. Implement collaborative development practices using Git and other version control tools.

Data Science & Analytics

6. Apply statistical methods and machine learning algorithms to data analysis.
7. Demonstrate skills in data cleaning, pre-processing, and visualization. Utilize tools such as Python, R, and SQL for analytics tasks.

8. Develop predictive models and evaluate their performance.
9. Communicate insights effectively through data storytelling

Cybersecurity

10. Understand and implement network security measures.
11. Perform threat detection, analysis, and mitigation.
12. Apply cryptographic techniques to secure communications.
13. Conduct vulnerability assessments and penetration testing.
14. Monitor systems for compliance with security policies regulations.

Cloud Computing & DevOps

15. Develop and deploy applications on cloud platforms.
16. Implement CI/CD pipelines to automate software delivery.
17. Utilize virtualization and containerization technologies like Docker and Kubernetes.
18. Monitor cloud performance and scale resources effectively.
19. Apply service models such as IaaS, PaaS, and SaaS in real-world solutions.

Web Technologies

20. Develop responsive web applications using HTML, CSS,and JavaScript.
21. Utilize frameworks such as React, Angular, or Django.
22. Implement APIs for data integration and exchange.
23. Apply techniques for web performance optimization.
24. Monitor and enhance web application security.

Mobile Computing

25. Develop mobile applications for Android and iOS platforms.
26. Apply UI/UX design principles for mobile devices.
27. Implement cross-platform solutions using Flutter or React Native.
28. Perform app performance tuning and battery optimization.
29. Integrate mobile apps with backend and cloud services.

Embedded Systems & IoT

30. Develop embedded applications using microcontrollers and sensors.
31. Implement IoT protocols for device communication.
32. Apply embedded C/C++ for hardware control.
33. Monitor real-time data from IoT devices.
34. Build secure IoT systems with device management.

Game Development

35. Develop games using engines like Unity or Unreal Engine.
36. Implement game physics and AI behaviors.
37. Build immersive 2D/3D game environments.
38. Apply storytelling and level design principles.
39. Test and optimize multiplayer and networked games.

Blockchain & Web3

40. Develop block chain-based applications using smart contracts.
41. Apply consensus algorithms in decentralized systems.
42. Implement Apps with secure and scalable architectures.
43. Utilize blockchain platforms like Ethereum or Hyperledger.
44. Perform blockchain security assessments and audits.

Robotics & Automation

45. Build robotic systems with integrated sensors and actuators.
46. Apply kinematics and control algorithms for robot movement.
47. Implement autonomous navigation systems.
48. Utilize robotic operating systems (ROS) for programming.
49. Monitor and maintain automation systems in industrial setups.

Human-Computer Interaction

50. Apply usability principles to interface design.
51. Develop interactive prototypes and wireframes.
52. Conduct usability testing and heuristic evaluations.
53. Implement accessibility features for inclusive design.
54. Monitor and improve user experience through feedback analysis.

Digital Marketing & Analytics

55. Apply SEO strategies to improve search rankings.
56. Develop and monitor social media campaigns.
57. Utilize analytics tools to evaluate marketing performance.
58. Implement content marketing strategies.
59. Build automated workflows for marketing efficiency.

IT Consulting & Services

60. Perform business process analysis for IT transformation.
61. Develop IT strategies aligned with organizational goals.
62. Utilize technology evaluation frameworks for solution selection.
63. Monitor compliance with IT governance standards.
64. Implement effective client communication and service delivery.

E-commerce Technology

65. Develop secure e-commerce platforms.
66. Implement payment gateway and order management systems.
67. Apply personalization algorithms for product recommendations.
68. Monitor online transaction security and fraud detection.
69. Utilize analytics to improve customer engagement.

Bioinformatics & Computational Biology

70. Apply computational tools to analyze biological data.
71. Develop algorithms for sequence alignment and genome mapping.
72. Implement models to simulate biological processes.
73. Utilize visualization tools for biological datasets.
74. Perform statistical validation of bioinformatics results.

Research & Academia

75. Apply research methodologies to investigate problems.
76. Develop structured literature reviews.
77. Implement experiments and analyze results.
78. Utilize academic writing skills for publications.
79. Demonstrate mentoring and collaborative research skills.

Basic Science

80. Apply mathematical techniques such as algebra, trigonometry, calculus, differential equations, linear algebra, probability and statistics to solve problems.
81. Apply physical principles such as motion, forces, energy and materials to solve problems.
82. Apply knowledge of chemical properties and reactions for construction material and environment (Corrosion, polymer, electrochemistry etc.).

Engineering Science Courses

83. Demonstrate proficiency in basic workshop operations (fitting, carpentry, welding, sheet metal, plumbing and machining etc.).
84. Apply the principles of engineering mechanics to analyse and solve problems involving forces, moment, equilibrium, friction, centred and MOI etc.
85. Apply the principles electrical engineering to analyse and maintain electrical systems, circuits, machines and power systems.

86. Demonstrate ability to interpreted and create drawings using geometric constructions, orthographic projections, isometric projections and CAD tools.
87. Demonstrate ability to apply fundamental principles of algorithms, programming, data structures and computing system to solve conceptual problems.

Generic Competencies

A. Problem-Solving Skills

88. Analytical Thinking: Ability to analyze complex problems, break them down into smaller components, and find effective solutions.
89. Critical Thinking: Ability to evaluate multiple solutions to a problem and choose the best course of action based on available data, safety, and cost-efficiency.

B. Communication Skills

90. Oral Communication: Ability to communicate complex technical information clearly to a variety of audiences, including clients, stakeholders, contractors, and team members.
91. Written Communication: Proficiency in drafting reports, proposals, technical specifications, and documentation that are clear, concise, and accurate.
92. Interpersonal Communication: Ability to collaborate effectively with multidisciplinary teams, clients, and project stakeholders.

C. Project Management

93. Time Management: Efficiently managing time and prioritizing tasks to meet deadlines in a dynamic project environment.
94. Resource Management: Ability to plan, allocate, and manage resources such as labour, materials, and equipment to ensure project efficiency.
95. Budgeting and Cost Control: Skills in estimating project costs, monitoring budgets, and ensuring projects are completed within financial constraints.
96. Risk Management: Ability to identify, assess, and mitigate risks during the planning and execution of engineering projects.

D. Teamwork and Leadership

97. Team Collaboration: Working effectively as part of a team,

contributing to the success of the project through collaboration, open communication, and respect for others' expertise.

98. Leadership Skills: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
99. Conflict Resolution: Ability to resolve conflicts between team members, clients, or contractors, ensuring that project objectives are still achieved.

E. Attention to Detail

100. Accuracy: Ensuring all engineering calculations, designs, and project plans are accurate and align with building codes, regulations, and standards.
101. Quality Assurance: Ensuring that the materials and processes used in construction adhere to high standards of quality and safety.

F. Ethical and Professional Integrity

102. Ethical Decision Making: Adhering to a strict code of ethics, ensuring public safety, environmental protection, and transparency in all dealings.
103. Accountability: Taking responsibility for the success or failure of a project, being proactive in addressing issues, and delivering results.

G. Adaptability and Flexibility

104. Openness to Change: Being able to adapt to new technologies, tools, and methods, as well as evolving project requirements or environmental conditions.
105. Learning and Development: Actively seeking opportunities for professional growth, staying current with industry trends, and acquiring new skills to remain competitive.

H. Creativity and Innovation

106. Creative Problem Solving: Thinking outside the box and coming up with novel solutions to engineering challenges.
107. Innovative Design: Contributing new ideas for designs and processes that can improve efficiency, reduce costs, or make better use of resources.

I. Cultural and Environmental Awareness

108. Sustainability Awareness: Knowledge of sustainable construction methods, green building practices, and the importance of reducing the environmental impact of engineering projects.
109. Cultural Sensitivity: Understanding and respecting cultural differences when working in diverse teams or international projects.
110. Environmental Impact Understanding: Considering the environmental consequences of engineering decisions and striving to minimize negative impacts through design and construction methods.

J. Decision-Making Skills

111. Data-Driven Decisions: Using available data, facts, and technical analysis to make informed decisions about the design, execution, and management of projects.
112. Prioritizing Decisions: Knowing which decisions need immediate attention and which can be deferred, especially in a high-pressure environment.

K. Regulatory and Legal Knowledge

113. Familiarity with Building Codes and Standards: Understanding and ensuring compliance with local, national, and international building codes, safety regulations, and legal standards.
114. Health and Safety: Knowledge of safety regulations and best practices for ensuring the health and safety of workers, the public, and the environment throughout the project lifecycle.

L. Client-Focused Mindset

115. Client Management: Building and maintaining strong relationships with clients, understanding their needs, and ensuring their expectations are met throughout the project.
116. Customer Service Orientation: Ensuring that client concerns are addressed promptly, and working toward providing value-added solutions that meet their goals.

8. Scheme of Computer Science Engineering Department

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Computer Science & Engineering Degree Programme

Semester - I (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks P	Theory Exam Time (Hrs.) SL
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	L	T		
1	Mathematics - I	BSC	1SH101BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Physics	BSC	1SH102BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Programming for Problem Solving	ESC	1CS103ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Mechanics	ESC	1CE104ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Applied Physics Lab	BSC	1SH105BS1	0	0	2	0	2	1					25	25	50	25	50	
6	Programming for Problem Solving Lab	ESC	1CS106ES1	0	0	2	0	2	1					25	25	50	25	50	
7	Engineering Mechanics Lab	ESC	1CE107ES1	0	0	2	0	2	1					25	25	50	25	50	
8	Workshop	ESC	1ME108ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Introduction to Web Technology	VSC	1CS109VS1	1	0	2	1	4	2						50	50	25	50	
10	English Communication	AEC	1SH110AE1	1	0	2	1	4	2					25	25	50	25	50	
11	Sports & Yoga	CC	1SH111CC1	0	0	4	0	4	2						50	50	25	50	
Total				**14**	**0**	**16**	**14**	**0**	**16**	**14**	**44**	**22**			**400**				**350**

Notional Learning Hours : [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Computer Science & Engineering Degree Programme

Semester - II (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics – II	BSC	2SH112BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Chemistry	BSC	2SH113BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Basic Electrical Engineering	ESC	2EE114ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Graphics	ESC	2ME115ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	AI Fundamentals	PCC	2CS116PC1	0	0	2	0	2	1					25	25	50	25	50	
6	Indian Knowledge Systems for Computer Applications	IKS	2CS117IK1	0	0	2	0	2	1					25	25	50	25	50	
7	Applied Chemistry – Lab	BSC	2SH118BS1	0	0	2	0	2	1					25	25	50	25	50	
8	Basic Electrical Engineering – Lab	ESC	2EE119ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Engineering Graphics/CAD Lab	ESC	2ME120ES1	1	0	2	1	4	2						50	50	25	50	
10	Basics of Computer Networking	SEC	2CS121VS1	1	0	2	1	4	2					25	25	50	25	50	
11	Digital Wellness	CC	2SH122CC1	0	0	4	0	4	2						50	50	25	50	
Total				**15**	**0**	**14**	**14**	**0**	**16**	**14**	**44**	**22**			**400**				**350**

Notional Learning Hours : [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 15x15 = 225 Hrs]

Exit Option (Level 4.5) for Undergraduate Certificate in Odd Semester of next Academic Year as approved by BOS																			
12	Digital Literacy and Office Automation	EC	3CS123EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Hardware Maintenance & Networking	EC	3CS124EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	3CS125EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	3CS126OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Computer Science & Engineering Degree Programme

Semester - III (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Data Structures & Algorithms	PCC	3CS201PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Object Oriented Programming (Java)	PCC	3CS202PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Discrete Mathematics	PCC	3CS203PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor – I	MDM	3CS204MD1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - I	OE	3_205OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Data Structures & Algorithms Lab	PCC	3CS206PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Object Oriented Programming (Java)	PCC	3CS207PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Programming Laboratory-I (Python Programming Lab)	PCC	3CS208PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Human Resource Management	EEM	3CS209EM1	2	0	0	2	4	2						50	50	25	50	
10	Constitutional Values and Fundamental Duties	VEC	3SH210VE1	2	0	0	2	4	2						50	50	25	50	
11	Field Project	FP	3CS400FP1	0	0	4	0	4	2					25	25	50	25	50	
12	Disaster Management and Preparedness	NC	3AL001NC1	2	0	0	0	2	0						50	50	25	50	
Total				**17**	**0**	**10**	**17**	**44**	**22**			**450**				**300**		**750**	

Notional Learning Hours : [Workload (teaching/guidance/practicum) 27x15 = 405 Hrs] + [Learner-engaged time 17x15 = 255 Hrs]

Optional Course for Double Minor / Honours Degree																			
12	Double Minor / Honours Course - I	DH	3CS211DH1/2	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Computer Science & Engineering Degree Programme

Semester - IV (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Theory of Computation	PCC	4CS212PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Operating Systems	PCC	4CS213PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Design & Analysis of Algorithm	PCC	4CS214PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - II	MDM	4CS215MD1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - II	OE	4_216OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Operating Systems Lab	PCC	4CS217PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Design & Analysis of Algorithm Lab	PCC	4CS218PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Programming Laboratory-II (Web Designing Lab)	VSC	4CS219VS1	0	0	4	0	4	2						50	50	25	50	
9	Technical Writing	AEC	4SH220AE1	1	0	2	1	4	2						50	50	25	50	
10	Fundamentals of Book Keeping and Accounting	EEM	4SH221EM1	1	0	2	1	4	2						50	50	25	50	
11	Environmental Science	VEC	4CE222VE1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
Total				**16**	**0**	**12**	**16**	**44**	**22**			**500**				**250**		**750**	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 28x15 = 420 Hrs] + [Learner-engaged time 16x15 = 240 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
12	Double Minor / Honours Course - II	DH	4CS223DH1/2	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5) for Undergraduate Diploma in Odd Semester of next Academic Year as approved by BOS																			
13	Mobile App Development (Android)	EC	5CS224EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
14	Full stack Developer	EC	5CS225EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
15	Internship / Apprenticeship in Industry	EI	5CS226EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
16	Two MOOC/NPTEL Courses	EC	5CS227OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Computer Science & Engineering Degree Programme

Semester - V (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Database Management Systems	PCC	5CS228PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Advanced Computer Architecture	PCC	5CS229PC1	3	1	0	4	8	4	60	40	100	40					100	3 Hrs.
3	Complier Design	PCC	5CS230PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - I	PEC	5CS231PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - III	MDM	5_232MD_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Open Elective - III	OE	5_233OE_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Database Management Systems Lab	PCC	5CS234PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Complier Design Lab	PCC	5CS235PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - I Lab	PEC	5CS236PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Multidisciplinary Minor - III - Lab	MDM	5_237MD_	0	0	2	0	2	1					25	25	50	25	50	
Total				**17**	**1**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	

Notional Learning Hours : [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]

Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - III	DH	5CS238DH1/2	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Computer Science & Engineering Degree Programme

Semester - VI (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Cloud Computing	PCC	6CS239PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Internet of Things	PCC	6CS240PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Computer Networks	PCC	6CS241PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - II	PEC	6CS242PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Programme Elective Course - III	PEC	6CS243PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Multidisciplinary Minor - IV	MDM	6_244MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Cloud Computing Lab	PCC	6CS245PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Internet of Things Lab	PCC	6CS246PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - II - Lab	PEC	6CS247PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Creative Thinking & Team Collaboration	SEC	6CS248VS1	1	0	2	1	4	2						50	50	25	50	
Total				18	0	8	18	44	22			550				200		750	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - IV	DH	6CS249DH1/2	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5.5) for B. Voc in Odd Semester of next Academic Year as approved by BOS																			
12	Network Engineer	EC	7CS250EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Cloud Engineer	EC	7CS251EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	7CS252EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	7CS253OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Computer Science & Engineering Degree Programme

Semester - VII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Advanced Cyber Security Practices	PCC	7CS301PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
2	Software Engineering	PCC	7CS302PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Programme Elective Course - IV	PEC	7CS303PE_	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - V	PEC	7CS304PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - V	MDM	7_305MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
6	Software Engineering Lab	PCC	7CS306PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Programme Elective Course - IV Lab	PEC Lab	7CS307PE_	0	0	2	0	2	1					25	25	50	25	50	
8	Research Methodology	RM	7CS401RM1	2	0	4	2	8	4	30	20	50	20		50	50	25	100	2 Hrs.
9	Project	PR	7CS402PR1	0	0	8	0	8	4					50	100	150	75	150	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**500**				**300**		**800**	

Notional Learning Hours : [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Optional Course for Double Minor / Honours Degree																			
10	Double Minor / Honours Course - V	DH	7CS308DH1/ 2	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
Optional Course for Honours with Research Degree																			
11	Research Project	RP	7CS403RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Computer Science & Engineering Degree Programme

Semester - VIII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Software Testing & Quality Assurance (Online)	PCC	8CS309PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Programme Elective Course - VI (Online)*	PEC	8CS310PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Multidisciplinary Minor - VI (Online)	MDM	8_311MD1_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
4	On Job Training (Internship/Apprenticeship)	OJT	8CS404IN1	0	0	24	0	24	12					100	100	200	100	200	
Total				**8**	**0**	**24**	**8**	**40**	**20**			**250**				**200**		**450**	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 32x15 = 480 Hrs] + [Learner-engaged time 8x15 = 120 Hrs]																			
Optional Course for Honours with Research Degree																			
5	Research Project	RP	8CS405RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

9. List of Programme Elective Courses

Students will have an option to choose the PEC offered by their respective Major Discipline offered during semester V to VIII Programme Elective Courses offered by Computer Science Engineering.

Sr. No.	Courses Offered Under	Programme Elective Course/Subjects Name	Course Code
1	V	Machine Learning (PEC-I)	5CS231PE1
2		Machine Learning Lab (PEC-Lab-I)	5CS236PE1
		OR	
3		Distributed Systems (PEC-I)	5CS231PE2
4		Distributed Systems Lab (PEC-Lab-I)	5CS236PE2
5	VI	Natural Language Processing (PEC-II)	6CS242PE1
6		Natural Language Processing Lab (PEC-Lab-II)	6CS246PE1
		OR	
7		Big Data Analytics (PEC-II)	6CS242PE2
8		Big Data Analytics Lab (PEC-Lab-II)	6CS246PE2
9		Image Processing (PEC-III)	6CS243PE1
		OR	
10		Dataware Housing & Mining (PEC-III)	6CS243PE2
11	VII	Artificial Network & Neural Networks(PEC-IV)	7CS303PE1
12		Artificial Network & Neural Networks Lab (PEC-Lab-IV)	7CS307PE1
		OR	
13		Augmented Reality & Virtual Reality (PEC-IV)	7CS303PE2
14		Augmented Reality & Virtual Reality Lab (PEC-Lab-IV)	7CS307PE2
15		Deep Learning (PEC-V)	7CS304PE1
		OR	
16		Management Information System (PEC-V)	7CS304PE2
17	VIII	Generative Artificial Intelligence (PEC-VI)	8CS310PE1
		OR	
18		Blockchain Fundamentals (PEC-VI)	8CS310PE2

14.5 Syllabus for Semester III & IV

Level: **5**	Course Code: **3CS201PC1**		Course Category: **PCC**		
Course Name	**Data Structures & Algorithms**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

Course Description:
Subject Code 3CS201PC1 Data Structures & Algorithms is a compulsory Engineering Science Course for Second Year B. Tech, Computer Science & Engineering.

Course Objectives:
The objective of this course is to build foundational object-oriented programming skills in Java by applying key concepts like abstraction, encapsulation, inheritance, and polymorphism to create modular, reusable, and interactive applications.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS201PC1.1	Explain basic concepts of data structures and algorithms for effective problem solving.	C-2
3CS201PC1.2	Implement operations on arrays, linked lists, stacks, and queues to develop functional programs.	C-3
3CS201PC1.3	Design tree and graph structures for solving real-world applications.	C-3
3CS201PC1.4	Compare searching and sorting algorithms for evaluating efficiency	C-3
3CS201PC1.5	Choose suitable data structures and algorithms to solve computational problems.	C-4
3CS201PC1.6	Classify and organize data using structures for file handling applications.	C-4

Course Contents:

Unit 1	**Introduction to Algorithms and Complexity:** Algorithm: Definition, characteristics, and importance Steps in algorithm development, Time and space complexity analysis, Asymptotic notations (O, Ω, Θ), Recursion and recursive algorithms, Divide and conquer concept (examples: binary search, merge sort)	7 Hrs
Unit 2	**Arrays and Linked Lists:** Introduction to Arrays, One-Dimensional Arrays, Two-Dimensional Arrays, Multi-Dimensional Arrays Representation and operations on arrays, Sparse matrices, String handling and operations, Linked List: concept, representation, and types Singly Linked List, Doubly Linked List, Circular Linked List, Operations: insertion, deletion, traversal, searching, Applications: polynomial addition, memory management	7 Hrs
Unit 3	**Stacks and Queues:** **Stack:** definition, operations, applications, Implementation using array and linked list, Applications: infix → postfix conversion, postfix evaluation, recursion. **Queue:** definition and operations, Simple queue, circular queue, priority queue, dequeue, Implementation using array and linked list, Applications: scheduling, simulation	7 Hrs
Unit 4	**Trees and Graphs:** Basic terminology (nodes, edges, height, degree, etc.), Binary tree representation and traversal (inorder, preorder, postorder), Binary Search Tree (BST): creation, insertion, deletion, searching, Expression trees and Huffman coding**,** Introduction to AVL trees and B-trees.	8 Hrs
Unit 5	**Graph:** Basic concepts and terminology, Memory Representation of graph: adjacency matrix, adjacency list, Traversal algorithms: DFS, BFS, Spanning Trees: Introduction, minimum cost spanning trees, Prim's Method and Kruskal's Method for MSTs. Applications of graphs (networking, path finding).	8 Hrs
Unit 6	**Searching, Sorting, & Hashing:** Linear and Binary Search algorithm **Sorting Algorithms:** Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort. **Hashing:** Hash tables, hash functions, collision handling (chaining, open addressing)	8 Hrs

Text Books:

1. E. Balagurusamy, *Data Structures Using C, McGraw* Hill.
2. Seymour Lipschutz: Data Structures, Schaum's Outline Series, McGraw-Hill, International Editions. Reema Thareja, *Data Structures Using C*, Oxford University Press.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures, CBS Publications.
2. Thomas H. Cormen et al., *Introduction to Algorithms*, MIT Press..
3. Narasimha Karumanchi, *Data Structures and Algorithms Made Easy*.

E Resources :

1. **Data Structures and Algorithms** – Prof. Naveen Garg (IIT Delhi) https://nptel.ac.in/courses/106102064
2. *Data Structures and Algorithm Specialization* – University of California, San Diego https://www.coursera.org/specializations/data-structures-algorithms
3. **Design and Analysis of Algorithms** – Prof. Madhavan Mukund (IIT Madras) https://nptel.ac.in/courses/106106131

Mapping of COs with Pos:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CS103ES1.1	3	2	1	-	1	-	-	-	-	-	1	3	3	3
3CS103ES1.2	3	3	2	1	2	-	-	-	1	-	1	3	3	1
3CS103ES1.3	3	3	3	2	2	-	-	-	2	-	1	3	3	1
3CS103ES1.4	3	3	2	2	2	-	-	-	-	-	1	3	2	1
3CS103ES1.5	3	3	3	2	3	-	-	-	2	1	2	3	3	2
3CS103ES1.6	3	3	2	2	3	1	-	-	1	-	3	3	2	3
3CS103ES1CO	3	3	2	2	3	1	-	-	1	1	1	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CS202PC1**			Course Category: **PCC**	
Course Name	**Object Oriented Programming (Java)**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

(1,4,120-PO1, PO3, PO4, PO5, PO9[Cognitive])

Course Description:
Subject Code 3CS202PC1 Object Oriented Programming (Java) is a compulsory Engineering Science Course for Second Year B. Tech. Computer Science and Engineering Branch.

Course Objectives:
Couse objective of this subject is to build a strong foundation in Object-Oriented Programming using Java by understanding core OOP principles and applying them to develop modular, reusable, and interactive software applications.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS201PC.1	Explain OOP principles and Java basics to understand object-oriented programming.	C3
3CS201PC.2	Apply classes, objects, constructors, and arrays to develop structured Java programs.	C3
3CS201PC.3	Implement inheritance, interfaces, abstract classes, and packages to achieve code reusability.	C4
3CS201PC.4	Analyze exceptions and use I/O streams for reliable file handling.	C4
3CS201PC.5	Develop Java applets using lifecycle and graphics to create interactive applications.	C5
3CS201PC.6	Design GUI applications with event handling to build user-friendly interfaces.	C6

Course Contents:

Unit 1	**Introduction to Object-Oriented Programming:** Need of OOP, Principles of OOP, Procedural vs Object-Oriented Programming, Java Virtual Machine, Java Features, Basic Program Structure, Variables, Data Types, Identifiers, Operators and Expressions, Type Conversion & Casting, Flow Control Statements	5 Hrs
Unit 2	**Classes and Objects:** Classes & Objects, Creating Objects, Methods Constructors, Garbage Collection, Class Variables & Methods, this Keyword, Arrays, Command Line Arguments	5 Hrs
Unit 3	**Inheritance, Interfaces & Packages:** Inheritance & Aggregation, Method Overriding, super & final Keywords, Abstract Classes, Interfaces: Defining, Implementing, Extending, Accessing Interface Variables Packages & java.lang Package	5 Hrs
Unit 4	**Exception Handling & I/O Streams:** Exception Types, Exception Handling Techniques, User-Defined Exceptions, Exception Enrichment, java.io. File Class, File Reading/Writing, Random Access Files, Input/Output Streams	5 Hrs
Unit 5	**Applets:** Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, getDocumentBase () and getCodeBase () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics	5 Hrs
Unit 6	**Event Handling:** Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. Abstract Window Toolkit: Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Textfield and Textarea, Container Class, Layouts, Menu, Scrollbar	5 Hrs

Text Books:

4. Sachin Malhotra and Saurabh Choudhary, Programming in Java, Oxford University Press 2010.
5. Herbert Schildt, Java Complete References (McGraw Hill)

Reference Books:

1. H. M. Dietel and P. J. Dietel, “Java How to Program”, Pearson Education/PHI, Sixth Edition.
2. E. Balagurusamy, Programming with Java (McGraw Hill)
3. Dr. R. NageswaraRao, Core Java an Integrated Approach (Dreamtech)

4. Khalid Mughal, A Programmer's Guide to Java Certification, 3rdEdition (Pearson)
5. Sharnam Shah and Vaishali Shah, Core Java for Beginners, (SPD),2010.

E Resources:

1. https://www.tutorialspoint.com/java/index.htm
2. https://www.geeksforgeeks.org/java/java/
3. https://www.w3schools.com/java/

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CS201PC.1	3	3	2	1	2	-	-	1	1	-	1	3	1	1
3CS201PC.2	3	2	2	-	3	-	-	1	1	-	1	3	2	1
3CS201PC.3	3	3	3	2	3	-	-	1	1	-	1	3	3	1
3CS201PC.4	3	3	2	3	3	-	-	1	1	-	2	3	3	2
3CS201PC.5	2	2	3	1	3	-	-	2	2	1	1	2	3	2
3CS201PC.6	2	2	3	1	3	-	-	1	2	-	1	2	3	2
3CS201PC.CO	3	3	3	2	3	-	-	1	1	1	1	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CS203PC1**		Course Category: **PCC**		
Course Name	**Discrete Mathematics**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

Course Description:
Subject Code 3CS203PC1 Discrete Mathematics is a compulsory Program Core Course for Second Year B.Tech. Computer Science And Engineering.

Course Objectives:
The objective of this course is to provide a foundational understanding of discrete structures such as logic, sets, relations, functions, counting, probability, graphs, and trees. To develop analytical skills using mathematical reasoning, proofs, and induction for solving discrete and computational problems.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS203PC1.1	Apply propositional logic, predicates, and rules of inference to construct and validate mathematical arguments.	C-3
3CS203PC1.2	Analyze and apply concepts of sets, relations, and functions to solve mathematical and computational problems.	C-4
3CS203PC1.3	Demonstrate understanding of algebraic systems and apply them in coding and computation to solve mathematical and programming problems.	C-3
3CS203PC1.4	Breakdown and design logical circuits using Boolean algebra and Karnaugh maps to optimize digital circuits.	C-4
3CS203PC1.5	Apply tree structures for efficient data organization, traversal, and encoding applications such as Huffman coding.	C-3
3CS203PC1.6	Analyze and solve problems involving graphs, including connectivity, traversals, and graph coloring applications.	C-4

Course Contents:

Unit 1	**The Foundations: Logic and Proofs:** Propositions, Truth Tables, Compound Propositions, Logical Operators, Logic and Bit Operations; Logical Equivalences, De Morgan's Laws, Satisfiability: Applications and Solving Problems; Predicates, Quantifiers: Restricted Domains, Precedence, Logical Equivalences; Rules of Inference for Propositional Logic, Use to Build Arguments, Resolution, Combination for Propositions and Quantified Statements	7 Hrs
Unit 2	**Sets, Functions and Relation :** Introduction, Venn Diagrams, Subsets, Size of a Set, Power Sets, Cartesian Products, Set Notation with Quantifiers, Truth Sets and Quantifiers, Set Operations, Partial Functions; Sequences, Recurrence Relations, Special Integer Sequences, Summations; Countable Sets, An Uncountable Set; Functions as Relations, Relations on a Set, Operations on n- ary Relations; Representing Relations Using Matrices; Relations and Their Properties, n-ary Relations and Their Applications,	8 Hrs
Unit 3	**Algebraic Structures:** Algebraic Systems: Examples and General Properties; Semigroups and Monoids: Homomorphism of Semigroups and Monoids, Subsemigroups and Submonoids; Groups: Definitions, Subgroups and Homomorphisms, Cosets and Lagrange's Theorem, Normal Subgroups, algebraic Systems with Two Binary Operations; Group Codes: The Communication Model and Basic Notions of Error Correction, Hamming Distance.	8 Hrs
Unit 4	**Boolean Algebra:** Lattices, Boolean Algebra: Boolean Functions, Representing Boolean Functions, sum of product expansions, Functional Completeness, Logic Gates, Combinations of Gate, Minimization of Circuits, Karnaugh Maps.	7 Hrs
Unit 5	**Tree :** Introduction, Rooted Tree, ordered rooted tree, tree as model, Properties of Trees, Applications of tree, Binary Search Trees, Decision Trees, Prefix Codes, Huffman Coding, Game Trees, Tree traversal, Preorder Traversing, In order Traversing, Post order Traversing, Spanning Tree, Minimum spanning tree	7 Hrs
Unit 6	**Graph:** Graph Models; Basic Terminology, Special Simple Graphs, Bipartite Graphs, Matchings, Applications of Special Types of Graphs, New Graphs from Old; Graph Representation, Adjacency and Incidence Matrices, Isomorphism of Graphs, Determining Isomorphism; Paths, Connectedness in Undirected Graphs and Directed	8 Hrs

	Graphs, Paths and Isomorphism, Counting Paths Between Vertices; Euler Paths and Circuits,	

Text Books:

1. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 7th Edition, McGraw-Hill.
2. J. P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Edition, McGraw-Hill.

Reference Books:

1. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press.
2. Seymour Lipschutz and Marc Lars Lipson, Schaum's Outline of Theory and Problems of Discrete Mathematics, 3rd Edition, Schaum's Outlines Series, McGraw-Hill
3. C. L. Liu and D. P. Mohapatra, Elements of Discrete Mathematics, A Computer Oriented Approach, 3rd Edition, Tata McGraw-Hill, McGraw-Hill.

E-Resources:

1.GeeksforGeeks: Discrete Mathematics Tutorials

2. Course: Discrete Mathematics by Prof. Kamala Krithivasan, IIT Madras
Link: https://nptel.ac.in/courses/106/106/106106183/

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CS203PC1.1	3	3	2	2	1	-	-	-	1	-	1	3	1	1
3CS203PC1.2	3	3	2	3	1	-	-	-	1	-	1	3	2	1
3CS203PC1.3	3	2	2	2	2	-	-	-	1	-	1	3	2	1
3CS203PC1.4	3	2	2	2	2	-	-	-	1	-	2	3	2	2
3CS203PC1.5	3	2	2	2	2	-	-	-	1	-	2	3	2	2
3CS203PC1.6	3	3	2	3	2	-	-	-	1	-	2	3	3	2
3CS203PC1CO	3	3	2	3	2	-	-	-	1	-	1	3	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CS204MD1**	Course Category: **MDM-I**

Course Name	**Operating System**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**-**	PA Marks	**-**	Total Marks	**50**

Course Description:
Subject Code 3CS204MD1 Operating System is a compulsory Multi-Disciplinary Minor Course offered by the department of Computer Science & Engineering for other Second Year B.tech. Major discipline

Course Objectives:
The objective of this course is to provide a fundamental understanding of operating system structures, functions, and services, including process, memory, file, and device management. To develop problem-solving skills in process scheduling, synchronization, deadlocks, security, and system performance.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS204MD1.1	Apply process and thread management concepts for multitasking and communication	C-3
3CS204MD1.2	Apply and compare different scheduling algorithms to improve CPU efficiency.	C-3
3CS204MD1.3	Explain memory management schemes like paging, segmentation to Analyze file and I/O management techniques	C-2

Course Contents:

Unit 1	**Introduction to OS** Introduction: Operating System definition, OS Evolution, Components and Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads	10 Hrs
Unit 2	**Process Scheduling :** Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR, Priority,	10 Hrs

	Multilevel Queue, Multilevel Feedback Queue Scheduling	
Unit 3	**Memory & File Management:** Memory Management: Paging, Segmentation, Virtual Memory, Page ReplacementFile System: File Concepts, Directory Structure, File Operations, File ProtectionI/O Management: Disk Scheduling and Management Basics Overview of Modern OS (Windows, Linux, Android) Memory and File Systems	10 Hrs

Text Books:

Avi Silberschatz, P.B.Galvin, G.Gagne, Operating System Concepts (9/e) John-Wiley & Sons.

Reference Books:

1. A.S.Tanenbaum, Modern Operating Systems, Pearson Education.
2. William Stallings, Operating Systems, Prentice-Hall.
3. D. M. Dhamdhere, Operating Systems, Tata McGraw-Hill. 4. P. Balkrishna Prasad, Operating Systems, Scitech Publications (I) Pvt. Ltd.

E-Resources:

1. Topic: Operating System Concepts
   Link: https://www.tutorialspoint.com/operating_system/
2. Course: Operating System Fundamentals by Prof. Rajib Mall, IIT Kharagpur
   Link: https://nptel.ac.in/courses/106105214

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CS204MD1.1	3	2	3	2	1	-	-	-	1	1	1	3	2	1
3CS204MD1.2	3	3	3	2	1	-	-	-	1	1	1	3	2	1
3CS204MD1.3	3	2	2	2	2	-	-	-	1	-	1	2	2	1
3CS204MD1CO	3	2	3	2	1	-	-	-	1	1	1	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	3SH205OE1	Course Category:	OE
Course Name	**Soft Skills & Profile Building**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3SH205OE1Soft Skills & Profile Building is a compulsory Open Elective Course for the Second Year B. Tech All Branch Students.

Course Objectives:
The objective of this course is to focus on developing advanced communication skills, leadership qualities and professional etiquette among engineering graduates. The course emphasizes workplace communication, interview preparedness, personal branding, and employability skills aligned with industry expectations. It integrates emotional intelligence, digital professional identity, and strategic career planning for holistic professional development.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE1.1	Apply advanced interpersonal, analytical, and persuasive communication techniques in professional contextsfor effective professional interactions.	C-3
3SH205OE1.2	Demonstrate professional workplace etiquette, business communication, and group discussion skillsto enhance employability.	C-3 A-3
3SH205OE1.3	Analyze leadership styles, emotional intelligence, and team dynamics for effective collaboration.	C-4 A-3
3SH205OE1.4	Design a structured and realistic career plan aligned with industry expectations and personal goalsfor professional growth.	C-6
3SH205OE1.5	Create ATS-friendly résumés, professional portfolios, and digital profiles for personal branding.	C-6 P-4
3SH205OE1.6	Perform effectively in interviews, workplace simulations, and job-search processes with professional confidencefor enhanced employability.	C-3 P-3 A-3

Course Contents:

Unit 1	**Advanced Communication Dynamics:** Advanced interpersonal communication strategies; speech articulation; structuring thoughts and fluency techniques; analytical and critical communication; storytelling techniques for impactful presentations; persuasive communication models.	7Hrs
Unit 2	**Global Workplace Etiquettes, Email Writing & GD–PI Perspective:** Professional greetings and workplace conduct; giving and receiving feedback; handling criticism and adaptability issues; professional values such as punctuality and attire; types of handshakes and significance; effective business email writing; types of Group Discussions, purpose of GDs; mock GDs (video-based); interview strategies and techniques.	8Hrs
Unit 3	**Leadership, Team Dynamics & Corporate Skills:** Personality types using 9/9 matrix; leadership styles; emotional intelligence and leadership relationship; conflict resolution and negotiation techniques; team-building skills (Johari Window perspective); cross-cultural communication; creativity and design thinking; structured problem-solving and decision-making**.**	7 Hrs
Unit 4	**Strategizing Career Planning:** SMART goal setting; mapping skills to career paths; understanding industry expectations; emerging futuristic soft and hard skills (domain-wise); personalized career roadmap; certification planning (technical and non-technical); networking skills and participation in professional communities	7 Hrs
Unit 5	**Profile Building, Portfolio & Personal Branding:** ATS-friendly résumé preparation and common mistakes; video résumé creation and self-marketing pitch; LinkedIn profile optimization and networking strategies; developing online portfolios using platforms such as GitHub, Behance, Google Sites, and Toastmasters	8 Hrs
Unit 6	**Employment Readiness & Industry Integration:** Workplace simulation activities (mock emails, meetings, discussions); mock personal interviews; understanding sector-specific industry dynamics; unconventional career opportunities after engineering; job-hunting strategies and popular job platforms	8 Hrs

Text Books:

1. Alex K., Soft Skills, S. Chand Publishing
2. Meenakshi Raman & Prakash Singh, Business Communication, Oxford University Press

Reference Books:

1. Stephen R. Covey,The 7 Habits of Highly Effective People,Free Press Publication
2. Daniel Goleman, Emotional Intelligence,published by Bantam Books.
3. Shiv Khera, You Can Win,published by Bloomsbury Publishing
4. Richard N. Bolles, What Color Is Your Parachute? Published by Ten Speed Press, Crown Publishing Group

E Resources:

1. NPTEL: Soft Skills and Personality Development
2. LinkedIn Learning – Communication & Career Development Courses
3. Harvard Business Review – Communication & Leadership Articles
4. Coursera /edX – Career Development & Employability Skills Modules

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE1.1	2	3	2	–	–	–	–	2	3	–	–	2	2	3
3SH205OE1.2	–	2	–	–	–	2	3	3	3	–	–	1	2	3
3SH205OE1.3	–	3	2	–	–	2	2	3	–	–	–	2	3	3
3SH205OE1.4	–	3	3	–	–	2	–	–	–	2	3	2	3	2
3SH205OE1.5	–	2	3	–	3	–	–	–	2	–	2	1	2	2
3SH205OE1.6	–	2	2	–	2	2	–	2	3	–	2	2	3	3
3SH205OE1CO	1	3	2	-	1	2	1	2	2	1	1	1	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	3SH205OE2	Course Category:	OE
Course Name	**Team Building & Management**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3SH205OE2Team Building & Management is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:
The Objective of the course is to develop teamwork capabilities, leadership and managerial skills, collaborative problem-solving abilities, conflict management techniques, and effective decision-making skills required in professional and organizational settings.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE2.1	Explain the principles and importance of effective team building in organizations to foster collaborative work culture.	C-2
3SH205OE2.2	Apply team dynamics and collaboration strategies to achieve common goals.	C-3 A-3
3SH205OE2.3	Analyze leadership styles and managerial roles for effective team performance.	C-4
3SH205OE2.4	Demonstrate conflict resolution, negotiation, and interpersonal management skills for effective team performance.	C-3 A-3
3SH205OE2.5	Apply motivation and performance management techniques in team-based environments for achieving organizational goals.	C-3
3SH205OE2.6	Perform effectively as a team member or leader in simulated managerial scenarios to develop leadership competencies	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Team Building:** Concept of teams; types of teams; stages of team development; characteristics of effective teams; roles and responsibilities of team members; barriers to effective teamwork; team norms and values.	7Hrs

Unit 2	**Team Dynamics & Interpersonal Relationships:** Group behaviour and dynamics; interpersonal communication in teams; trust and collaboration; listening as a team skill; diversity and inclusion in teams; cross-cultural team management	8Hrs
Unit 3	**Leadership in Teams:** Leadership concepts; leadership styles; emotional intelligence and leadership; situational leadership; influence and power in teams; leadership ethics and responsibilities.	7 Hrs
Unit 4	**Conflict Management & Negotiation:** Sources and types of conflict; conflict resolution techniques; negotiation strategies; managing difficult team members; stress management; maintaining team harmony	7 Hrs
Unit 5	**Motivation, Performance & Team Effectiveness:** Motivation theories; team motivation techniques; goal setting and performance measurement; feedback and appraisal systems; decision-making in teams; problem-solving techniques.	8 Hrs
Unit 6	**Managerial Skills & Team-Based Applications:** Managerial roles and functions; planning, organizing, and controlling teams; delegation and coordination; workplace simulations (team meetings, role plays); case studies on team management; team performance evaluation.	8 Hrs

Text Books:

1.Stephen P. Robbins, Organizational Behaviour, Pearson Education

2. L.M. Prasad, Management Principles and Practices, published by Sultan Chand & Sons

Reference Books:

1. Patrick Lencioni, The Five Dysfunctions of a Team, published by Jossey-Bass

2. Peter G. Northouse, Leadership, published by SAGE Publications

3. Daniel Goleman, Emotional Intelligence, published by Bantam Books

E Resources:

1. NPTEL – Organizational Behavior& Management Courses
2. LinkedIn Learning – Team Leadership & Management Modules
3. Harvard Business Review – Teamwork & Leadership Articles
4. Coursera / edX – Team Management and Leadership Courses

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3SH205OE2.1	2	–	–	–	–	–	–	–	–	–	–	1	2	3
3SH205OE2.2	–	2	2	–	–	–	–	3	2	–	–	2	3	3
3SH205OE2.3	–	3	3	–	–	–	–	2	–	–	–	2	3	3
3SH205OE2.4	–	2	2	–	–	2	3	3	–	–	–	2	3	3
3SH205OE2.5	–	2	2	–	–	–	–	2	–	2	–	2	3	3
3SH205OE2.6	–	2	2	–	–	2	–	3	2	–	2	2	3	3
3SH205OE2 CO	1	2	2	-	-	1	1	2	1	1	1	2	3	3

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course code: **3CS206PC1**		Course Category: **PCC**		
Course Name	**Data Structures & Algorithms Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	-
Total Credit Hours	**30 Hrs**				
SEE Marks	-	SEE Time	-	CIA Marks	-
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3CS206PC1 Data Structures & Algorithms Lab provides hands-on practice of core data structures and algorithms using C/C++, strengthening problem-solving skills through practical implementation.

Course Objectives:
The objective of the course is to implement core data structures and develop algorithms for basic operations, and to apply abstract data types to solve computational and real-life problems.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS206PC1.1	Implement arrays, linked lists, stacks, and queues for structured data handling.	C-3,P-3,A-2
3CS206PC1.2	Apply tree and graph traversal algorithms to solve real-time problems.	C-4,P-3
3CS206PC1.3	Develop searching, sorting, and hashing programs to compare performance.	C-4,P-4,A-3

List of Practicals:
Minimum Ten practical's from the list mentioned below.

1. Implementation of array operations (insert, delete, search, traverse).
2. Implementation of singly linked list and its operations.
3. Implementation of doubly and circular linked lists.
4. Stack implementation using array and linked list.
5. Applications of stack: infix to postfix conversion, postfix evaluation.
6. Queue implementation using array and linked list.
7. Circular queue and priority queue implementation.
8. Implementation of binary tree and its traversals (inorder, preorder, postorder).
9. Implementation of binary search tree (insertion, deletion, search).
10. Implementation of graph using adjacency list/matrix.
11. Graph traversal algorithms: BFS and DFS.
12. Implementation of linear and binary search.

E Resources:

1. Thomas H. Cormen et al., Introduction to Algorithms (CLRS) – MIT PresseBook.https://mitpress.mit.edu/9780262046305/introductional goriths/
2. Data Structures and Algorithms – Prof. Naveen Garg (IIT Delhi) https://nptel.ac.in/courses/106102064
3. *Programming,* Data Structures and Algorithms using C – Prof. Anupam Basu (IIT Kharagpur) https://nptel.ac.in/courses/106105085
4. Comprehensive tutorials, problems, and practice questions. https://www.geeksforgeeks.org/data-structures

Mapping of COs with POs

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3CS206PC1.1	3	2	2	1	3	-	-	-	3	1	1	3	2	1
3CS206PC1.2	3	2	3	2	2	-	-	-	2	1	1	3	3	1
3CS206PC1.3	3	3	3	2	3	-	-	-	3	2	1	3	3	2
3CS206PC1CO	3	2	3	2	3	-	-	-	3	1	1	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CS207PC1**		Course Category: **PCC**		
Course Name	**Object Oriented Programming Lab (Java)**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**-**
Total Credit Hours	**30 Hrs**				
SEE Marks	**-**	SEE Time	**-**	CIA Marks	**-**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3CS207PC1 Object Oriented Programming Lab (Java) is a compulsory Program Core Course for Second Year B.Tech. Computer Science and Engineering.

Course Objectives:
To build a strong foundation in Object-Oriented Programming using Java by understanding core OOP principles and applying them to develop modular, reusable, and interactive software applications.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS207PC1.1	Apply core object-oriented programming concepts—such as classes, objects, overloading, inheritance, interfaces, and abstraction—to design and implement Java programs.	C-3, P-4, A-2
3CS207PC1.2	Use Java features including arrays, command-line input, exception handling, file I/O, and GUI components (AWT/Swing) to develop, test, and debug structured applications.	C-3, C-4, P-5, A-3
3CS207PC1.3	Develop interactive applications incorporating applets, graphics, event handling, and essential OOP mechanisms to solve foundational real-world problems	C-4, C-5, P-6, A-4

List of Practical's:
Minimum Ten practical's from the list mentioned below.

1. Introduction to Object Oriented Programming and installation of JDK. Write a program to print a message "Hello World..."
2. Develop a program to explain use of Operators in java.
3. Develop a program to demonstrate the concept of Class, Method and Object.
4. Develop a program to study and implement the concept of Method Overloading.
5. Develop a program to study and implement concept of Constructor Overloading in Java.

6. Develop a program to study and implement the Array in Java.
7. Develop a Program on various ways to accept data through keyboard (Command Line Argument)
8. Develop a Program to study and implement the concept of Inheritance.
9. Develop a Program to study and implement the concept of Method Overriding.
10. Develop a Program to study and implement the Abstract Class.
11. Develop a Program to study and implement the concept of Interface in Java.
12. Develop a Program to study and implement Exception Handling Mechanism in Java.

E Resources:

1. https://www.w3schools.com/java/
2. https://www.geeksforgeeks.org/java/
3. https://www.tutorialspoint.com/java/index.htm

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CS207PC1.1	3	2	2	–	3	–	–	–	–	–	1	3	2	1
3CS207PC1.2	3	3	2	2	3	–	–	1	1	–	2	3	3	1
3CS207PC1.3	2	3	3	2	3	1	–	1	2	–	3	3	3	2
3CS207PC1CO	3	3	2	2	3	1	-	1	2	-	2	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CS208PC1**		Course Category: **PCC**		
Course Name	**Programming Laboratory-I (Python Programming Lab)**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	-
Total Credit Hours	**30 Hrs**				
SEE Marks	-	SEE Time	-	CIA Marks	-
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3CS208PC1 Programming Laboratory-I (Python Programming Lab) is a compulsory Program Core Course for Second Year B.Tech. Computer Science and Engineering.

Course Objectives:
The objective of this course is to develop practical proficiency in Python by applying core syntax, data structures, functional and object-oriented concepts, and modules with file handling to build structured and efficient programs.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CS208PC1.1	Demonstrate the use of the Python interpreter, apply basic syntax, perform string operations, and manipulate built-in data structures	C3,P3, A2
3CS208PC1.2	Apply functional programming concepts, list/tuple/dictionary processing, and problem-solving techniques to implement computational logic in Python programs	C3,P4, A2
3CS208PC1.3	Develop Python programs using OOP concepts, modules, packages, and file-handling techniques.	C4,P4,P5, A3

List of Practical's:
Minimum Ten practicals from the list mentioned below.

1. Introduction of Python Programing and Write a program to understand basic Python interpreter
2. Write a program to perform String Manipulation and Functions
3. Write a program to implement Python Data structures
4. Write a program to find the maximum, minimum, and average of elements in a list.
5. Write a program to convert a list into a tuple and display its elements
6. Write a program to create a dictionary of student names and marks, then display the student with highest marks

7. Implement Classes and Objects using Python
8. Design a program to understand Overloading in Python
9. Design a program to understand Overriding in Python
10. Implement Inheritance using Python
11. Develop a Python code for Information hiding
12. Implement Python's Modules and Packages
13. Write a program to illustrate concept of File handling

E Resources:

1. https://www.w3schools.com/java/
2. https://www.geeksforgeeks.org/java/
3. https://www.tutorialspoint.com/java/index.htm

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CS208PC1.1	3	2	2	2	1	–	–	–	–	1	1	3	2	1
3CS208PC1.2	3	3	3	2	2	–	–	–	–	1	1	3	3	1
3CS208PC1.3	3	2	3	2	2	–	–	–	1	2	2	3	3	2
3CS208PC1 CO	3	2	3	2	2	–	–	–	1	1	1	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CS209EM1**		Course Category: **EEM**		
Course Name	**Human Resource Management**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks		SEE Time		CIA Marks	
EE Marks	**50**	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 3CS209EM1 Human Resource Management is a compulsory Management Course for Second Year B. Tech.

Course Objectives:
The objective of this course is to introduce students to the principles and practices of Human Resource Management (HRM) and its application in technical and industrial organizations.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS209EM1.1	Understand the nature and role of HRM in engineering contexts	C-2
3CS209EM1.2	Apply concepts of manpower planning, recruitment, training, and performance appraisal to technical teams.	C-3
3CS209EM1.3	Analyze contemporary issues and digital trends in HRM	C-4

Course Contents:

Unit 1	**Fundamentals of HRM:** Concept, scope and significance of HRM , Role of HR in engineering & technology-based organizations, HR Planning, Recruitment and selection process, Challenges in modern HRM.	10 Hrs
Unit 2	**Training, Performance & Compensation:** Training & Development, Evaluating training effectiveness (Kirkpatrick's levels), Performance Management, Compensation & rewards, Employee engagement and retention strategies.	10 Hrs
Unit 3	**Legal, Ethical & Emerging HRM Issues:** Overview of key labour laws: Factories Act, Wages Act, Maternity Benefit Act, Industrial relations & employee welfare, HR Information Systems (HRIS), Change management, Emerging trends	10 Hrs

Text Books:

1. K. Aswathappa, Human Resource Management: Text & Cases, Tata McGraw Hill.
2. P. Subba Rao, Personnel and Human Resource Management, Himalaya Publishing House, Latest Edition.
3. A. K. Singh, Human Resource Management, Laxmi Publications.
4. Gary Dessler, Human Resource Management, Pearson Education (Indian Edition).

Reference Books:

1. Bohlander & Snell, Managing Human Resources, Cengage Learning.
2. C. B. Mamoria & S. V. Gankar, Human Resource and Personnel Management, Himalaya Publishing.
3. V. S. P. Rao, Human Resource Management, Excel Books.
4. P. C. Tripathi, Human Resource Development and Management, Sultan Chand & Sons.

E Resources:

1. NPTEL Online Course, Human Resource Management https://nptel.ac.in/courses/110105053
2. SWAYAM (AICTE), Human Resource Management https://swayam.gov.in
3. https://ekumbh.aicte-india.org/ebooks
4. https://egyankosh.ac.in

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CS209EM1.1	2	1	1	1	-	2	2	1	2	2	1	2	2	2
3CS209EM1.2	2	2	2	2	1	2	2	1	3	3	2	2	3	2
3CS209EM1.3	2	2	2	2	1	2	3	2	2	3	2	2	2	3
3CS209EM1CO	2	2	2	2	1	2	2	1	2	3	2	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3SH210VE1**	Course Category:	**VEC**
Course Name	**Constitutional Values and Fundamental Duties**			
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours **30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	--	SEE Time	--	CIA Marks --
EE Marks	**25**	PA Marks	**25**	Total Marks **50**

Course Description:
Subject Code 3SH210VE1 Constitutional Values and Fundamental Duties is a compulsory Valus enhancement Course for Second Year B. Tech.

Course Objectives:
The objective of the course is to introduce the Indian Constitution, its historical background, fundamental values, rights, and duties.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH210VE1.1	Explain the historical background, making, and significance of the Indian Constitution to Understand the Constitution, Preamble, and core values.	C2
3SH210VE1.2	Interpret Fundamental Rights and Duties (Articles 12–35, 51A) to evaluate their implications through case studies in professional and civic life.	C3
3SH210VE1.3	Apply constitutional principles to engineering ethics, sustainability concerns (Articles 48A, 51A(g)), and demonstrate social commitment, innovation, and inclusive growth as nation builders.	C3

Course Contents:

Unit 1	**Introduction to the Constitution and Fundamental Values**: Overview of the Indian Constitution – Historical background and making of the Constitution; Meaning of Constitution; Preamble – Meaning and significance. Core Constitutional Values – Justice (Social, Economic, Political); Liberty (thought, expression, belief, faith, worship); Equality (status and opportunity); Fraternity (dignity and unity of the nation). Relevance of constitutional values for professionals and citizens.	10 Hrs
Unit 2	**Fundamental Rights and Duties**: Fundamental Rights (Articles 12–35) – Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right	10 Hrs

	to Constitutional Remedies. Fundamental Duties (Article 51-A) – Importance and implications; Role of youth and professionals in upholding duties. Case studies highlighting real-life significance of rights and duties.	
Unit 3	**Application of Constitutional Values in Engineering and Public Life**: Ethical Responsibilities and Constitutional Alignment – Engineering ethics and public interest; Environment and sustainability as constitutional concern (Articles 48A, 51A(g)); Engineers as nation builders – Social commitment, innovation, and inclusive growth.	10 Hrs

Text Books:

1. Basu D. D., Introduction to the Constitution of India, LexisNexis Publication, New Delhi (Twenty-Third Edition).
2. Jain M. P., Constitution of India, LexisNexis Publication, New Delhi (Eighth Edition).
3. Laxmikanth M., Indian Polity, McGraw Hill Education, New Delhi (Sixth Edition).
4. Austin Granville, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, New Delhi.
5. Shukla V. N., Constitution of India, Eastern Book Company, Lucknow (Twelfth Edition).
6. Government of India, Constitution of India (Bare Act), Government of India Publication, New Delhi.

Reference Books:

1. Subhash Kashyap, Our Constitution, National Book Trust, New Delhi.
2. Durga Das Basu, Shorter Constitution of India, LexisNexis Publication.
3. P. M. Bakshi, The Constitution of India, Universal Law Publishing.
4. J. N. Pandey, Constitutional Law of India, Central Law Agency.
5. Seervai H. M., Constitutional Law of India, N. M. Tripathi Pvt. Ltd. (Vols. I–III).
6. B. Shiva Rao, The Framing of India's Constitution: A Study, Indian Institute of Public Administration.
7. D. C. Wadhwa, Political Science and Constitutional Law, Eastern Book Company.
8. Madhav Khosla, The Indian Constitution: Oxford India Short Introductions, Oxford University Press.

E Resources :

4. NPTEL course on Constitutional Studies, Prof. Sudhir Krishnaswamy, National Law School of India University
5. Constitutional Values and Fundamental Duties (University of Delhi – aligned with NEP 2020, available via NPTEL/DU open learning) https://kmc.du.ac.in/kmcouter/collnews/download/40727448169063791359.pdf/LinkedContents/pdf/All/All

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH210VE1.1	3	2	-	1	-	-	-	-	-	-	-	2	2	
3SH210VE1.2	-	3	2	2	-	2	3	3	-	-	-	3	2	-
3SH210VE1.3	-	-	3	3	-	2	3	2	-	2	-	3	3	2
3SH210VE1CO	1	2	2	2	-	2	2	2	-	1	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CS400FP1**		Course Category:	**FP**	
Course Name	**Field Project**				
Credits	**02**	Total L:T:P Hours	0:0:4 **60 Hrs**	Total SL Hours	**-**
Total Credit Hours	**60 Hrs**				
SEE Marks	**-**	SEE Time	**-**	CIA Marks	**-**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3CS400FP1 Field Project is an Experiential Learning Courses for Second Year B.Tech. Computer Science and Engineering.

Course Objectives:
The objective of this course is to equip students with practical skills to address rural challenges through digital tools, smart technologies, and sustainable practices and to foster social responsibility and innovation for effective community development.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS400FP1.1	Apply digital and smart technologies to solve basic rural community problems.	C-3, P-3, A-2
3CS400FP1.2	Perform field activities in digital literacy, agriculture support, health, and resource management.	C-2, P-5, A-3
3CS400FP1.3	Work with communities to create simple, practical solutions for local development.	C-4, P-4, A-4

Course Contents:

Module	**Description**	**Hours**
Module 1	Orientation & Sensitization	4
Module 2	Field Visit & Problem Identification	24
Module 3	Problem–Solution Design & Implementation	20
Module 4	Documentation, Presentation & Reflection	12

Note:

1. Students must collaborate within their assigned practical batches. Each batch should be further divided into subgroups, with five students per subgroup, Students are required to select any one of the project types/domains listed below in accordance with the prescribed guidelines

2. Projects

1. Digital Empowerment: Training on mobile banking, UPI, and government e-services (Aadhaar, PM-KISAN).
2. Smart Agriculture: AI-based chatbots for crop queries or IoT-based soil sensors.
3. Cyber Security: Workshops on fraud, phishing awareness, and secure online transactions
4. Health & Hygiene: Developing AI-powered health apps in local languages.
5. E-Commerce: Assisting farmers and artisans with online listings (eNAM, Etsy, Meesho).
6. Smart Water Literacy & Conservation Mapping: Resource Management & Traditional Wisdom
7. The "Green School" STEM Initiative: Focus: Education & Renewable Energy
8. Circular Economy: "Waste-to-Wealth" Workshop: Waste Management & Entrepreneurship
9. Career Bridge: Digital Readiness for Rural Youth: Skill Development & Career Guidance
10. Smart Infrastructure: GIS-Based Village Resource Mapping: Community Development & Infrastructure

3. Documentation /Project Report Format:

The Documentation /Project Report shall contain the following sections:

1. Title Page
2. Certificate & Declaration
3. Abstract
4. Introduction (Community + E&TC relevance)
5. Objectives
6. Literature Survey
7. Methodology (Survey + Technical)
8. Problem Identification
9. Proposed E&TC Solution
10. Implementation / Simulation
11. Results & Analysis
12. Community Feedback & Social Impact
13. Conclusion & Future Scope
14. References
15. Appendices (Photos, questionnaires, certification letter issued by the Gram Panchayat office)

Course Plan:

Lecture No.	Module Title	Topic	Hours
1	**Module1: Orientation & Sensitization**	NEP 2020: Community Engagement & Role of Engineers, Ethics, Social Responsibility & SDGs for Computer Science and Engineering, Overview of Rural & Urban Communication Infrastructure, Identification of Community Institutions (GP, School, Self Help Group (SHG), Health Centre), Field Safety, Team Formation, Area & Theme Allocation, Reorganization	4
2	**Module 2: Field Visits & Problem Identification**	Pre-Visit Study: Planning for digital literacy workshops and tech-driven farming surveys. Digital Empowerment: Initial assessment of villager awareness regarding UPI, mobile banking, and government e-services	24
3		Site Identification: Mapping the digital divide; documenting layouts of local businesses and traditional water bodies for revival	
4		Technical Observation: Evaluating existing digital infrastructure, internet connectivity, and current literacy levels in local schools.	
5		Data Recording: Documenting community needs in Cyber Security (fraud awareness) and E-Commerce (market linkage for artisans).	
6		Analysis: Comparing local access to technology against Digital India mission standards and government e-service availability	
7		Problem Identification: Selecting a specific challenge in Education & Skill Development (e.g., STEM kits or digital literacy)	
8	**Module3: Engineering Problem–Solution Design & Implementation-**	Data Analysis: Processing field data to define technical requirements for AI/IoT solutions in rural settings	20
9		Design: Preparing logic flows and UI sketches for Cyber Security	

		(password safety) or E-Commerce platforms for SHGs.	
10		Implementation (Community-Driven Innovation): Developing prototypes like AI chatbots for crops, IoT soil sensors, or GIS-based village mapping.	
11		Resource Estimation: Cost and hardware/software estimates for low-cost water filters or solar-powered irrigation prototypes.	
12		Evaluation: Assessing feasibility and community benefits, such as improved efficiency in farming or secure digital transactions.	
13	**Module4: Documentation, Presentation & Reflection**	Documentation: Data analysis and graphical representation of project impact (e.g., number of villagers trained).	12
14		Finalization: Formatting the project report (Introduction, Objectives, Methodology, Execution, Results).	
15		Evaluation: Final presentation to community institutions and Viva Voce.	

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CS400FP1.1	2	2	1	0	2	1	2	1	2	1	1	1	2	2
3CS400FP1.2	1	1	2	0	2	2	3	3	2	1	2	0	2	3
3CS400FP1.3	1	2	2	1	2	3	3	3	3	2	2	0	3	3
3CS400FP1CO	1	2	2	0	2	2	3	2	2	1	2	0	2	3

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3AL001NC1**		Course Category: **NC**		
Course Name	**Disaster Management and Preparedness**				
Credits	--	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	--
Total Credit Hours	--				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	--	Total Marks	--

Course Description:
Subject Code 3AL001NC1 Disaster Management and Preparedness is a Compulsory Non-Credit course for Second Year B. Tech all disciplines.

Course Objectives:
The objective of this course is to provide students with a comprehensive understanding of disasters, their types, impacts, the complete disaster management cycle, and the roles of various agencies in Disaster Risk Reduction.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3AL001NC1.1	Identify the concepts of disaster, hazard, vulnerability and risk, and classify disasters to understand the basic nature, causes and profiles of disasters in India.	C-2
3AL001NC1.2	Analyze the disaster management cycle for risk assessment, mitigation, preparedness, response, recovery, and international disaster management frameworks.	C-4
3AL001NC1.3	Apply disaster management practices, including stakeholder roles, national policies, engineers' responsibilities, and preparedness measures for effective disaster risk reduction.	C-3

Course Contents:

Unit 1	**Introduction to Disaster Management:** Concepts and definitions – disaster, hazard, vulnerability, risk, severity, frequency, exposure, capacity, and impact; classification of disasters- Natural disasters: earthquakes, tsunami, landslides, mining, Hydro-Meteorological Disasters: floods, draught, cyclones, coastal erosion. Biological Disaster: epidemics, pest attacks, forest fire, Manmade disasters: Industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, vulnerability profile of India, ecological fragility; principles of disaster prevention and mitigation	10 hrs

Unit 2	**Disaster Management Cycle and Framework:** Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development. Awareness During Disaster – Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation. Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action Phases of disaster management; vulnerability and capacity assessment, post-disaster environmental response	12 hrs
Unit 3	**Disaster Management practices:** Roles and responsibilities of government, community, local bodies, NGOs, and other stakeholders, National Policy on Disaster Management Act 2005 Mega Disasters of India and Lessons Learnt, Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster.	8 hrs

Textbooks:

1. Sharma, S. C. (2022). Disaster Management, Khanna Publication.
2. Subramanian, R. (2024). Disaster Management. Vikas Publication.

Reference Books:

1. Gaur, R. C. (2018). Environmental Engineering and Disaster Management. New Age International.
2. Pradeep Sahni, 2024, Disaster Risk Reduction in South Asia, Prentice Hall.
3. Mondal, D. (2022). Disaster Management. New Delhi: CBS Publishers & Distributors
4. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
5. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
6. Natural Disaster Management Policy , 2009,GOI
7. H.N. Shrivastava& G.D. Gupta, Management of Natural Disasters in developing Countries, Daya Publishers , Delhi
8. S.L. Goyal, Encyclopedia of disaster Management, Vol I,II & III Disaster Managemnt Policy and administration, Deep & Deep, New Delhi,2006
9. Coppola D P, Introduction to International Disaster Management, Elsevier Science (B/H), London, 2007
10. Disaster Mitigation in Asia & Pacific, Asian Development Bank

Course Assignments

Internal Assessment at Institute level will be based on following assignments:

1.Study of Recent Disasters (at local, state and national level)

2.Preparation of Disaster Risk Management Plan of an Area or Sector

3.A Case study on Disaster Management

E Recourses:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed61/preview

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3AL001NC1.1	3	2	-	-	-	3	2	-	-	-	3	1	1	2
3AL001NC1.2	3	3	-	-	-	3	3	-	-	-	3	2	2	3
3AL001NC1.3	3	3	-	-	-	3	3	-	-	3	3	2	2	3
3AL001NC1.CO	3	3	-	-	-	3	3	-	-	1	3	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CS211DH1**		Course Category: **DH**		
Course Name	**Network Security**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

Course Description:

Subject Code 3CS211DH1 Network Security is a compulsory Double Minor / Honours Course offered by the department of Computer Science and Engineering for Second Year B.Tech., of all discipline.

Course Objectives:

The objective of this course is to introduce core principles and practices of network security, including cryptography, secure protocols, access control, firewalls, intrusion detection, and security management for modern networks.

Course Outcomes:

After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS211DH1.1	Explain basic concepts of network security, threats, vulnerabilities, and attack models to understand security risks.	C-2
3CS211DH1.2	Apply cryptographic techniques to secure data and network communications.	C-5
3CS211DH1.3	Analyse authentication, access control, and secure protocols for protecting network resources.	C-3
3CS211DH1.4	Evaluate firewall, IDS/IPS, and monitoring techniques to mitigate network threats.	C-4
3CS211DH1.5	Explain security issues in wireless, web, and emerging technologies to improve system security.	C-2
3CS211DH1.6	Explain security issues in wireless, web, and emerging technologies to improve system security.	C-5

Course Contents:

Unit 1	**Introduction to Network Security** Security goals: Confidentiality, Integrity, Availability, Types of attacks: Passive, Active, Insider, Outsider, Threats, vulnerabilities, and risk assessment, Security services and mechanisms, Overview of network security architecture	8 Hrs
Unit 2	**Cryptography Fundamentals** Symmetric key cryptography: DES, AES, Asymmetric key cryptography: RSA, Diffie–Hellman, Hash functions and message authentication codes, Digital signatures and certificates, Public Key Infrastructure (PKI)	8 Hrs
Unit 3	**Authentication and Secure Communication** User authentication techniques, Password-based and multi-factor authentication, Access control models, Secure communication protocols: SSL/TLS, HTTPS Email security basics	7 Hrs
Unit 4	**Network Security Mechanisms** Firewalls: Packet filtering, stateful, proxy firewalls, Intrusion Detection and Prevention Systems (IDS/IPS), Virtual Private Networks (VPNs), Network monitoring and logging, Security policies and configuration management	8 Hrs
Unit 5	**Wireless and Web Security (7 Hrs)** Wireless security: WEP, WPA, WPA2, WPA3, Web security threats: SQL Injection, XSS, CSRF, Secure web application practices, Security issues in cloud and IoT networks	7 Hrs
Unit 6	**Case Studies and Emerging Trends (7 Hrs)** Network security breaches and incident analysis, Security management and compliance, Cyber laws and ethical considerations, Emerging trends: Zero Trust, AI in security Future challenges in network security	7 Hrs

Text Books:

1. William Stallings, Cryptography and Network Security, Pearson Education.
2. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill.
3. Charlie Kaufman, Radia Perlman & Mike Speciner, Network Security, Pearson

.**Reference Books:**

1. Andrew S. Tanenbaum, Computer Networks, Pearson Education.
2. Wenliang Du, Computer & Internet Security, Pearson.
3. Mark Stamp, Information Security: Principles and Practice, Wiley.

E Resources :

1. NPTEL – Network Security Courses,
   https://nptel.ac.in/courses?search=network%20security
2. Cisco Networking Academy – Security Modules
   https://www.netacad.com/courses/security
3. OWASP Foundation – Web Security Resources
   https://owasp.org
4. CERT-In – Advisories and Security Reports
   https://www.cert-in.org.in

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CS211DH1.1	2	2	1	–	1	–	–	–	–	–	1	2	1	–
3CS211DH1.2	3	3	2	1	3	–	–	–	–	–	2	3	3	–
3CS211DH1.3	2	3	2	1	2	–	–	–	–	–	2	2	3	–
3CS211DH1.4	2	3	3	2	3	1	–	–	–	–	2	2	3	1
3CS211DH1.5	1	2	1	–	2	2	1	–	–	–	2	1	2	2
3CS211DH1.6	1	3	2	2	2	2	1	–	–	1	3	1	2	3
3CS211DH1CO	2	3	2	2	3	2	1	–	–	1	2	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3CS211DH2**		Course Category: **DH**		
Course Name	**System Design**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

Course Description:
Subject Code 3CS211DH2 System Design is a compulsory Double Minor / Honours Course offered by the department of Computer Science and Engineering for Second Year B.Tech., of all discipline.

Course Objectives:
The course introduces software architecture and system design within the development life cycle. It emphasizes architectural styles, design principles, and data management concepts.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS211DH2.1	Explain system design concepts and requirement types for efficient software development.	C-2
3CS211DH2.2	Compare architecture styles for effective real-world system design.	C-5
3CS211DH2.3	Apply modular design, cohesion, and coupling with UML for structured development.	C-3
3CS211DH2.4	Analyze scalability, load balancing, and performance for reliable systems.	C-4
3CS211DH2.5	Describe data management methods for efficient data-driven applications.	C-2
3CS211DH2.6	Evaluate case studies like library, chat, and e-commerce systems for practical design understanding.	C-5

Course Contents:

Unit 1	**Introduction to System Design:** System Design and Software Architecture: Definition, structure, characteristics, Role of architect in software development life cycle. System Development Life Cycle: Process models, Waterfall, Incremental, Spiral, Agile, Where architecture fits in SDLC phases, Functional requirements – behaviour and features of the system,	8 Hrs

	Non-functional requirements, Architecture Characteristics	
Unit 2	**Software Architecture Styles:** Monolithic Architecture: Characteristics, Pros, Cons, Layered Architecture: Common layers, Principles of separation of concerns, Client–Server Architecture: Two-tier and three-tier models, Communication protocols and request/response pattern, Micro-services Architecture: Service decomposition strategies, Communication mechanisms, deployment and scalability, Service-Oriented Architecture: service contract, registry, orchestration, Compare and contrast with micro-services	8 Hrs
Unit 3	**Principles of Modular Design:** Modularity Principles Benefits: flexibility, maintainability, parallel development, Cohesion and Coupling: Types of Cohesion and Coupling, Designing for high cohesion and low coupling, Component and Interface Design, UML Basics: Use-case diagrams for capturing requirements, Class diagrams for structural view, Sequence diagrams for interactions, Component and deployment diagrams for high-level architecture	7 Hrs
Unit 4	**Scalability and System Reliability:** Scalability Concepts: Vertical vs. horizontal scaling, Stateless vs. stateful services, Load Balancing: DNS-based, hardware, software load balancers, round-robin, least-connections, consistent hashing, Global vs. local load balancing, Performance: Response time, throughput, latency, Performance bottlenecks and mitigation strategies, Reliability & Availability: Redundancy, replication, active-passive and active-active failover.	8 Hrs
Unit 5	**Basics of Data Management:** Relational Databases,NoSQL Databases, Partitioning and Sharding, Replication, Consistency Models, Data-Layer Performance Considerations	7 Hrs
Unit 6	**Theoretical Case Discussions on Small-Scale Systems:** Case Study 1: Library Management System, Case Study 2: E-Commerce Platform, Case Study 3: Chat / Messaging System, Visualization and Documentation.	7 Hrs

Text Books:

5. Mark Richards & Neal Ford, Fundamentals of Software Architecture, O'Reilly
6. Len Bass, Paul Clements & Rick Kazman, Software Architecture in Practice, Addison-Wesley
7. Ian Sommerville, Software Engineering, Pearson (or Pressman ,Software Engineering, A Practitioner's Approach)
8. Martin Kleppmann, Designing Data-Intensive Applications, O'Reilly
9. Martin L. Abbott & Michael T. Fisher , The Art of Scalability / Scalability Rules
10. sAlex Xu, System Design Interview (Vol. 1 & 2) / S. Narayanan , Grokking the System Design Interview

Reference Books:

1. Eric Evans, Domain-Driven Design, Addison-Wesley
2. Gregor Hohpe, Software Architecture: The Hard Parts, O'Reilly
3. George Coulouris et al., Distributed Systems: Concepts and Design
4. Andrew Tanenbaum, Modern Operating Systems (for scalability and reliability fundamentals

E Resources:

1. O'Reilly Online Learning Library – Software Architecture & Data-Intensive Applications, https://www.oreilly.com/online-learning/
2. ThoughtWorks Insights – Software Architecture Articles & Blogs https://www.thoughtworks.com/insights/architecture
3. Public GitHub Repositories for Architecture Diagrams & UML Models**,**https://github.com/topics/system-design, https://github.com/topics/uml

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3CS211DH2.1	2	2	1	–	1	–	–	–	–	–	1	2	2	–
3CS211DH2.2	2	3	3	2	2	–	–	–	–	–	2	2	3	–
3CS211DH2.3	2	3	3	2	3	–	–	–	–	–	2	2	3	–
3CS211DH2.4	2	3	3	3	3	1	–	–	–	–	2	2	3	1
3CS211DH2.5	2	2	2	1	2	–	–	–	–	–	1	2	2	–
3CS211DH2.6	2	3	3	3	2	2	1	–	–	1	3	2	3	2
3CS211DH2CO	2	3	3	2	3	2	1	–	–	1	2	2	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CS212PC1**			Course Category:	**PCC**
Course Name	**Theory of Computation**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

Course Description:
Subject Code 4CS212PC1 Theory of Computation is a compulsory Program Course for Second Year B. Tech, Computer Science & Engineering.

Course Objectives:
The Objective of this course is to develop the ability to model and analyze the behavior of abstract computing devices such as finite automata, pushdown automata, and Turing machines.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CS212PC1.1	Design DFA, NFA, and Mealy/Moore machines and apply minimization techniques for efficient computation.	C-6
4CS212PC1.2	Analyze regular expressions and grammars and show their equivalence with finite automata for language representation.	C-4
4CS212PC1.3	Develop and simplify CFGs and explain derivations, normal forms, and the Chomsky hierarchy for syntax analysis.	C-6
4CS212PC1.4	Design pushdown automata and establish equivalence with CFGs for parsing applications.	C-6
4CS212PC1.5	Apply Turing machines to construct and simulate computational models for problem solving.	C-3
4CS212PC1.6	Analyze decidability and undesirability of problems to understand computational limits.	C-4

Course Contents:

Unit 1	**Finite State Machines:** Alphabet, String, Formal and Natural Language, Operations, Definition and Design DFA (Deterministic Finite Automata), NFA (Non-Deterministic Finite Automata), Equivalence of NFA and DFA: Conversion of NFA into DFA, Conversion of NFA with epsilon moves to NFA, Minimization Of DFA, Definition and Construction of Moore and Mealy Machines, Inter conversion between	7 Hrs

	Moore and Mealy Machines. Minimization of Finite Automata. (Construction of Minimum Automaton).	
Unit 2	**Regular Expression and Regular Grammar:** Definition and Identities of Regular Expressions, Construction of Regular Expression of the given Language, Construction of Language from the RE, Conversion of FA to RE using Arden's Theorem, Inter-conversion RE to FA, Pumping Lemma for RL, Closure properties of RLs (proofs not required), Regular grammar, Equivalence of RG (RLG and LLG) and FA.	7 Hrs
Unit 3	**Context Free Grammar and Language:** Introduction, Formal Definition of Grammar, Notations, Derivation Process: Leftmost Derivation, Rightmost Derivation, Derivation Trees, Construction of Context-Free Grammars and Languages, Pumping Lemma for CFL, Simplification of CFG, Normal Forms (CNF and GNF), Chomsky Hierarchy.	7 Hrs
Unit 4	**Pushdown Automata:** Introduction and Definition of PDA, Construction of PDA, Acceptance of CFL, Equivalence of CFL and PDA: Inter-conversion, Introduction of DCFL and DPDA, Enumeration of properties of CFL, Context Sensitive Language, Linear Bounded Automata.	7 Hrs
Unit 5	**Turing Machines:** Formal definition of a Turing Machine, Design of TM, Computable Functions, Church's hypothesis, Counter machine, Variants of Turing Machines: Multi-tape Turing machines, Universal Turing Machine.	7 Hrs
Unit 6	**Decidability and Un-Decidability:** Decidability of Problems, Halting Problem of TM, Un-Decidability: Recursive enumerable language, Properties of recursive & non-recursive enumerable languages, Post Correspondence Problem, Introduction to Recursive Function Theory	7 Hrs

Text Books:

1. Hopcraft H.E. & Ullman J, Introduction to Automata Theory, Languages and Computation
2. Peter Linz, An Introduction to Formal Languages and Automata

Reference Books:

1. Rajesh K. Shukla, Theory of Computation, CENGAGE Learning, 2009.
2. K V N Sunitha and N Kalyani, Formal Languages and Automata Theory, McGraw Hill,2010
3. Lewis H.P. and Papadimition C.H., Elements of Theory of Computation
5. C. K. Nagpal, Formal Languages and Automata Theory, Oxford University Press, 2011.
6. Vivek Kulkarni, Theory of Computation, OUP India, 2013

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CS212PC1.1	3	2	3	2	1	-	-	-	-	-	1	3	2	1
4CS212PC1.2	3	3	2	2	1	-	-	-	-	-	1	3	2	1
4CS212PC1.3	3	3	2	2	1	-	-	-	-	-	1	3	2	1
4CS212PC1.4	3	3	3	2	1	-	-	-	-	-	1	3	3	1
4CS212PC1.5	3	3	3	2	2	-	-	-	-	-	1	3	3	1
4CS212PC1.6	3	3	2	2	1	-	-	-	-	-	2	3	2	1
4CS212PC1CO	3	3	3	2	1	-	-	-	-	-	1	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **4.5**	Course Code: **4CS213PC1**		Course Category: **PCC**		
Course Name	**Operating System**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	-	PA Marks	-	Total Marks	**100**

Course Description:
Subject Code 4CS213PC1 Operating System is a compulsory Program Core Course for Second Year B. Tech. Computer Science and Engineering.

Course Objectives:
The objective of this course is to understand core operating system functions, processes, memory, files, and devices and develop skills to solve problems in scheduling, synchronization, deadlocks, and system performance.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
4CS213PC1.1	Summarize OS concepts, structure, and process management to understand system operation.	C-2
4CS213PC1.2	Apply CPU scheduling algorithms for improving system performance.	C-3
4CS213PC1.3	Analyse synchronization issues and apply mechanisms to avoid deadlocks.	C-4
4CS213PC1.4	Compare memory management techniques for efficient memory use.	C-2
4CS213PC1.5	Describe file system structures and apply allocation methods for effective file storage.	C-2
4CS213PC1.6	Summarize I/O organization and apply disk scheduling for faster data access.	C-2

Course Contents:

Unit 1	**Introduction to OS** Introduction: Operating System definition, OS Evolution, Components and Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads	5 Hrs

Unit 2	**Process Scheduling :** Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue Scheduling	5 Hrs
Unit 3	**Process Synchronization:** Process Synchronization Basics: The Critical-Section Problem, Synchronization Hardware, Semaphores, Monitors, Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock	5 Hrs
Unit 4	**Memory Management:** Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation, Virtual Memory Management: Background, Demand paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing	5 Hrs
Unit 5	**File System:** File-System Interface; Directory Structure, File-System Mounting, File Sharing &Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management. File Recovery	5 Hrs
Unit 6	**I/O System:** I/O Systems: Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure	5 Hrs

Text Books:

1. Avi Silberschatz, P.B.Galvin, G.Gagne, “Operating System Concepts” (9/e) John-Wiley & Sons.

Reference Books:

1. A.S.Tanenbaum, “Modern Operating Systems” Pearson Education.
2. William Stallings, “Operating Systems” Prentice-Hall.
3. D. M. Dhamdhere, “Operating Systems” Tata McGraw-Hill.
4. P. Balkrishna Prasad, “Operating Systems” Scitech Publications (I) Pvt. Ltd.

E-Resources:

1. Topic: Operating System Concepts
   Link: https://www.tutorialspoint.com/operating_system/
2. Course: Operating System Fundamentals by Prof. Rajib Mall, IIT Kharagpur Link: https://nptel.ac.in/courses/106105214

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CS213PC1.1	3	2	2	1	1	-	-	-	1	1	1	2	2	1
4CS213PC1.2	3	3	3	2	1	-	-	-	1	1	1	3	3	1
4CS213PC1.3	3	3	3	2	2	-	-	-	1	1	1	3	3	1
4CS213PC1.4	3	2	2	2	2	-	-	-	1	-	1	2	2	1
4CS213PC1.5	3	2	2	2	2	-	-	-	1	-	1	2	2	1
4CS213PC1.6	3	2	2	2	2	-	-	-	1	-	1	2	2	1
4CS213PC1 CO	3	3	3	2	2	-	-	-	1	1	1	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CS214PC1**		Course Category: **PCC**		
Course Name	**Design & Analysis of Algorithm**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

Course Description:
Subject Code 4CS214PC1 Design & Analysis of Algorithm is a compulsory Program Core Course for Second Year B. Tech Computer Science & Engineering.

Course Objectives:
The objective of this course is to enable students to design, analyze, and evaluate efficient algorithms using key strategies and complexity analysis for effective problem solving.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CS214PC1.1	Analyze iterative and recursive algorithms using time estimation and order notations for efficiency evaluation.	C-4
4CS214PC1.2	Apply divide-and-conquer strategies to solve problems such as multiplication and convex hulls.	C-3
4CS214PC1.3	Solve optimization and multistage problems using dynamic programming techniques.	C-3
4CS214PC1.4	Solve multistage and optimization problems using dynamic programming techniques.	C-3
4CS214PC1.5	Apply backtracking for combinational search and traversal problems.	C-3
4CS214PC1.6	Evaluate sorting algorithms using time–space complexity and worst/average case analysis.	C-5

Course Contents:

Unit 1	Iterative Algorithm Design Issue Introduction, Use of Loops, Efficiency of Algorithms, Estimating & Specifying Execution Times, Order Notations.	5 Hrs
Unit 2	Divide And Conquer Introduction, Multiplication Algorithm and its analysis, Binary Search, Mergesort, Quick Sort, Convex Hulls.	5 Hrs
Unit 3	Greedy Methods Introduction, Knapsack Problem, Job sequencing with	5 Hrs

	deadlines, Minimum Spanning Trees, Prim's Algorithms, Kruskal's Algorithm.	
Unit 4	Dynamic Programming Introduction, Multistage Graphs, Traveling Salesman, Matrix multiplication, Single Source Shortest Paths.	5 Hrs
Unit 5	Backtracking Combinational Search, Search & Traversal, Backtracking Strategy, Backtracking Framework.	5 Hrs
Unit 6	Efficiency of Algorithm Polynomial Time & Non Polynomial Time, Efficiency of Recursion, Complexity, Time-Space Trade off.	5 Hrs

Text Books:

1. Dave and Dave, "Design and Analysis of Algorithms" Pearson Education.

Reference Books:

1. Aho, Hopcroft & Ullman, "The Design & Analysis of Computer Algorithms", Addison-Wesley.
2. G. Brassard, P.Bratley, "Fundamentals of Algorithmics" , PHI.
3. Horowitz & Sahani, " Fundamental Algorithms" , Galgotia.

E Resources:

1. Design & Analysis of Algorithm, OpenCourseware Link:https://ocw.mit.edu/courses/6-046j-design-and-analysis ofalgorithms- spring-2015/?
2. Introduction to Algorithms Link: https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-spring-2020/

Mapping of COs with POs

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	1	2	3
4CS214PC1.1	3	3	1	2	1	-	-	-	1	1	2	3	2	1
4CS214PC1.2	3	2	2	1	1	-	-	-	1	1	2	3	2	1
4CS214PC1.3	3	3	2	1	2	1	-	-	1	1	2	3	3	1
4CS214PC1.4	3	3	2	2	1	1	-	-	1	1	2	3	3	1
4CS214PC1.5	3	2	2	1	1	1	-	-	1	1	2	3	2	1
4CS214PC1.6	3	3	1	3	1	-	-	-	1	1	3	3	2	2
4CS214PC1CO	3	3	2	2	1	1	-	-	1	1	2	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code: **4CS215MD1**		Course Category: **MDM-II**		
Course Name	**Computer Architecture & Organization**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**-**	PA Marks	**-**	Total Marks	**50**

Course Description:
Subject Code 4CS215MD1 Computer Architecture & Organization is a compulsory Multi-Disciplinary Minor Course offered by the department of Computer Science & Engineering for other Second Year B.tech. Major discipline

Course Objectives:
The objective this course is to demonstrate understanding of Computer Architecture & Organization by explaining computer structure, processor arithmetic operations, addressing modes, and memory organization techniques.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
4CS215MD1.1	Understand and explain the basic structure of a computer, its functional units, memory addressing, and instruction sequencing for system design.	C-2
4CS215MD1.2	Analyze and explain memory hierarchy and processing unit operations to optimize system speed and efficiency.	C-4
4CS215MD1.3	Apply and execute arithmetic algorithms, interrupt handling, and DMA techniques for efficient I/O and computation to enhance I/O performance.	C-3

Course Contents:

Unit 1	**Basic Structure of Computer:** H/W & S/W: Functional Units, Bus structures, Addressing Methods and Machine Program Sequencing: Memory Locations, Addresses, Instruction and instruction sequencing, Addressing Modes. Basic I/O Operations.	09 Hrs.
Unit 2	**Memory & Processing Unit:** Basic Concepts, Memory Hierarchy, Semiconductor RAM Memories, Internal Organization of Memory Chips, Static Memories, Dynamic Memories, Read Only Memories, Speed, Size and Cost. Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Micro programmed Control, Microinstructions, and Micro program Sequencing.	11 Hrs.
Unit 3	**I/O Organization and Arithmetic** Accessing I/O Devices, Interrupts, Enabling and Disabling Interrupts, Handling Multiple Devices, DMA, Design of Fast Adders, Signed Addition and Subtraction, Multiplication of Positive Numbers, Restoring and Non-Restoring Division	10 Hrs.

Text Books:

1. Carl Hamacher, Zvonko Vranesic, and Safwat Zaky, Computer Organization, 5th Edition, McGraw Hill.
2. William Stallings**,** Computer Organization and Architecture: Designing for Performance, 10th Edition, Pearson.

Reference Books:

1. William Stallings, Computer Organization and Architecture: Designing for Performance‖, Eighth Edition, Pearson.
2. John P. Hayes, Computer Architecture and Organization‖, McGraw Hill Publication.
3. DA Patterson and JLHennessy, Computer Organization and Design, Morgan Kaufmann Publisher, 2nd edition
4. A.S. Tanenbaum, "Structured Computer Organization", PHI Publication.

E Resources:

1. Lecture notes – “COMPUTER ORGANISATION” (PDF) covering memory organisation, arithmetic and I/O. mrecacademics.com+1
2. Chapter on Input-Output Organisation (PDF) – covers accessing I/O devices, interrupts, DMA etc. Jagdish Kapadnis+1
3. Online tutorial – “Computer Organization & Architecture” on GeeksforGeeks, with modules including CPU, memory, buses and I/O. GeeksforGeeks
4. Online course – “Computer Architecture” on Coursera (free to audit) covering modern architecture, useful for advanced context. Coursera
5. ARM Education Kit – teaching materials for architecture including memory, control units and I/O. arm.com

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CS215MD1.1	3	2	2	1	2	–	–	1	1	–	2	2	2	1
4CS215MD1.2	3	3	2	2	3	–	–	1	1	–	2	3	3	1
4CS215MD1.3	3	3	3	2	3	–	–	2	2	1	2	3	3	2
4CS215MDCO	3	3	3	2	3	–	–	1	1	1	2	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	4SH216OE1	Course Category:	OE
Course Name	**Quantitative and Logical Reasoning**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 4SH216OE1 Quantitative and Logical Reasoning is a compulsory Open Elective Course for the Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the Course is to develop quantitative aptitude, logical reasoning, problem-solving efficiency, and decision-making skills for placements, competitive exams, and real-life applications

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE1.1	Apply arithmetic and numerical techniques to solve quantitative problems accurately.	C-3
4SH216OE1.2	Solve algebraic and equation-based problems using simplification and approximation methods to improve problem-solving efficiency.	C-3
4SH216OE1.3	Analyze logical reasoning problems using structured and critical thinking approaches to improve decision-making skills.	C-4
4SH216OE1.4	Interpret and analyze data using graphical and tabular methods for decision making for strategic planning.	C-4
4SH216OE1.5	Solve complex logical puzzles and advanced reasoning problems efficiently for competitive examination success.	C-3
4SH216OE1.6	Demonstrate effective aptitude test strategies integrating quantitative and logical reasoning skills for career advancement opportunities.	C-3

Course Contents:

Unit 1	**Number System & Arithmetic Foundations:** Number system fundamentals; LCM and HCF applications; divisibility rules; percentage calculations; ratio and proportion; averages; profit and loss; simple and compound interest; speed mathematics and shortcut techniques.	7Hrs
Unit 2	**Algebra, Equations & Simplification Techniques:** Linear and quadratic equations; algebraic expressions; simplification and approximation; indices and surds; inequalities; time and work; pipes and cisterns; time, speed and distance; mixtures and allegation.	7 Hrs
Unit 3	**Logical Reasoning: Analytical & Critical Thinking:** Coding–decoding; blood relations; direction sense; series and pattern recognition; analogies; ranking and ordering; syllogisms; statement and assumption; statement and conclusion; cause–effect reasoning.	7 Hrs
Unit 4	**Data Interpretation & Analytical Aptitude:** Tables; pie charts; line graphs; bar graphs; caselets; data sufficiency; DI shortcut techniques; approximation in data interpretation; comparative and predictive data analysis.	8Hrs
Unit 5	**Advanced Logical Reasoning & Puzzle Solving:**Seating arrangements (linear, circular, and complex); floor-based puzzles; scheduling puzzles; selection-based puzzles; Venn diagrams; logical grouping; critical reasoning frameworks	8 Hrs
Unit 6	**Placement Aptitude Mastery & Test Strategies:** Integrated quantitative and logical reasoning practice; decision-making and elimination strategies; speed improvement techniques; mock placement aptitude patterns (TCS, Infosys, Wipro, Accenture, Capgemini); common error analysis; test-taking strategies; aptitude and reasoning simulations.	8 Hrs

Text Books:

1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing
2. Arun Sharma, Logical Reasoning and Data Interpretation, McGraw Hill

Reference Books:

1. Arun Sharma, How to Prepare for Quantitative Aptitude,published by McGraw Hill Education.
2. R.S. Aggarwal, A Modern Approach to Logical Reasoning, published by S. Chand Publishing
3. M.K. Pandey, Analytical Reasoning, published by BSC Publishing Co. Pvt. Ltd.
4. Rajesh Verma, Fast Track Objective Arithmetic, published by Arihant Publications

E Resources:
1. NPTEL – Quantitative Aptitude & Logical Reasoning Courses
2. IndiaBIX – Quantitative and Logical Reasoning Practice
3. CareerRide – Aptitude Preparation Modules
4. PrepInsta / HackerEarth – Placement Aptitude Practice Platforms

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4SH216OE1.1	3	3	2	–	–	–	–	–	–	–	–	2	3	1
4SH216OE1.2	3	3	2	–	–	–	–	–	–	–	–	3	2	1
4SH216OE1.3	–	3	3	–	–	–	–	–	–	–	–	2	3	2
4SH216OE1.4	–	3	2	–	–	–	–	–	–	–	–	3	3	2
4SH216OE1.5	–	3	3	–	–	–	–	–	–	–	–	2	3	2
4SH216OE1.6	–	3	2	–	–	–	–	–	–	2	3	2	3	2
4SH216OE1 CO	1	3	3	–	–	–	–	–	–	1	1	2	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4SH216OE2**	Course Category:	**OE**
Course Name	**Critical Thinking & Decision Making**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 4SH216OE2 Critical Thinking & Decision Making is a compulsory Open Elective Course forSecond Year B. Tech All Branch Students.

Course Objectives:
The objective of this course is to develop critical thinking and decision-making competencies by strengthening analytical reasoning and structured problem-solving skills applicable to professional and real-world situations.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE2.1	Apply critical thinking frameworks to analyze problems systematically.	C-3
4SH216OE2.2	Evaluate information, assumptions, and arguments for logical consistency and validity.	C-5
4SH216OE2.3	Analyze complex situations and identify feasible alternatives for decision making.	C-4
4SH216OE2.4	Design rational and ethical decision-making strategies under uncertainty to ensure sustainable organizational outcomes.	C-6 A-3
4SH216OE2.5	Apply quantitative and qualitative tools to support decision-making processes.	C-3
4SH216OE2.6	Demonstrate effective decision making in simulated professional and team-based scenarios to resolve workplace challenges effectively	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundations of Critical Thinking:** Concept of critical thinking; elements of reasoning; logical vs illogical thinking; assumptions and inferences; inductive and deductive reasoning; common cognitive biases; barriers to critical thinking.	7Hrs

Unit 2	**Analytical Reasoning & Problem Framing:** Problem identification and structuring; root cause analysis; issue trees; questioning techniques; systems thinking; analytical reasoning models.	7 Hrs
Unit 3	**Decision Making Models & Techniques:** Rational decision-making model; intuitive decision making; bounded rationality; decision trees; cost–benefit analysis; risk and uncertainty; heuristics.	7 Hrs
Unit 4	**Data-Driven & Ethical Decision Making:** Use of data in decision making; qualitative vs. quantitative data; basic decision matrices; ethical frameworks; professional ethics; social and environmental considerations in decisions.	8Hrs
Unit 5	**Creativity, Innovation & Strategic Thinking:** Creative thinking techniques; lateral thinking; design thinking approach; scenario planning; strategic decision making; innovation in problem solving.	8 Hrs
Unit 6	**Applied Decision Making & Case Analysis:** Case studies from industry and management; individual and group decision simulations; conflict resolution through decision frameworks; decision-making under pressure; reflection and feedback	8 Hrs

Text Books:

1.Alec Fisher, Critical Thinking, published by Cambridge University Press.
2. John Adair, Decision Making and Problem Solving, published by Kogan Page.

Reference Books:

1Daniel Kahneman, Thinking, Fast and Slow published by Farrar, Straus and Giroux.
2. Rolf Dobelli, The Art of Thinking Clearly,published by Sceptre.
3. John S. Hammond, Ralph L. Keeney, Howard Raiffa, Smart Choices, published by Harvard Business School Press.
4. Ken Watanabe, Problem Solving 101, published by Portfolio.

E Resources:

1. NPTEL – Critical Thinking &Decision Making Courses
2. Coursera – Critical Thinking and Decision-Making Modules
3. Harvard Business Review – Decision Making Articles
4. MIT OpenCourseWare – Decision Analysis

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH216OE2.1	2	3	2	–	–	–	–	–	–	–	–	3	2	2
4SH216OE2.2	–	3	3	–	–	–	–	–	–	–	–	3	2	2
4SH216OE2.3	–	3	2	–	–	–	–	–	–	–	–	3	3	2
4SH216OE2.4	–	3	3	–	–	2	3	–	–	–	–	2	3	3
4SH216OE2.5	–	2	2	–	2	–	–	–	–	–	–	3	3	2
4SH216OE2.6	–	2	2	–	–	2	–	2	2	–	2	3	3	3
4SH216OE2. CO	1	3	3	-	1	1	1	1	1	-	1	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CS217PC1**		Course Category: **PCC**		
Course Name	**Operating System Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	**-**
Total Credit Hours	**30 Hrs**				
SEE Marks	**-**	SEE Time	**-**	CIA Marks	**-**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 4CS217PC1 Operating System Lab is a compulsory Program Core Course for Second Year B.Tech. Computer Science and Engineering.

Course Objectives:

The objective of the course is to enhance understanding of processes, threads, memory management, CPU scheduling, synchronization, and file systems by enabling learners to implement and analyse these mechanisms directly.

Course Outcomes:

After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
4CS217PC1.1	Apply Linux commands and system-level C programming to manage files, processes, threads, and synchronization.	C-3
4CS217PC1.2	Analyze and simulate CPU scheduling, memory management, and page replacement algorithms to evaluate system performance.	C-4
4CS217PC1.3	Implement file allocation, disk scheduling, and deadlock avoidance techniques to ensure efficient and safe OS operations.	C-6

List of Practical's:

Minimum 10 practicals from the list mentioned below.

1. To study Linux Operating System along with its installation.
2. To Study and Execute basic file commands and process related open source Ubuntu commands
3. Commands to view all executing, block and suspended process, Command to check and change the priority of process CPU utilization for executing processes, other basics commands related to processes
4. Write a program for multithreading using C.
5. To simulate First Come First Serve & Shortest Job First process scheduling algorithm
6. To simulate Shortest Job First process scheduling algorithm
7. To implement Round Robin Process scheduling Algorithm
8. To implement and analyze multi-level queue scheduling algorithm
9. To implement all page replacement policies.

10. To implement Dining-Philosophers problem to deal with concurrency control mechanism.
11. To implement All Disk Scheduling algorithm
12. To simulate Bankers algorithm for deadlock avoidance

E Resources:

1. Topic: Operating System Concepts
   Link: https://www.tutorialspoint.com/operating_system/
2. Course: Operating System Fundamentals by Prof. Rajib Mall, IIT Kharagpur
   Link: https://nptel.ac.in/courses/106105214

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CS217PC1.1	3	2	3	2	2	-	-	1	1	1	1	3	2	1
4CS217PC1.2	3	3	3	3	2	-	-	1	1	1	1	3	3	1
4CS217PC1.3	3	2	3	2	2	-	-	1	1	1	1	3	3	2
4CS217PC1 CO	3	2	3	2	2	-	-	1	1	1	1	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CS218PC1**		Course Category: **PCC**		
Course Name	**Design & Analysis of Algorithm Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**-**
Total Credit Hours	**30 Hrs**				
SEE Marks	**-**	SEE Time	**-**	CIA Marks	**-**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 4CS218PC1Design & Analysis of Algorithm Lab is a compulsory Program Core Course for Second Year B. Tech Computer Science & Engineering.

Course Objectives:

The objective of this course is to enable students to design, analyze, and evaluate efficient algorithms using key strategies and complexity analysis for effective problem solving.

Course Outcomes:

After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
4CS218PC1.1	Implement searching, sorting, matrix multiplication, and basic optimization algorithms using C with correct recursive and divide-and-conquer techniques.	C-3, P-4, A-2
4CS218PC1.2	Apply greedy and graph algorithms (Kruskal, Prim, Dijkstra, BFS, DFS, Floyd-Warshall) to solve MST and shortest-path problems through effective programming.	C-3, P-4, A-2
4CS218PC1.3	Analyze algorithm performance by comparing time complexity, behavior, and correctness for different inputs.	C-4, P-5, A-3

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Implement C programs to perform recursive calls using the following searching algorithms. 1. Linear Search when the list is given. 2. Binary Search when the given list is not sorted.
2. Study and analyze to sort an array of integers using merge sort.
3. Implement and analyze to sort an array of integers using quicksort.
4. Write a C program for Implementing (n X n) matrix multiplication using the Strassen matrix multiplication algorithm.
5. Explain the knapsack algorithm to find an optimal solution of getting maximum profit and implement using the program.
6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm and implement using C.

7. Implement programs to find minimum cost spanning trees from a given graph using Prim's algorithm.
8. Implement Prim's algorithm to find the Minimum Cost Spanning Tree of an undirected graph using the program.
9. Develop a program to implement Floyd's algorithm which will produce the shortest distance between all vertex pairs of a weighted graph.
10. Implement programs to find the shortest path in a given graph using Dijkstra's algorithm.

E Resources:

1. Introduction to Algorithms (CLRS) Link: https://edutechlearners.com /download/Introduction_to_algorithms-3rd%20Edition.pdf
2. Introduction to Algorithms Link: https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-spring-2020/

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CS218PC1.1	3	2	2	1	3	–	–	–	2	1	1	3	2	1
4CS218PC1.2	3	3	3	2	3	–	–	–	2	1	1	3	3	1
4CS218PC1.3	3	3	2	2	3	–	–	–	3	2	1	3	3	2
4CS218PC1CO	3	3	3	2	3	–	–	–	2	1	1	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:**5**	Course Code: **4CS219VS1**		Course Category: **VSC**		
Course Name	**Programming Laboratory –II (Web Designing Lab)**				
Credits	**02**	Total L:T:P etc. Hours	0:0:4 **60 Hrs**	Total SL Hours	**-**
Total Credit Hours	**60 Hrs**				
SEE Marks	**-**	SEE Time	**-**	CIA Marks	**-**
EE Marks	**-**	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 4CS219VS1 Programming Laboratory –II (Web Designing Lab) is a Vocational Skill Course for Second Year B.Tech Computer Science and Engineering.

Course Objectives:
The objective of the course is to introduce the fundamental web technologies and PHP programming for handling forms, performing computations, managing files, and designing interactive web pages and to develop, analyse, and implement dynamic web applications using authentication, sessions, cookies, CSS styling, and database connectivity with proper testing and documentation.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CS219VS1.1	Understand basic web technologies, HTML, PHP syntax, and file handling to create simple dynamic pages.	C-2, P-6, A-4
4CS219VS1.2	Analyse and implement authentication, sessions, cookies, and input validation to ensure secure and accurate web applications.	C-4, P-3, A-1
4CS219VS1.3	Design modular PHP web applications using CSS, file operations, and proper testing to build usable and creative websites.	C-6, P-5, A-5

List of Practical's:
Minimum eight practical's from the list mentioned below.

1. Get name of the user from a form and show greeting text.
2. Write a PHP program for mathematical calculation and to manipulate arrays.
3. Write a program for display our personal information using various tags in PHP, HTML.
4. Create a php program for login page A) with SQL connection B) Without using SQL connection.
5. Write a program for display the date and time and create a php program for displaying our curriculum vitae.

6. Write a program for counting the visiting page using cookie.
7. Write a php program to Read from existing file and Write a php program to write a file.
8. Write a PHP program demonstrating the use of CSS for styling.
9. Create a web page for software company websites.
10. Create a PHP page for login system using session.

Text Books:

1. Vikram Vaswani, PHP and MySQL for Beginners.
2. Stevan Holzer, PHP (Complete Reference).

Reference Books:

1. Vikram Vaswani, PHP: A Beginner's Guide (Indian Edition), Tata McGraw Hill
2. Vijay Joshi, PHP Programming Lab Manual, TechMax Publications

E Resources:

1. PHP Spoken Tutorial (IIT Bombay), https://spoken-tutorial.org/tutorial-search/?search_foss=PHP
2. .PHP Lab Manuals (PDFs), https://www.msubaroda.ac.in/academics/syllabus
3. https://www.vlab.co.in/?utm_source=chatgpt.com
4. https://spoken-tutorial.org/?utm_source=chatgpt.com
5. https://swayam.gov.in

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CS219VS1.1	3	2	2	2	3	1	1	1	2	1	2	3	2	1
4CS219VS1.2	3	3	3	3	2	1	1	2	3	2	2	3	3	2
4CS219VS1.3	2	2	3	2	3	2	1	2	2	2	1	3	3	2
4CS219VS1CO	2	2	3	2	3	1	1	2	2	2	2	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**4SH220AE1**	Course Category:	**AEC**
Course Name	**Technical Writing**			
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours	**15 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 4SH220AE1 Technical Writing is common Ability Enhancement Course for Second Year B. Tech.

Course Objectives:
The objective of the course is to enhance students' ability to write effective technical documents, professional correspondence, and research-oriented content with clarity, accuracy, and ethical standards.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH220AE1.1	Apply principles of technical writing in engineering documents.	C-3 P-2 A-2
4SH220AE1.2	Apply technical writing skills to prepare professional documents.	C-4 P-2 A-2
4SH220AE1.3	Create ethical, well-structured technical and research documents using IEEE referencing for professional and academic communication.	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Technical Writing:** Nature and importance of technical communication, characteristics of technical writing, audience analysis, technical vocabulary, grammar and style, clarity and conciseness, paragraph structure, coherence, technical descriptions, instructions and manuals.	7 Hrs
Unit 2	**Professional and Research Writing:** Technical reports and documentation, structure of reports, abstracts and summaries, research papers, project proposals, resumes and cover letters, business emails, documentation ethics, plagiarism, referencing styles (IEEE), editing and proofreading.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.
1. Analysis of Technical Communication to Identify the nature, purpose of given technical documents and evaluate their effectiveness.

2. Editing technical text for clarity and brevity
3. Technical description of an engineering device/system
4. Writing step-by-step technical instructions
5. Preparation of structured technical reports
6. Resume and cover letter drafting
7. Technical report writing based on laboratory work, case study, or project work
8. Abstract and executive summary writing for technical documents
9. Referencing and citation using IEEE format
10. Editing, proofreading, and plagiarism check of technical documents

Text Books:

1. Rizvi A. M. & Patnaik P., Effective Technical Communication, McGraw Hill Education (India), New Delhi (Second Edition).
2. Verma S., Technical Communication for Engineers, Vikas Publishing House Pvt. Ltd., New Delhi (First Edition).
3. Misra P. & Tyagi K., Advanced Technical Communication, PHI Learning Pvt. Ltd., New Delhi (Second Edition).

Reference Books:

1. Chauhan G. S., Kashiramka S. & Thimmesha L., Technical Communication, Cengage Learning India Pvt. Ltd., New Delhi (First Edition).
2. Alred G. J., Brusaw C. T. & Oliu B., Handbook of Technical Communication, Oxford University Press, New Delhi (Second Edition).
3. IEEE Editorial Style Manual, IEEE Standards Association, IEEE, USA (Latest Edition).
4. Joseph G. & Joseph B., Grammar and Usage for Technical Communication, Cambridge University Press India, Delhi (First Edition).

E Resources :

1. NPTEL–SWAYAM, IIT Roorkee, Technical Communication for Engineers.
2. https://owl.purdue.edu
3. https://ieeeauthorcenter.ieee.org

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH220AE1.1	-	-	-	-	-	-	-	-		3	-	2	2	1
4SH220AE1.2	-	-	-	-	-	-	-	-	3	3	-	1	3	2
4SH220AE1.3	-	-	-	-	-	-	-	3		3	3	3	3	3
4SH220AE1 CO	-	-	-	-	-	-	-	1	1	3	1	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4SH221EM1**			Course Category:	**EEM**
Course Name	**Fundamentals Of Book Keeping And Accounting**				
Credits	**02**	Total L:T:P etc. Hours	1:0:2 **45 Hrs**	Total SL Hours	**15 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	-	SEE Time	-	CIA Marks	-
EE Marks	-	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 4SH221EM1 Fundamentals of Book Keeping and Accounting is a compulsory Skill Enhancement Course for Second Year B.Tech. Computer Science and Engineering.

Course Objectives:
The objective of this course is to provide students with a strong foundation in basic accounting principles and bookkeeping techniques.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH221EM1.1	Understand and follow the Concepts and Principles of Bookkeeping	C-2
4SH221EM1.2	Apply and perform the Double-Entry System of Accounting	C-3
4SH221EM1.3	Understand and execute Financial Statements.	C-3

Course Contents:

Unit 1	**Fundamentals of Bookkeeping** Concept and Principles of Bookkeeping: Definition and objectives of bookkeeping, Difference between bookkeeping and accounting Types of accounts: Real, Personal, and Nominal, The Golden Rules of Accounting Bookkeeping Terminology: Key terms: Assets, Liabilities, Owner's Equity, Revenues, Expenses, Understanding Debits and Credits.	7 Hrs
Unit 2	**Basics Of Accounting** The Accounting Cycle: Steps in the accounting cycle, Journalizing transactions, Posting to the ledger, Trial balance preparation Source Documents and Books of Accounts: Types of source documents (Invoices, Receipts, Bank statements) Primary books: Cash Book, Purchase Book, Sales Book, Journal Book Double-Entry System of Accounting: Introduction to the	8 Hrs

	double-entry system, Understanding dual aspect concept, Practical examples of double-entry Introduction to Financial Statements: Purpose and types of financial statements, Understanding Profit and Loss Account (Income Statement),Balance Sheet (Statement of Financial Position) Preparation of Financial Statements: Preparing a Trading Account, Preparing a Profit and Loss Account, Preparing a Balance Sheet.	

List of Practical's:

Minimum eight practicals from the list mentioned below

1. Understand how to record transactions in the journal.
2. Learn how to transfer entries from the journal to the ledger.
3. Understand how to prepare a trial balance and ensure the books are balanced.
4. Record cash receipts and payments in a cash book.
5. Identify and use source documents to record transactions.
6. Learn to record credit sales and credit purchases in their respective books.
7. Understand and apply the double-entry accounting system.
8. Prepare the profit and loss account and balance sheet based on financial data.
9. Focus on recording and posting nominal accounts like expenses, revenues, and gains or losses.
10. Calculate gross profit or loss by preparing a Trading Account.

Text Books:

1. B.S.Khanna, I.M.Pandey,G.K.Ahuja,S.C.L.Batra, Practical Costing.
2. B.K.Bhar, Cost Accounting.

Reference Books:

1. N.M.Soni, Introduction to Accounting.
2. T.S.Grewal, Principles of Accounting.
3. N.P.Jain, Basic Accounting.

E- Resources:

1. https://www.icai.org
2. https://www.khanacademy.org/college-careers-more/personal-finance/pf-accounting
3. https://quickbooks.intuit.com
4. https://training.sap.com
5. https://www.inflibnet.ac.in

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH221EM1.1	3	3	2	2	2	-	-	1	-	-	-	1	2	2
4SH221EM1.2	2	2	-	2	3	-	-	2	1	1	-	2	2	2
4SH221EM1.3	2	-	-	-	2	2	-	-	-	-	-	1	2	2
4SH221EM1CO	2	2	1	1	2	1	1	1	-	-	-	1	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CE222VE1**		Course Category: **VEC**		
Course Name	**Environmental Science**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:
Subject Code 4CE222VE1 Environmental Science is a Value Education course for Second Year B. Tech Computer Science & Engineering.

Course Objectives:
The objective of this course is to develop understanding of environmental systems, natural resource management, ecological balance, and sustainable development practices to promote awareness and responsibility toward environmental protection and societal well-being.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE222VE1.1	Analyze renewable and non-renewable natural resources and associated problems to promote sustainable utilization for future generations.	C-4
4CE222VE1.2	Analyze food chains, webs, and ecological pyramids to evaluate ecological interactions and succession processes.	C-4
4CE222VE1.3	Examine shift from unsustainable to sustainable development to promote responsible resource planning for society.	C-3

Course Contents:

Unit 1	Renewable and non-renewable resources Environmental Science, Definition, scope and importance, Need for public awareness, Renewable and non-renewable resources, Natural resources and associated problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life styles.	10 hrs
Unit 2	**Ecosystem:** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of	10 hrs

	the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem.	
Unit 3	**Social Issues & Environment:** From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions, Environment Protection Act. Air (Prevention and Control of Pollution) Act., Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, public awareness.	10 hrs

Text Books:

1. Suresh K. Dhameja, Environmental Studies, Katson Books
2. Benny Joseph, Environmental Studies, McGraw Hill Education

Reference Books:

1. Masters & Wendell Ela, Introduction to Environmental Engineering and Science, Pearson Education
2. William Cunningham & Mary Cunningham, Environmental Science, McGraw Hill

E Recourses:

https://www.vlab.co.in/broad-area-civil-engineering

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE222VE1.1	3	2	-	-	-	2	2	-	-	-	-	-	-	-
4CE222VE1.2	3	2	-	-	-	3	2	-	-	-	-	-	1	-
4CE222VE1.3	3	2	-	-	-	3	3	-	-	-	-	-	1	-
4CE222VE1.CO	3	2	-	-	-	3	3	-	-	-	-	-	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CS223DH1**		Course Category: **DH**		
Course Name	**Intrusion Detection & Prevention System**				
Credits	**04**	Total L:T:P etc. Hours	3:0:0 **60 Hrs**	Total SL Hours	**60 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

Course Description:
Subject Code 4CS223DH1 Intrusion Detection & Prevention System is a compulsory Double Minor / Honours Course offered by the department of Computer Science and Engineering for Second Year B.Tech., of all discipline.

Course Objectives:
The objective of this course is to provide in-depth knowledge of intrusion detection and prevention techniques, including attack modeling, IDS/IPS architectures, detection methods, log analysis, and real-world IDPS deployment.

Course Outcomes:
After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3CS211DH1.1	Explain intrusion types, attack patterns, and threat modeling techniques to understand advanced cyber threats.	C-2
3CS211DH1.2	Analyze IDS and IPS architectures and detection methodologies for effective intrusion detection.	C-5
3CS211DH1.3	Apply signature-based, anomaly-based, and hybrid detection techniques to identify intrusions accurately.	C-3
3CS211DH1.4	Evaluate IDS/IPS tools for network, host, and cloud environments to select appropriate security solutions.	C-4
3CS211DH1.5	Analyze logs, alerts, and traffic data to detect and respond to intrusions.	C-2
3CS211DH1.6	Assess real-world intrusion cases and design mitigation strategies for improved system security.	C-5

Course Contents:

Unit 1	**Intrusion Concepts and Threat Modeling** Intrusion definition and classification, Difference between attacks, intrusions, and incidents, Threat modeling and attack surfaces, Cyber kill chain and MITRE ATT&CK framework, Advanced persistent	10 Hrs

	threats (APT), Attack vectors beyond basic network security	
Unit 2	**IDS and IPS Architectures** Intrusion Detection vs Intrusion Prevention Systems, Host-Based IDS (HIDS), Network-Based IDS (NIDS), Inline vs passive deployment, IDS/IPS placement strategies, Performance and scalability challenges	10 Hrs
Unit 3	**Detection Techniques and Algorithms** Signature-based detection, Anomaly-based detection, Specification-based detection, Statistical models for intrusion detection, Machine learning techniques for IDS, False positives, false negatives, and tuning IDS rules	10 Hrs
Unit 4	**IDS/IPS Tools and Technologies** Snort architecture and rule writing, Suricata features and performance comparison, OSSEC and Wazuh for host-based detection, SIEM integration with IDS/IPS, Cloud-based IDPS solutions, IDS in SDN and virtualized networks	10 Hrs
Unit 5	**Log Analysis, Incident Response & Prevention** Network traffic analysis, Log correlation and alert management, Incident response workflow, Automated blocking and prevention mechanisms, Forensics basics in intrusion analysis, Security orchestration and response (SOAR)	10 Hrs
Unit 6	**Case Studies and Emerging Trends** Enterprise intrusion case studies, Web application intrusion scenarios, Insider threat detection, AI-driven intrusion detection, Zero Trust and adaptive security Future challenges in intrusion prevention	10 Hrs

Text Books:

1. Rebecca Gurley Bace & Peter Mell, Intrusion Detection Systems, Pearson Education.
2. Earl Carter & Jonathan Hogue, Intrusion Prevention Fundamentals, Cisco Press.
3. Richard Bejtlich, The Practice of Network Security Monitoring, No Starch Press.

Reference Books:

1. Rafeeq Rehman, Intrusion Detection with Snort, Prentice Hall.
2. Tao Peng, Machine Learning for Intrusion Detection, Springer.
3. Wenliang Du, Computer & Internet Security, Pearson.

E Resources:

1. NPTEL – Advanced Network & Intrusion Detection Courses
   https://nptel.ac.in
2. Cisco Networking Academy – Cybersecurity & IDPS
   https://www.netacad.com
3. OWASP – Attack Detection & Prevention
   https://owasp.org
4. MITRE ATT&CK Framework
   https://attack.mitre.org

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CS211DH1.1	2	2	2	–	–	–	–	–	–	–	–	2	–	1
3CS211DH1.2	3	3	2	2	2	–	1	–	–	–	–	3	2	–
3CS211DH1.3	3	3	3	2	3	–	–	–	–	–	–	3	3	2
3CS211DH1.4	2	3	3	3	3	1	–	–	–	–	–	2	3	1
3CS211DH1.5	2	3	2	3	3	1	–	–	–	–	–	2	3	1
3CS211DH1.6	2	3	3	3	2	2	1	–	–	1	2	2	3	2
3CS211DH1CO	3	3	3	3	3	2	1	–	–	1	2	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CS223DH2**		Course Category: **DH**		
Course Name	**Software Testing**				
Credits	**04**	Total L:T:P etc. Hours	4:0:0 **60 Hrs**	Total SL Hours	**60 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**-**	PA Marks	**-**	Total Marks	**100**

Course Description:
Subject Code 4CS223DH2 Software Testing is a compulsory Double Minor / Honours Course offered by the department of Computer Science and Engineering for Second Year B.Tech., of all discipline.

Course Objectives:
The course aims to build a strong foundation in software verification, validation, and testing techniques. It also focuses on assessing non-functional aspects such as performance, security, and usability.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CS223DH2.1	Define errors, faults, failures and verification vs validation to understand software defects and QA basics.	C-2
4CS223DH2.2	Distinguish unit, integration, system, acceptance, regression testing for choosing correct testing levels.	C-2
4CS223DH2.3	Apply equivalence partitioning and boundary value analysis to design black-box test cases.	C-3
4CS223DH2.4	Use path coverage and cyclomatic complexity for effective white-box testing.	C-3
4CS223DH2.5	Explain test automation need, benefits, challenges to improve testing speed and reliability.	C-2
4CS223DH2.6	Describe performance, security, and usability testing for ensuring non-functional quality.	C-2

Course Contents:

Unit 1	**Introduction to Testing:** Definition of errors, faults, and failures, Types of software errors (logical, syntax, runtime),Sources of faults in software development, Difference between verification and validation, Static vs. dynamic testing techniques Importance of early testing in SDLC, Cost of defect detection at different phases, Quality assurance vs quality control, Role of standards in QA (ISO,	10 Hrs

	IEEE),Process-oriented vs product-oriented approaches, Testing principles (early testing, defect clustering, pesticide paradox)	
Unit 2	**Testing Levels :** Unit testing: drivers, stubs, isolation of modules, Integration testing: incremental and non-incremental strategies, System testing: functional, non-functional, recovery and compatibility checks, Acceptance testing: user acceptance, contract and regulatory compliance, Regression testing : automation in regression, selection of regression test suite, Continuous testing in DevOps pipelines, End-to-end workflow validation, Smoke and sanity testing, Differences between alpha, beta testing.	10 Hrs
Unit 3	**Black-box Testing:** Equivalence partitioning: dividing input domains, Boundary value analysis: edge condition testing, Decision table testing: rules and outcomes, State transition testing: events and states, Use-case based testing, Error guessing technique, Random testing methods, Exploratory testing approaches, Advantages and limitations of black-box testing, Guidelines for effective test case design, Comparison of black-box and white-box testing techniques.	10 Hrs
Unit 4	**White-box Testing:** tatement coverage: executing all statements, Branch coverage: decision points, Path coverage: independent paths, Cyclomatic complexity: measuring control flow complexity, Loop testing techniques, Condition coverage and multiple condition coverage, Basis path testing, Control flow graph construction, Data flow testing, Mutation testing, Advantages and limitations of white-box testing, Comparison with black-box testing techniques.	10 Hrs
Unit 5	**Test Automation Concepts:** Need for automation: efficiency, repeatability, Benefits: faster execution, reliability, reusability, Challenges: maintenance, tool selection, cost, Overview of tools: JUnit, Selenium, TestNG, Framework design and architecture for automation, Continuous integration and automated testing pipelines, Test script maintenance and version control, Limitations of test automation, Criteria for selecting automation tools.	10 Hrs
Unit 6	**Non-functional Testing:** Performance testing: load, stress, scalability, Security testing: vulnerabilities, penetration testing, Usability testing: user experience evaluation, Test metrics: defect density, coverage, reliability metrics, Reliability testing and recovery testing, Compatibility testing across platforms and environments, Maintainability and	10 Hrs

	portability testing, Scalability and endurance testing, Accessibility testing for differently abled users, Compliance testing with standards and regulations, Importance of monitoring and reporting in non-functional testing, Tools and frameworks for non-functional testing.	

Text Books:

1. Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black – Foundations of Software Testing
2. Srinivasan Desikan, Gopalaswamy Ramesh – Software Testing: Principles and Practice
3. Richard Szeliski – Computer Vision: Algorithms and Applications
4. Srinivasan Desikan, Gopalaswamy Ramesh – Software Testing: Principles and Practice

Reference Books:

1. Glenford J. Myers, The Art of Software Testing
2. Mauro Pezze, Michal Young, Software Testing and Analysis
3. Paul Ammann, Jeff Offutt, Introduction to Software Testing (Cambridge University Press)
4. Aditya P. Mathur, Foundations of Software Testing (Pearson)

E Resources:

1. Course Introduction to Software Testing – NPTEL (Prof. Rajiv Misra, IIT Patna) https://nptel.ac.in/courses/106105150
2. Black-box & White-box Testing Techniques – GeeksforGeeks Tutorials https://www.geeksforgeeks.org/software-testing-basics

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CS223DH2.1	2	2	–	–	–	–	–	–	–	–	1	2	1	–
4CS223DH2.2	2	2	1	–	–	–	–	–	–	–	1	2	2	–
4CS223DH2.3	3	3	2	–	2	–	–	–	–	–	1	3	3	–
4CS223DH2.4	3	3	2	2	2	–	–	–	–	–	1	3	3	–
4CS223DH2.5	2	2	1	–	2	–	–	–	–	–	2	2	2	1
4CS223DH2.6	2	3	2	2	2	2	1	–	–	–	2	2	3	2
4CS223DH2CO	3	3	2	2	2	2	1	–	–	–	2	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **5CS224EC1**		Course Category: **EC**		
Course Name	**Mobile App Development (Android)**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:
Subject Code 5CS224EC1 Mobile App Development (Android) is a Exit Course in Computer Science and Engineering for Second Year B. Tech.

Course Objectives:
The objective of this course is to develop students' ability to design, build, and deploy Android mobile applications using modern tools, structured UI development, backend integration, and app testing practices.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
5CS224EC1.1	Apply Android basics, UI components, and activity lifecycle to create functional mobile interfaces.	C-3,P-3
5CS224EC1.2	Analyze and implement data storage, background tasks, and API-based communication for dynamic mobile apps.	C-4, P-4
5CS224EC1.3	Design, build, and deploy complete Android apps using multimedia, Firebase, and performance-optimized components.	C-4,P-5

Course Contents:

Unit 1	**Android Basics and User Interface Components** Introduction to Android: Features, architecture, application structure, Android Components: Activities, services, broadcast receivers, content providers., Activity Lifecycle & Intents: Navigation, intent filters, passing data. **User Interface Design**: XML layout system, Constraint Layout, Linear Layout, Relative Layout. UI Elements: TextView, EditText, Button, ImageView, Spinner, CheckBox, RadioButton, Event Handling: Listeners, dialogs, toast, snackbar, Basic Navigation & Screen Management.	10 Hrs

Unit 2	**Data Storage, Background Processing & Networking** Data Storage: SharedPreferences, files, internal & external storage, Database Systems: SQLite database & Room library (CRUD operations), Networking: HTTP basics, JSON parsing, REST APIs using Retrofit/Volley, Background Tasks: Services, foreground services, broadcast receivers, WorkManager, Threading & Asynchronous Operations: Threads, handlers, AsyncTask, Firebase Basics: Authentication & Realtime database integration.	8 Hrs
Unit 3	**Advanced App Development, Multimedia & Deployment** Multimedia Integration: Audio player, video player, camera usage, Advanced UI: Menus, themes, styles, recyclerview, adapters, custom UI components, App Architecture: MVC/MVVM basics, lifecycle-aware components, Location Services: GPS basics, Google Maps integration, Testing & Optimization: Debugging tools, logcat, ANR handling, app performance, Deployment: APK creation, app signing, versioning, publishing overview.	12 Hrs

List of Practical's:

Minimum ten practical's from the list mentioned below.

1. Create a simple Android project with a basic UI layout.
2. Implement activity lifecycle with screen transitions.
3. Design an app using buttons, images, and user inputs.
4. Create multi-screen navigation using intents.
5. Design and implement menus, dialogs, and notifications.
6. Store and retrieve user data using Shared Preferences.
7. Develop a Room/SQLite application with CRUD operations.
8. Build an app that fetches data from a RESTful API (JSON parsing).
9. Integrate Firebase Authentication and Realtime Database.
10. Implement background tasks using Services / WorkManager.
11. Create an audio/video player app.
12. Generate a signed APK and deploy it on a device.

Text Books:

1. Pradeep Kothari, Android Application Development, BPB Publications.
2. Satya Komatineni, Dave MacLean & Reto Meier, Pro Android, Apress (Indian edition available).
3. B. M. Harwani, Android Programming Unleashed, Pearson India.

Reference Books:

1. Ramesh Potnis, Android Apps Development: A Hands-On Guide, Wiley India.
2. Rajiv Sharma, Mobile Application Development (Android), Khanna Book Publishing.
3. Anubhav Singh & Rimjhim Bhadani, Beginning Android Programming, BPB Publications.

E-Resources:

1. NPTEL – Mobile Application Development
   https://nptel.ac.in/courses/106106183
2. Android Developers Official Documentation
   https://developer.android.com
3. GeeksforGeeks – Android Tutorial Series
   https://www.geeksforgeeks.org/android-tutorial/

Mapping of COs with POs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
5CS224EC1.1	3	2	2	2	2	-	-	1	-	-	-	3	2	1
5CS224EC1.2	3	3	3	2	3	1	-	1	1	-	-	3	3	1
5CS224EC1.3	3	3	3	2	3	2	-	1	2	2	-	3	3	2
5CS224EC1CO	3	3	3	2	3	1	-	1	1	1	-	3	3	1

Correlation levels- 1: Slight (Low),2: Moderate(Medium),3: Substantial (High)

Level: **5**	Course Code: **5CS225EC1**		Course Category: **EC**		
Course Name	**Full stack Developer**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:
Subject Code 5CS225EC1 Full stack Developer is an Exit Course for Second Year B. Tech. Computer Science and Engineering.

Course Objectives:
The objective of this course is to enable students to design, develop, and deploy full-stack web applications using HTML, CSS, JavaScript, Node.js/Express, MongoDB/MySQL, REST APIs, authentication, and hosting platforms.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
5CS225EC1.1	Apply HTML, CSS, JavaScript, and frontend frameworks to build responsive user interfaces.	C-3, P-3
5CS225EC1.2	Develop backend services using Node.js/Express and implement database operations using MongoDB/MySQL.	C-4, P-4
5CS225EC1.3	Design, integrate, and deploy full-stack applications with REST APIs, authentication, testing, and cloud hosting.	C-6, P-5

Course Contents:

Unit 1	**Frontend Development: HTML, CSS, JavaScript & Frameworks** HTML Basics: Structure, tags, forms, semantic elements. CSS Styling: Selectors, box model, flexbox, grid, responsive design, animations. JavaScript Programming: Variables, loops, functions, DOM manipulation, events, ES6 features. Frontend Framework Basics: React.js / Angular (components, props, state, routing). UI/UX Essentials: Layout design, accessibility, responsiveness, media queries.	10 Hrs

Unit 2	**Backend Development & Databases** Server-Side Programming: Node.js fundamentals, Express.js routing, middleware, REST APIs. Database Systems: MongoDB CRUD operations, Mongoose schema design OR MySQL structure, joins, queries. Authentication & Security: JWT, sessions, cookies, password hashing, form validation. API Integration: JSON handling, fetch/axios, error handling. Backend Architecture: MVC pattern, environment variables, modular app structure.	8 Hrs
Unit 3	**Full Stack Integration, Deployment & Testing** Connecting Frontend & Backend: API calls, CORS, state management. Advanced Features: File upload, email services, third-party APIs. Testing: Postman, API testing, unit tests basics. Performance: Caching, optimization, debugging tools. Deployment: Cloud hosting using Render, Netlify, Vercel, GitHub Pages, and Heroku alternatives. Version Control: Git basics, branching, pull/merge, GitHub workflows. Project Packaging: Build scripts, environment configs, production deployment checklist.	12 Hrs

List of Practical's:

Minimum ten practicals from the list mentioned below.

1. Create a static website using HTML5 & CSS3.
2. Build a responsive layout using Flexbox/Grid.
3. Implement DOM-based interactivity using JavaScript.
4. Create a React.js or Angular single-page interface.
5. Develop Node.js + Express server with REST APIs.
6. Perform MongoDB/MySQL CRUD operations.
7. Implement JWT-based authentication.
8. Connect frontend with backend using API calls.
9. Deploy frontend and backend apps on cloud platforms.
10. Build a mini full-stack project (e.g., TODO app, blog system).
11. Implement file upload and form validation.
12. Test APIs using Postman and debug backend errors.

Text Books:

4. Navin Sabharwal & Mehak Khurana, Full Stack Web Development, BPB Publications.
5. Vikram Vaswani, MySQL: The Complete Reference, Tata McGraw-Hill.
6. Shyam Seshadri, Angular: Up and Running, O'Reilly (Indian edition available).

Reference Books:

1. Robin Nixon, Learning PHP, MySQL & JavaScript, O'Reilly.
2. Ethan Brown, *Web Development with Node & Express*, O'Reilly.
3. Brad Dayley, *React.js Essentials*, Packt Publishing.

E-Resources:

1. **NPTEL – Full Stack Development**
   https://nptel.ac.in/courses/106105233
2. **MDN Web Docs – Web Development**
   https://developer.mozilla.org
3. **FreeCodeCamp – Full Stack Curriculum**
   https://www.freecodecamp.org/learn

Mapping of COs with Pos & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
5CS225EC1.1	3	2	2	2	2	-	-	1	-	-	-	3	2	1
5CS225EC1.2	3	3	3	2	3	1	-	1	1	-	-	3	3	1
5CS225EC1.3	3	3	3	2	3	2	-	1	2	2	-	3	3	2
5CS225EC1CO	3	3	3	2	3	1	-	1	1	1	-	3	3	1

Correlation levels- 1: Slight (Low),2: Moderate (Medium),3:Substantial (High)

ANNEXURE –I

Syllabus of III and IV Semester Courses for Four-Year Multidisciplinary Undergraduate B.Tech. Degree Programme in Electrical Engineering

(In view of NEP-2020)

For students admitted in academic session 2025-26 and onwards



03/09/2026

SHRI JAWAHARLAL DARDA EDUCATION SOCIETY'S
JAWAHARLAL DARDA
INSTITUTE OF ENGINEERING AND TECHNOLOGY, YAVATMAL
AN AUTONOMOUS INSTITUTE
Affiliated to Sant Gadge Baba Amravati University, Approved by AICTE, New Delhi and DTE Maharashtra
93VP+PWF: P6, MIDC Area, Lohara, Yavatmal - 445 001, Maharashtra (www.jdiet.ac.in)

1. Vision

To establish a leading Electrical Engineering Department which will produce competent technocrats capable of facing global technical challenges.

2. Mission

1. To impart quality education by compatible teaching-learning process and skill development.
2. To motivate students and faculty members for innovation and research.
3. To practice concepts of Electrical Engineering along with industrial association so as to develop competent technocrats capable of contributing to society.

3. Programme Education Objectives

PEO1: Graduates will demonstrate expertise in analysis, design and evaluation of electrical engineering and allied technical systems.

PEO2: Graduates will locally and globally engage with technical fraternity and contribute to ethical and creative practice of electrical engineering.

PEO3: Graduates will adapt with the dynamics in the constantly changing technical field through lifelong learning, self-study and continuous professional development.

PEO4: Graduates will demonstrate leadership and also a commitment to teamwork while working with others having diverse culture and interdisciplinary backgrounds.

4. SDG of United Nation

1. **No Poverty:** End poverty in all its forms everywhere.
2. **Zero Hunger:** End hunger, achieve food security, improve nutrition, and promote sustainable agriculture.
3. **Good Health and Well-being:** Ensure healthy lives and promote well-being for all at all ages.
4. **Quality Education:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities.
5. **Gender Equality:** Achieve gender equality and empower all women and girls.
6. **Clean Water and Sanitation:** Ensure availability and sustainable management of water and sanitation for all.
7. **Affordable and Clean Energy:** Ensure access to affordable, reliable, sustainable, and modern energy.
8. **Decent Work and Economic Growth:** Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work.
9. **Industry, Innovation, and Infrastructure:** Build resilient infrastructure, promote sustainable industrialization, and foster innovation.

10. **Reduced Inequalities:** Reduce inequality within and among countries.
11. **Sustainable Cities and Communities:** Make cities and human settlements inclusive, safe, resilient, and sustainable.
12. **Responsible Consumption and Production:** Ensure sustainable consumption and production patterns.
13. **Climate Action:** Take urgent action to combat climate change and its impacts.
14. **Life Below Water:** Conserve and sustainably use oceans, seas, and marine resources.
15. **Life on Land:** Protect, restore, and promote sustainable use of terrestrial ecosystems, forests, and biodiversity.
16. **Peace, Justice, and Strong Institutions:** Promote peaceful and inclusive societies, provide access to justice, and build effective, accountable institutions.
17. **Partnerships for the Goals:** Strengthen the means of implementation and revitalize the global partnership for sustainable development.

5. WK: Washington Accord Knowledge Profile-Attributes for engineering program

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and mo01delling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Outcomes (NBA, Jan 2025)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

7. Programme Specific Indicators

Power Generation and Distribution

1. Understanding and analyzing electrical circuits using Ohm's and Kirchhoff's laws.
2. Design, operation, and maintenance of generation, transmission, and distribution systems.
3. Application of electronic devices in controlling power rectifiers, inverters, converters.
4. Knowledge of IEEE, IEC, and local safety standards and codes.
5. Techniques for improving energy efficiency and conducting energy audits.
6. Understanding insulation coordination, breakdown mechanisms, and equipment used in high-voltage systems.
7. Analyzing and mitigating voltage sags, surges, harmonics, and power factor issues in electrical networks.
8. Designing and implementing control strategies for AC/DC drives used in industrial applications.
9. Designing systems to protect electrical networks from lightning and ensure proper grounding.
10. Identifying, analyzing, and solving complex engineering problems.
11. Planning, executing, and closing electrical engineering projects.
12. Proficiency in software tools, simulation platforms, and digital collaboration systems.

Electrical Machinery and Equipment Manufacturing

13. Knowledge of motors, generators, and transformers - operation, control, and maintenance.
14. Application of electronic devices in controlling power rectifiers, inverters, converters.
15. Designing and implementing control strategies for AC/DC drives used in industrial applications.
16. Identifying, analyzing, and solving complex engineering problems.
17. Planning, executing, and closing electrical engineering projects.
18. Generating new ideas or applying existing knowledge in innovative ways to solve engineering problems.

Renewable Energy (Solar, Wind, Hydro)

19. Design, operation, and maintenance of generation, transmission, and distribution systems.
20. Design and integration of solar, wind, and other renewable energy sources.
21. Techniques for improving energy efficiency and conducting energy audits.
22. Identifying, analyzing, and solving complex engineering problems.
23. Ability to self-learn and adapt to technological advancements.
24. Understanding the impact of engineering solutions in societal and ethical contexts.

Industrial Automation and Control Systems

25. Application of electronic devices in controlling power rectifiers, inverters, converters.
26. Use of feedback and automation in electrical systems for stability and accuracy.
27. Programming and integration of programmable logic controllers and SCADA systems
28. Designing and implementing control strategies for AC/DC drives used in industrial applications.
29. Setting up Supervisory Control and Data Acquisition systems for real-time monitoring and control.
30. Knowledge of Modbus, Profibus, Ethernet/IP, etc., for data communication in automation systems
31. Planning, executing, and closing electrical engineering projects.
32. Proficiency in software tools, simulation platforms, and digital collaboration systems.

Electric Vehicles (EVs) and Automotive Electronics

33. Knowledge of motors, generators, and transformers—operation, control, and maintenance
34. Application of electronic devices in controlling power—rectifiers, inverters, converters.
35. Designing microcontroller-based systems for smart devices and applications.
36. Designing and implementing control strategies for AC/DC drives used in industrial applications
37. Identifying, analyzing, and solving complex engineering problems.
38. Ability to self-learn and adapt to technological advancements.
39. Flexibility in working with new technologies and under dynamic industry environments.

Semiconductor and Electronics Industry

40. Application of electronic devices in controlling power—rectifiers, inverters, converters.
41. Designing microcontroller-based systems for smart devices and applications.
42. Knowledge of Modbus, Profibus, Ethernet/IP, etc., for data communication in automation systems.
43. Ability to self-learn and adapt to technological advancements.
44. Proficiency in software tools, simulation platforms, and digital collaboration systems.
45. Generating new ideas or applying existing knowledge in innovative ways to solve engineering problems.

Railway Electrification and Traction Systems

46. Understanding and analyzing electrical circuits using Ohm's and Kirchhoff's laws.
47. Knowledge of motors, generators, and transformers operation, control, and maintenance.

48. Design, operation, and maintenance of generation, transmission, and distribution systems.
49. Analyzing and mitigating voltage sags, surges, harmonics, and power factor issues in electrical networks.
50. Designing and implementing control strategies for AC/DC drives used in industrial applications.
51. Designing systems to protect electrical networks from lightning and ensure proper grounding.
52. Identifying, analyzing, and solving complex engineering problems.

Aerospace and Defense Electronics

53. Application of electronic devices in controlling power—rectifiers, inverters, converters.
54. Use of feedback and automation in electrical systems for stability and accuracy.
55. Designing microcontroller-based systems for smart devices and applications.
56. Knowledge of Modbus, Profibus, Ethernet/IP, etc., for data communication in automation systems.
57. Ability to self-learn and adapt to technological advancements.
58. Working effectively with global teams and diverse work environments.

Building and Infrastructure Electrical Services

59. Design, operation, and maintenance of generation, transmission, and distribution systems.
60. Preparing electrical layouts using CAD tools and understanding electrical codes.
61. Knowledge of IEEE, IEC, and local safety standards and codes.
62. Electrical design and control of heating, ventilation, and air conditioning systems.
63. Integration of lighting, HVAC, security, and energy systems for smart building operations.
64. Planning, executing, and closing electrical engineering projects.

Marine and Naval Electrical Systems

65. Knowledge of motors, generators, and transformers—operation, control, and maintenance.
66. Design, operation, and maintenance of generation, transmission, and distribution systems.
67. Understanding insulation coordination, breakdown mechanisms, and equipment used in high-voltage systems.
68. Designing and implementing control strategies for AC/DC drives used in industrial applications.
69. Designing systems to protect electrical networks from lightning and ensure proper grounding.
70. Identifying, analyzing, and solving complex engineering problems.

Medical Equipment and Biomedical Devices

71. Measuring electrical quantities using sensors, transducers, and digital instruments.
72. Designing microcontroller-based systems for smart devices and applications.
73. Knowledge of IEEE, IEC, and local safety standards and codes.
74. Ability to self-learn and adapt to technological advancements.
75. Generating new ideas or applying existing knowledge in innovative ways to solve engineering problems.

Embedded Systems and IoT

76. Programming and integration of programmable logic controllers and SCADA systems.
77. Designing microcontroller-based systems for smart devices and applications.
78. Knowledge of Modbus, Profibus, Ethernet/IP, etc., for data communication in automation systems.
79. Use of Internet of Things for predictive maintenance, load monitoring, and system diagnostics.
80. Proficiency in software tools, simulation platforms, and digital collaboration systems.
81. Generating new ideas or applying existing knowledge in innovative ways to solve engineering problems.
82. Delivering technical information clearly to both technical and non-technical audiences.

Basic Science

83. Apply mathematical techniques such as algebra, trigonometry, calculus, differential equations, linear algebra, probability and statistics to solve problems.
84. Apply physical principles such as motion, forces, energy and materials to solve problems.
85. Apply knowledge of chemical properties and reactions for construction material and environment (Corrosion, polymer, electro chemistry etc.).

Engineering Science Courses

86. Demonstrate proficiency in basic workshop operations (fitting, carpentry, welding, sheet metal, plumbing and machining etc.).
87. Apply the principles of engineering mechanics to analyse and solve problems involving forces, moment, equilibrium, friction, centred and MOI etc.
88. Apply the principles electrical engineering to analyse and maintain electrical systems, circuits, machines and power systems.
89. Demonstrate ability to interpreted and create drawings using geometric constructions, orthographic projections, isometric projections and CAD tools.
90. Demonstrate ability to apply fundamental principles of algorithms, programming, data structures and computing system to solve conceptual problems.

Generic Competencies

A. Problem-Solving Skills

91. Analytical Thinking: Ability to analyze complex problems, break them down into smaller components, and find effective solutions.
92. Critical Thinking: Ability to evaluate multiple solutions to a problem and choose the best course of action based on available data, safety, and cost-efficiency.

B. Communication Skills

93. Oral Communication: Ability to communicate complex technical information clearly to a variety of audiences, including clients, stakeholders, contractors, and team members.
94. Written Communication: Proficiency in drafting reports, proposals, technical specifications, and documentation that are clear, concise, and accurate.
95. Interpersonal Communication: Ability to collaborate effectively with multidisciplinary teams, clients, and project stakeholders.

C. Project Management

96. Time Management: Efficiently managing time and prioritizing tasks to meet deadlines in a dynamic project environment.
97. Resource Management: Ability to plan, allocate, and manage resources such as labour, materials, and equipment to ensure project efficiency.
98. Budgeting and Cost Control: Skills in estimating project costs, monitoring budgets, and ensuring projects are completed within financial constraints.
99. Risk Management: Ability to identify, assess, and mitigate risks during the planning and execution of engineering projects.

D. Team work and Leadership

100. Team Collaboration: Working effectively as part of a team, contributing to the success of the project through collaboration, open communication, and respect for others' expertise.
101. Leadership Skills: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
102. Conflict Resolution: Ability to resolve conflicts between team members, clients, or contractors, ensuring that project objectives are still achieved.

E. Attention to Detail

103. Accuracy: Ensuring all engineering calculations, designs, and project plans are accurate and align with building codes, regulations, and standards.
104. Quality Assurance: Ensuring that the materials and processes used in construction adhere to high standards of quality and safety.

F. Ethical and Professional Integrity

105. Ethical Decision Making: Adhering to a strict code of ethics, ensuring public safety, environmental protection, and transparency in all dealings.
106. Accountability: Taking responsibility for the success or failure of a project, being proactive in addressing issues, and delivering results.

G. Adaptability and Flexibility

107. Openness to Change: Being able to adapt to new technologies, tools, and methods, as well as evolving project requirements or environmental conditions.
108. Learning and Development: Actively seeking opportunities for professional growth, staying current with industry trends, and acquiring new skills to remain competitive.

H. Creativity and Innovation

109. Creative Problem Solving: Thinking outside the box and coming up with novel solutions to engineering challenges.
110. Innovative Design: Contributing new ideas for designs and processes that can improve efficiency, reduce costs, or make better use of resources.

I. Cultural and Environmental Awareness

111. Sustainability Awareness: Knowledge of sustainable construction methods, green building practices, and the importance of reducing the environmental impact of engineering projects.
112. Cultural Sensitivity: Understanding and respecting cultural differences when working in diverse teams or international projects.
113. Environmental Impact Understanding: Considering the environmental consequences of engineering decisions and striving to minimize negative impacts through design and construction methods.

J. Decision-Making Skills

114. Data-Driven Decisions: Using available data, facts, and technical analysis to make informed decisions about the design, execution, and management of projects.
115. Prioritizing Decisions: Knowing which decisions need immediate attention and which can be deferred, especially in a high-pressure environment.

K. Regulatory and Legal Knowledge

116. Familiarity with Building Codes and Standards: Understanding and ensuring compliance with local, national, and international building codes, safety regulations, and legal standards.
117. Health and Safety: Knowledge of safety regulations and best practices for ensuring the health and safety of workers, the public, and the environment throughout the project lifecycle.

L. Client-Focused Mindset

118. Client Management: Building and maintaining strong relationships with clients, understanding their needs, and ensuring their expectations are met throughout the project.
119. Customer Service Orientation: Ensuring that client concerns are addressed promptly, and working toward providing value-added solutions that meet their goals.

8. Scheme of Electrical Engineering Department

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electrical Engineering Degree Programme

Semester - I (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - I	BSC	1SH101BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Physics	BSC	1SH102BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Programming for Problem Solving	ESC	1CS103ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Mechanics	ESC	1CE104ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Applied Physics Lab	BSC	1SH105BS1	0	0	2	0	2	1					25	25	50	25	50	
6	Programming for Problem Solving Lab	ESC	1CS106ES1	0	0	2	0	2	1					25	25	50	25	50	
7	Engineering Mechanics Lab	ESC	1CE107ES1	0	0	2	0	2	1					25	25	50	25	50	
8	Workshop	ESC	1ME108ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Electronics Technology	VSC	1EE109VS1	1	0	2	1	4	2						50	50	25	50	
10	English Communication	AEC	1SH110AE1	1	0	2	1	4	2					25	25	50	25	50	
11	Sports & Yoga	CC	1SH111CC1	0	0	4	0	4	2						50	50	25	50	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours : [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electrical Engineering Degree Programme
Semester - II (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - II	BSC	2SH112BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Chemistry	BSC	2SH113BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Basic Electrical Engineering	ESC	2EE114ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Graphics	ESC	2ME115ES1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
5	Electrical Technology	PCC	2EE116PC1	1	0	2	1	4	2						50	50	25	50	
6	Origin and pioneers of Vidyut Shastra	IKS	2EE117IK1	1	0	2	1	4	2						50	50	25	50	
7	Applied Chemistry - Lab	BSC	2SH118BS1	0	0	2	0	2	1					25	25	50	25	50	
8	Basic Electrical Engineering - Lab	ESC	2EE119ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Engineering Graphics/CAD Lab	ESC	2ME120ES1	0	0	2	0	2	1					25	25	50	25	50	
10	Universal Human values	SEC	2SH121VS1	1	0	2	1	4	2						50	50	25	50	
11	Digital Wellness	CC	2SH122CC1	1	0	2	1	4	2						50	50	25	50	
Total				**15**	**0**	**14**	**15**	**44**	**22**			**400**				**350**		**750**	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 15x15 = 225 Hrs]																			
Exit Option (Level 4.5) for Undergraduate Certificate in Odd Semester of next Academic Year as approved by BOS																			
12	Electrification of Building	EC	3EE123EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Repairing and Maintenance of Domestic Appliances	EC	3EE124EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	3EE125EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	3EE126OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electrical Engineering Degree Programme

Semester - III (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Network Analysis	PCC	3EE201PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Electronic Devices & Circuits	PCC	3EE202PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Electrical Machines-I	PCC	3EE203PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Multi Disciplinary Minor- I	MDM	3__ 204MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - I	OE	3__205OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Network Analysis - Lab	PCC	3EE206PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Electronic Devices & Circuits - Lab	PCC	3EE207PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Electrical Machines-I - Lab	PCC	3EE208PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Economics of Energy Markets	EEM	3EE209EM1	2	0	0	2	4	2						50	50	25	50	
10	Constitutional Values and Fundamental Duties	VEC	3SH210VE1	2	0	0	2	4	2						50	50	25	50	
11	Field Project	FP	3EE400FP1	0	0	4	0	4	2					25	25	50	25	50	
12	Disaster Management and Preparedness	NC	3AL001NC1	2	0	0	0	2	-						50	50	25	50	
Total				**19**	**0**	**10**	**17**	**46**	**22**			**450**				**300**		**750**	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 17x15 = 255 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
12	Double Minor / Honours Course - I	DH	3__211DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electrical Engineering Degree Programme
Semester - IV (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Analog and Digital circuit	PCC	4EE212PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Electrical Measurement & Instrumentation	PCC	4EE213PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Power Systems-I	PCC	4EE214PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Multi Disciplinary Minor- II	MDM	4__215MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - II	OE	4__216OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Electrical Measurement & Instrumentation - Lab	PCC	4EE217PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Power Systems-I - Lab	PCC	4EE218PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Electrical CAD	VSC	4EE219VS1	0	0	4	0	4	2						50	50	25	50	
9	Technical Writing	AEC	4SH220AE1	1	0	2	1	4	2						50	50	25	50	
10	Fundamentals of Book Keeping & Accounting	EEM	4SH221EM1	1	0	2	1	4	2						50	50	25	50	
11	Environmental Science	VEC	4CE222VE1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
Total				**16**	**0**	**12**	**16**	**44**	**22**			**500**				**250**		**750**	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 28x15 = 420 Hrs] + [Learner-engaged time 16x15 = 240 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
12	Double Minor / Honours Course - II	DH	4__223DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5) for Undergraduate Diploma in Odd Semester of next Academic Year as approved by BOS																			
14	Solar Panel Design and Implementation	EC	5EE224EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
15	Repairing and maintenance of Electrical Machines	EC	5EE225EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
16	Internship / Apprenticeship in Industry	EI	5EE226EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
17	Two MOOC/NPTEL Courses	OC	5EE227OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (An Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electrical Engineering Degree Programme

Semester - V (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Electrical Machines-II	PCC	5EE228PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Computer Aided Electrical Machine Design	PCC	5EE229PC1	3	1	0	4	8	4	60	40	100	40					100	3 Hrs.
3	Control Systems	PCC	5EE230PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - I	PEC	5EE231PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multi Disciplinary Minor-III	MDM	5__232MD_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
7	Open Elective - III	OE	5__233OE_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
8	Electrical Machines-II - Lab	PCC	5EE234PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Control Systems - Lab	PCC	5EE235PC1	0	0	2	0	2	1					25	25	50	25	50	
10	Programme Elective Course - I - Lab	PEC	5EE236PE_	0	0	2	0	2	1					25	25	50	25	50	
11	Multi Disciplinary Minor-III Lab	MDM	5__237MD_	0	0	2	0	2	1					25	25	50	25	50	
Total				**17**	**1**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
12	Double Minor / Honours Course - III	DH	5__238DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (An Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electrical Engineering Degree Programme
Semester - VI (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Power Electronics	PCC	6EE239PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Computer Application in Power Systems	PCC	6EE240PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Power Systems-II	PCC	6EE241PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - II	PEC	6EE242PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Programme Elective Course - III	PEC	6EE243PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Multi Disciplinary Minor- IV	MDM	6__244MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Power Electronics - Lab	PCC	6EE245PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Computer Application in Power Systems - Lab	PCC	6EE246PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - II Lab	PEC	6EE247PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Personal Skills (GD& PI)	SEC	6SH248VS1	1	0	2	1	4	2						50	50	25	50	
Total				**18**	**0**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - IV	DH	6__249DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5.5) for B. Voc in Odd Semester of next Academic Year as approved by BOS																			
12	Industrial Electrical Systems installation and maintenance	EC	7EE250EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	PCB Design and circuit simulation	EC	7EE251EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	7EE252EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	OC	7EE253OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electrical Engineering Degree Programme

Semester - VII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Electrical Installation & Design	PCC	7EE301PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Switchgear and Protection	PCC	7EE302PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Programme Elective Course - IV	PEC	7EE303PE_	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - V	PEC	7EE304PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multi Disciplinary Minor- V	MDM	7__305MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
6	Switchgear and Protection - Lab	PCC	7EE306PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Programme Elective Course - IV - Lab	PEC	7EE307PE_	0	0	2	0	2	1					25	25	50	25	50	
8	Research Methodology	RM	7EE401RM1	2	0	4	2	8	4	30	20	50	20		50	50	25	100	2 Hrs.
9	Project	PR	7EE402PR1	0	0	8	0	8	4					50	100	150	75	150	
				14	**0**	**16**	**14**	**44**	**22**			**500**				**300**		**800**	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 33x15 = 495 Hrs] + [Learner-engaged time 14x15 = 225 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
10	Double Minor / Honours Course - V	DH	7__308DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
Optional Course for Honours with Research Degree																			
11	Research Project	RP	7EE403RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electrical Engineering Degree Programme

Semester - VIII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	High Voltage Engineering (Online)	PCC	8EE309PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Programme Elective Course - VI (Online)*	PEC	8EE310PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Multi Disciplinary Minor-VI (Online)	MDM	8__311MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
4	On Job Training (Internship/Apprenticeship)	OJT	8EE404IN1	0	0	24	0	24	12					100	100	200	100	200	
Total				**8**	**0**	**24**	**8**	**40**	**20**			**250**				**200**		**450**	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 32x15 = 480 Hrs] + [Learner-engaged time 8x15 = 120 Hrs]																			
Optional Course for Honours with Research Degree																			
5	Research Project	RP	8EE405RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	
* Can be considered for MOOCS/NPTEL courses.																			

9. List of Programme Elective Courses

Students will have an option to choose the PEC offered by their respective Major Discipline offered during semester V to VIII. Programme Elective Courses offered by Electrical Engineering

Sr. No.	Semester	Programme Elective Course/Subjects Name	Course Code
1	V	Power System Operation & Control (PEC-I)	5EE231PE1
2		Power System Operation & Control-Lab (PEC- Lab I)	5EE236PE1
		OR	
3		Green and Sustainable Energy (PEC-I)	5EE231PE2
4		Green and Sustainable Energy-Lab (PEC- Lab I)	5EE236PE2
5	VI	Electrical safety (PEC-II)	6EE242PE1
6		Electrical safety-Lab (PEC-Lab II)	6EE247PE1
		OR	
7		Electrical Machine Design (PEC-II)	6EE242PE2
8		Electrical Machine Design- Lab (PEC-Lab II)	6EE247PE2
9		Electrical & hybrid Vehicles (PEC-III)	6EE243PE1
		OR	
10		Industrial Electrical System (PEC-III)	6EE243PE2
11	VII	Signals & Systems (PEC-IV)	7EE303PE1
12		Signals & Systems-Lab (PEC- Lab IV)	7EE308PE1
		OR	
13		Power Semiconductor Based Drives (PEC-IV)	7EE303PE2
14		Power Semiconductor Based Drives-Lab (PEC- Lab IV)	7EE308PE2
15		Artificial Intelligence in Electrical Engineering (PEC-V)	7EE304PE1
		OR	
16		EV charging systems & Infrastructure (PEC-V)	7EE304PE2
17	VIII	HVDC & FACTS (PEC-VI)	8EE310PE1
		OR	
18		Digital Signal Processing (PEC-VI)	8EE310PE2

.

10. Syllabus for Semester III & IV

Level: **5.0**		Course Code:	**3EE201PC1**	Course Category:	**PCC**
Course Name	**Network Analysis**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3EE201PC1 Network Analysis is compulsory Program Core Course for Second Year B. Tech Electrical Engineering.

Course Objectives:

The objective of this course is to develop a clear understanding of electrical network concepts and analysis methods for effectively solving diverse circuit problems.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE201PC1.1	Determine the basic circuit elements and their interconnections to develop foundational knowledge and skills in electrical circuit behaviour	C-3
3EE201PC1.2	Evaluate the transient response of electrical circuits using Laplace transform methods to gain essential skills in dynamic circuit analysis	C-5
3EE201PC1.3	Demonstrate the application of mesh current and node voltage methods to analyse electrical circuits and develop practical skills in systematic circuit evaluation.	C-4
3EE201PC1.4	Analyse electrical circuits using network simplification theorems to ensure accurate evaluation and effective interpretation of circuit behaviour	C-4
3EE201PC1.5	Solve circuit problems using concepts of electric network topology to strengthen analytical skills in circuit interpretation.	C-3
3EE201PC1.6	Evaluate various network functions and examine two-port network behaviour to build foundational understanding of advanced circuit characteristics.	C-5

Course Contents:

Unit 1	**Basic Concept of Electrical Circuits:** Electric circuit, Types of Electric circuit, Ideal source, Practical source, dependent and independent source Voltage and Current sources, source transformation, Duality network transformation.	6Hrs
Unit 2	**Electric Circuit Analysis using Laplace Transforms:** Review of Laplace transform, waveform synthesis, Analysis of electrical circuits using Laplace transform for standard inputs (unit step, ramp and impulse). Solution of first and second order differential equations of different combinations of series and parallel RLC networks.	6 Hrs
Unit 3	**Mesh and Node Analysis:** Introduction, mesh analysis, super mesh. Nodal analysis, the super node, nodal vs mesh analysis.	9 Hrs
Unit 4	**Network Theorems:** Superposition, Thevenin's, Norton's, Maximum Power transfer, Reciprocity theorems, Millman's theorem, Tellegen's theorem.	8 Hrs
Unit 5	**Network Topology and Equations:** Graph of a network, trees and loops. Incidence matrix, tie set and cut set matrix of a network, network equilibrium equations.	6 Hrs
Unit 6	**Two port networks and Network functions:** Two port networks: open circuit impedance parameter, short circuit admittance parameter, transmission parameter, hybrid parameter, interrelationship between parameters. interconnection of two port networks Network functions**:** Driving point and transfer functions, Poles and zeros. Necessary conditions for driving point and transfer function.	10 Hrs

Text Books:

1. Van Valkenburg, Network Analysis, Third Edition, 2009, Prentice Hall of India.
2. Sudhakar, A Shyam Mohan,Circuits and Networks, Third Edition, 2006, Tata McGraw-Hill.
3. Ravish R. Singh, Network Analysis and Synthesis, McGraw Hill education (India).

Reference Books:

1. Mahmood Nahvi, Joseph A Edminister, Schaum's, Outline of Electric Circuits, 6th Edition, Tata McGraw-Hill, 6th Edition, 2013.

2. W. H. Hayt and J. E. Kemmerly, Engineering Circuit Analysis, McGraw Hill Education, 2013.
3. K. Sureshkumar, Electric Circuits & Network, PearsonPublication.
4. D. Roy Choudhary, Networks and Systems, New Age International Publishers, 2nd Edition, 2012.

E-Resources:

1. https://www.allaboutcircuits.com/textbook/
2. https://www.open.edu/openlearn/science-maths-technology/basics-electrical-engineering/content-section-
3. https://nptel.ac.in/courses/108/104/108104049/
4. https://nptel.ac.in/courses/108/105/108105159/

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3EE201PC1.1	3	2	-	-	-	-	-	-	-	-	-	2	2	-
3EE201PC1.2	3	2	-	2	1	-	-	-	-	-	-	3	3	-
3EE201PC1.3	3	2	-	-	1	-	-	-	-	-	-	2	3	-
3EE201PC1.4	3	3	-	-	2	-	-	-	-	-	-	2	3	-
3EE201PC1.5	3	3	-	-	-	-	-	-	-	-	-	2	3	-
3EE201PC1.6	3	2	-	2	2	-	-	-	-	-	-	3	3	-
3EE201PC1CO	3	2	-	-	1	-	-	-	-	-	-	2	3	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**3EE202PC1**		Course Category:	**PCC**
Course Name	**Electronic Devices & Circuits**				
Credits	**02**	Total L: T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours:	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**03 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3EE202PC1 Electronic Devices & Circuits is a compulsory Program Core Course for Second Year B.Tech. Electrical Engineering.

Course Objectives:

The objective of this course is to equip students with the knowledge to analyze semiconductor device characteristics and design fundamental analog circuits using diodes, transistors, FETs, special diodes, and operational amplifiers for practical electronic applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE202PC1.1	Apply the fundamentals of semiconductor physics to analyse the V–I characteristics of Diodes and Zener regulators, enabling correct selection and use in voltage regulation applications	C-3
3EE202PC1.2	Design and analyse diode-based circuits such as half-wave/full-wave rectifiers and simple filters to develop the ability to create basic DC power supply systems.	C-3, C-4
3EE202PC1.3	Determine the construction and operation of BJTs and UJTs and calculate suitable DC biasing and stability factors to ensure reliable and predictable transistor operation.	C-3, C-4
3EE202PC1.4	Analyse power amplifiers and oscillator circuits by evaluating their power gain, efficiency, and distortion.	C-4
3EE202PC1.5	Apply the operational principles and structural characteristics of JFETs and MOSFETs to determine appropriate biasing methods and utilize them in switching and voltage-control applications.	C-3

3EE202PC1.6	Apply the principles and characteristics of Special Diodes to appropriately select and use them in specialised electronic circuit applications.	C-3, C-5

Course Contents:

Unit 1	**Semiconductor Physics and Devices:** P-N Junction diode theory, Energy bands in intrinsic and extrinsic silicon, Carrier transport, Diffusion current, Drift current, Mobility and resistivity, Zener diode as voltage regulator.	4 Hrs
Unit 2	**Rectifiers, Filters, and Power Supply Circuits:** DC regulated power supply, Halfwave, Full wave centre tapped, Full wave and bridge rectifier. Filters - C, LC and their analysis, clipping and clamping.	4 Hrs
Unit 3	**Bipolar Junction Transistors (BJTs) and UJT:** Theory and Analysis of Bipolar Junction transistor, Methods of biasing and their needs, 'Q' and stability factors. UJT: Characteristics, working.	5 Hrs
Unit 4	**Power Amplifiers:** Class 'A', 'B', 'AB' and 'C' amplifiers, Calculations of power gain, efficiency, power dissipation and distortion oscillators, their criteria, Hartley, Colpitts and R-C Oscillators, Crystal Oscillator.	6 Hrs
Unit 5	**Introduction & Classification: JFET & MOSFET:** Construction and operation, Drain and Transfer characteristics, parameters, Applications (JFET as a voltage variable resistor) (MOSFET as a switch)	5 Hrs
Unit 6	**Special Semiconductor Diodes and Optoelectronic Devices:** Theory, construction and application Sof Schottky diode, Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, phototransistor.	6 Hrs

Text Books:

1. Jacob Millman and Christos C. Halkias,Integrated Electronics: Analog and Digital Circuits and Systems, McGraw-Hill.
2. Robert L. Boyles tad and Louis Nashelsky, Electronic Devices and Circuits Theory, Prentice-Hall.
3. Adel S. Sedra and Kenneth C. Smith, Holt, Rinehart, and Winston,Microelectronic Circuits, Inc.
4. Jacob Millman, Christos C. Halkias, Integrated Electronic, McGraw Hill Education.
5. Robert L. Boylestead, Louis Nashelsky, Electronic Devices and Circuits Theory, 11th Edition, 2009, Pearson.

Reference Books:

1. Horowitz,The Art of Electronics, 3rdEdition Cambridge University Press.
2. David A. Bell, Electronic Devices and Circuits, 5thEdition, Oxford.
3. J. Millman, H. Taub and Mothiki S. PrakashRao, Pulse, Digital and Switching Waveforms, 2ndEd., 2008, McGrawHill.
4. Jacob Millman, Electronic Devices and Circuits, McGraw Hill.

E-Resources:

1. https://www.youtube.com/watch?v=S76CnEJMl5E
2. https://www.youtube.com/watch?v=MZPeRlst8rQ
3. https://www.youtube.com/watch?v=-VwPSDQmdjM
4. https://www.youtube.com/watch?v=i2t9GTAd2I0

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3EE202PC1.1	3	2	-	-	-	-		-	-	-	-	-	3	1
3EE202PC1.2	3	2	3	-	-	-	-	-	-	-	-	-	3	2
3EE202PC1.3	3	2	3	-	-	-	-	-	-	-	-	1	3	1
3EE202PC1.4	3	-	3	-	-	-	-	-	-	-	1	1	3	2
3EE202PC1.5	3	-	-	-	-	-	-	-	-	-	1	1	3	2
3EE202PC1.6	3	2	-	-	-	-	-	-	-	-	1	-	3	2
3EE202PC1CO	3	1	2	-	-	-	-	-	-	-	1	1	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**3EE203PC1**		Course Category:	**PCC**
Course Name	**Electrical Machines- I**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours:	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3EE203PC1 Electrical Machine- I is a compulsory Program Core Course for Second Year B. Tech Electrical Engineering.

Course Objectives:

The objective of this course is to develop understanding and practical skills in the principles, operation, and performance analysis of electrical machines.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE203PC1.1	Explain construction, operation, EMF, torque, windings, and commutation to analyze rotating machine performance.	C-3
3EE203PC1.2	Classify DC generators, analyze characteristics, applications, parallel operation, and testing for efficient system use.	C-4
3EE203PC1.3	Analyze types, characteristics, starting methods, speed control, braking techniques, losses, efficiency, and testing of D.C. motors to apply them effectively in controlled motion and industrial drive applications.	C-4
3EE203PC1.4	Explain transformer construction, operation, losses, equivalent circuit, and tests to evaluate performance.	C-3
3EE203PC1.5	Compare autotransformers with two-winding transformers, derive voltage and current ratios, calculate copper savings, and analyze construction, operation, advantages, limitations, and applications to assess their economic and practical use in electrical systems.	C-3
3EE203PC1.6	Analyze construction, working, types, connections, vector groups, open-delta operation, and testing of three-phase transformers to ensure proper	C-3

	selection, connection, and performance evaluation in power and distribution systems.	

Course Contents:

Unit 1	**Fundamentals of Rotating Machines:** Construction, Principle of Operation, EMF Equation, Torque Equation. Armature winding Lap, wave, single layer, double layer. Armature Reaction and commutation, method of improving commutation.	8 Hrs
Unit 2	**D.C. Generators**: Types, Characteristics and Applications of D.C. Generators, Parallel Operation of D.C. Generators, Introduction to testing of D.C. Generators as per Indian standard.	7 Hrs
Unit 3	**D.C. Motors:** Types, characteristics and Applications of D.C. Motors. Starting, Electric Braking, Speed Control of DC Motors. Losses, efficiency and testing of DC Motors.	7 Hrs
Unit 4	**Single phase Transformer:** Construction and Working principle, EMF Equation, losses. Equivalent Circuit, Parallel Operation. Open Circuit, Short Circuit & Sumpner's test on transformer as per Indian standard.	9 Hrs
Unit 5	**Single phase Autotransformer:** Comparison between two-winding transformer and auto-transformer, Construction, working, merits, demerits and application of Autotransformer, Derivation of voltage ratio, current ratio, copper saving, transformation ratio.	6 Hrs
Unit 6	**Three Phase Transformer:** Construction, Working, Types, connections, vector group connections, open delta Connection, OC, SC, load test, vector group test on three phase transformers, Power transformers and Distribution transformers.	8 Hrs

Text-Books:

1. D P Kothari & I J Nagrath, Electrical Machines,TMH. New Delhi.
2. S. K. Bhattacharya, Electrical Machines, McGraw Hill Education.
3. P. S. Bimbhra, Electrical Machines, Khanna Publications.
4. A.E. Fitzgerald, Charles Kingsley, and Stephen D. Umans, Electric Machinery, 7th Edition, McGraw-Hill Education, New York, 2014.

Reference Books:

1. H. Cotton, Advance Electrical Technology, Wheeler publication.

2. Stephen J. Chapman, Electric Machinery Fundamentals, McGraw-Hill Education
3. V.K. Mehta & Rohit Mehta, Principles of Electrical Machines, S. Chand Publishing

E-Resources:

1. https://nptel.ac.in/courses/108/105/108105149/
2. https://www.coursera.org/courses?query=electric%20machine
3. https://www.allaboutcircuits.com/textbook/alternating-current/
4. https://www.youtube.com/channel/UCdJ9apM9g7SPDLTuV2kRNO
5. https://www.edx.org/course

Mapping of COs with Pos & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3EE203PC1.1	3	2	1	-	3	-	-	-	-	-	-	2	1	1
3EE203PC1.2	2	3	1	-	2	-	-	-	-	-	-	3	2	1
3EE203PC1.3	2	3	2	-	2	-	-	-	-	-	-	3	2	1
3EE203PC1.4	3	2	2	-	2	-	-	-	-	-	-	2	2	-
3EE203PC1.5	3	2	2	-	3	-	-	-	-	-	-	2	2	1
3EE203PC1.6	2	2	2	-	2	-	-	-	-	-	-	3	2	1
3EE203PCCO	3	3	2	-	2	-	-	-	-	-	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**3EE204MD1**	Course Category:	**MDM**
Course Name	**Electrical Energy Generation**			
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours **30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks **20**
EE Marks	**--**	PA Marks	**--**	Total Marks **50**

Course Description:

Subject Code 3EE204MD1 Electrical Energy generation is a compulsory Multidisciplinary Minor Course offered by the department of Electrical Engineering for other Second Year B. Tech, major disciplines.

Course Objectives:

The objective of this course is to enable students to integrate knowledge and skills from multiple disciplines for innovative problem solving.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE204MD1.1	Classify energy sources and explain working principles of various power plants to recognize their role in meeting electricity demand.	C-3
3EE204MD1.2	Explain the layout, components, and operation of thermal, hydro, and nuclear power plants to assess their performance and suitability for power generation.	C-4
3EE204MD1.3	Describe biomass, solar, and wind energy systems and their working principles to apply renewable energy technologies for sustainable power generation.	C-3

Course Contents:

Unit 1	**Basics of Power Generation:** Energy sources and their classification (conventional & non-conventional), Types of power plants, Selection of site for power plants Load curves, load duration curves, and plant capacity factors Terms: Connected load, Maximum demand, Demand factor, Load factor, Diversity factor, Plant capacity factor, Plant use factor	06 Hrs

Unit 2	**Thermal power plant:** Layout of Thermal power plant, Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, ash & coal handling plant. Advantages & disadvantages. **Hydro power plant**: Layout of Hydro power plant, Selection of site, classification of hydro power plant according to available head, nature of load, functions of different components and their working, mini and micro hydro-electric power generation, advantages & disadvantages. **Nuclear power plant:** Layout of Nuclear power plant, Functions of different components of nuclear plant, types of nuclear reactors, advantages & disadvantages.	12 Hrs
Unit 3	**Biomass Power Plant:** Layout of Biomass Power Plant, Functions of Different Components, Types of Biomass Conversion Systems, Advantages of Biomass Power Plant, Disadvantages of Biomass Power Plant, Applications of Biomass Energy. **Solar Energy:** Solar energy — importance and potential, Solar radiation, Solar constant, Earth-sun relationship: declination, hour angle, latitude, Solar angles: Zenith, Azimuth, Altitude angles, Measurement of solar radiation — Pyranometer, Pyrheliometer. **Wind energy:** Basic principle of wind energy conversion, selection of site, basic components of wind energy conversion system, Applications, Advantages and disadvantages.	12 Hrs

Text-Books:

1. B. R. Gupta, Generation of electrical energy, Eurasia Publishing House, New Delhi
2. Tanmay Deb, Electrical Power Generation (Conventional and Renewable), Khanna Publishing house, New Delhi.

Reference Books:

1. G. D. Rai, Non-conventional energy resources, Khanna Publishers New Delhi.
2. S.P. Sukhatme, Solar energy, Tata McGraw Hill Publication.
3. V.K. Mehta, Principles of Power System, S. Chand publication.
4. M.V. Deshpande, Elements of Electrical Power Station Design, Wheeler Publishing.
5. S.B. Pandya, Conventional energy technology, Tata McGraw Hill Publication.

E-Resources:

1. https://openlibrary.org/works/OL16578271W/Power_plant_engineering
2. https://openlibrary.org/works/OL4584032W/Electric_power_generation
3. https://nptel.ac.in/courses/108/101/108101140/
4. https://nptel.ac.in/courses/108/106/108106081/

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3EE204MD1.1	3	2	-	-	-	2	-	-	-	-	-	2	-	1
3EE204MD1.2	3	2	1	-	-	-	-	-	-	-	-	1	1	1
3EE204MD1.3	3	3	2	-	-	-	-	-	-	-	-	2	2	2
3EE204MD1CO	3	3	2	-	2	-	-	-	-	-	-	2	2	1

Correlation levels-1:Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**3SH205OE1**	Course Category:	**OE**
Course Name	**Soft Skills & Profile Building**			
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours **45 Hrs**
Total Credit Hours	**90 Hrs**			
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks **40**
EE Marks	**--**	PA Marks	**--**	Total Marks **100**

Course Description:

Subject Code 3SH205OE1Soft Skills & Profile Building is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The objective of this course is to focus on developing advanced communication skills, leadership qualities and professional etiquette among engineering graduates.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE1.1	Apply advanced interpersonal, analytical, and persuasive communication techniques in professional contexts for effective professional interactions.	C-3
3SH205OE1.2	Demonstrate professional workplace etiquette, business communication, and group discussion skills to enhance employability.	C-3 A-3
3SH205OE1.3	Analyze leadership styles, emotional intelligence, and team dynamics for effective collaboration.	C-4 A-3
3SH205OE1.4	Design a structured and realistic career plan aligned with industry expectations and personal goals for professional growth.	C-6
3SH205OE1.5	Create ATS-friendly résumés, professional portfolios, and digital profiles for personal branding.	C-6 P-4
3SH205OE1.6	Perform effectively in interviews, workplace simulations, and job-search processes with professional confidence for enhanced employability.	C-3 P-3 A-3

Course Contents:

Unit 1	**Advanced Communication Dynamics:** Advanced interpersonal communication strategies; speech articulation; structuring thoughts and fluency techniques; analytical and critical communication; storytelling techniques for impactful presentations; persuasive communication models.	7Hrs
Unit 2	**Global Workplace Etiquettes, Email Writing & GD–PI Perspective:** Professional greetings and workplace conduct; giving and receiving feedback; handling criticism and adaptability issues; professional values such as punctuality and attire; types of handshakes and significance; effective business email writing; types of Group Discussions, purpose of GDs; mock GDs (video-based); interview strategies and techniques.	8Hrs
Unit 3	**Leadership, Team Dynamics & Corporate Skills:** Personality types using 9/9 matrix; leadership styles; emotional intelligence and leadership relationship; conflict resolution and negotiation techniques; team-building skills (Johari Window perspective); cross-cultural communication; creativity and design thinking; structured problem-solving and decision-making**.**	7 Hrs
Unit 4	**Strategizing Career Planning:** SMART goal setting; mapping skills to career paths; understanding industry expectations; emerging futuristic soft and hard skills (domain-wise); personalized career roadmap; certification planning (technical and non-technical); networking skills and participation in professional communities	7 Hrs
Unit 5	**Profile Building, Portfolio & Personal Branding:** ATS-friendly résumé preparation and common mistakes; video résumé creation and self-marketing pitch; LinkedIn profile optimization and networking strategies; developing online portfolios using platforms such as GitHub, Behance, Google Sites, and Toastmasters	8 Hrs
Unit 6	**Employment Readiness & Industry Integration:** Workplace simulation activities (mock emails, meetings, discussions); mock personal interviews; understanding sector-specific industry dynamics; unconventional career opportunities after engineering; job-hunting strategies and popular job platforms	8 Hrs

Text Books:

1. Alex K., Soft Skills, S. Chand Publishing
2. Meenakshi Raman & Prakash Singh, Business Communication, Oxford University Press

Reference Books:

1. Stephen R. Covey, The 7 Habits of Highly Effective People, Free Press Publication
2. Daniel Goleman, Emotional Intelligence, published by Bantam Books.
3. Shiv Khera, You Can Win, published by Bloomsbury Publishing
4. Richard N. Bolles, What Color Is Your Parachute? Published by Ten Speed Press, Crown Publishing Group

E Resources:

1. NPTEL: Soft Skills and Personality Development
2. LinkedIn Learning – Communication & Career Development Courses
3. Harvard Business Review – Communication & Leadership Articles
4. Coursera /edX – Career Development & Employability Skills Modules

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE1.1	2	3	2	–	–	–	–	2	3	–	–			
3SH205OE1.2	–	2	–	–	–	2	3	3	3	–	–			
3SH205OE1.3	–	3	2	–	–	2	2	3	–	–	–			
3SH205OE1.4	–	3	3	–	–	2	–	–	–	2	3			
3SH205OE1.5	–	2	3	–	3	–	–	–	2	–	2			
3SH205OE1.6	–	2	2	–	2	2	–	2	3	–	2			
3SH205OE1CO	1	3	2	-	1	2	1	2	2	1	1			

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3SH205OE2**	Course Category:	**OE**
Course Name	**Team Building & Management**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3SH205OE2Team Building & Management is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the course is to develop teamwork capabilities, leadership and managerial skills, collaborative problem-solving abilities, conflict management techniques, and effective decision-making skills required in professional and organizational settings.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE2.1	Explain the principles and importance of effective team building in organizations to foster collaborative work culture.	C-2
3SH205OE2.2	Apply team dynamics and collaboration strategies to achieve common goals.	C-3 A-3
3SH205OE2.3	Analyze leadership styles and managerial roles for effective team performance.	C-4
3SH205OE2.4	Demonstrate conflict resolution, negotiation, and interpersonal management skills for effective team performance.	C-3 A-3
3SH205OE2.5	Apply motivation and performance management techniques in team-based environments for achieving organizational goals.	C-3
3SH205OE2.6	Perform effectively as a team member or leader in simulated managerial scenarios to develop leadership competencies	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Team Building:** Concept of teams; types of teams; stages of team development; characteristics of effective teams; roles and responsibilities of team members; barriers to effective teamwork; team norms and values.	7Hrs
Unit 2	**Team Dynamics & Interpersonal Relationships:** Group behavior and dynamics; interpersonal communication in teams; trust and collaboration; listening as a team skill; diversity and inclusion in teams; cross-cultural team management	8Hrs
Unit 3	**Leadership in Teams:** Leadership concepts; leadership styles; emotional intelligence and leadership; situational leadership; influence and power in teams; leadership ethics and responsibilities.	7 Hrs
Unit 4	**Conflict Management & Negotiation:** Sources and types of conflict; conflict resolution techniques; negotiation strategies; managing difficult team members; stress management; maintaining team harmony	7 Hrs
Unit 5	**Motivation, Performance & Team Effectiveness:** Motivation theories; team motivation techniques; goal setting and performance measurement; feedback and appraisal systems; decision-making in teams; problem-solving techniques.	8 Hrs
Unit 6	**Managerial Skills & Team-Based Applications:** Managerial roles and functions; planning, organizing, and controlling teams; delegation and coordination; workplace simulations (team meetings, role plays); case studies on team management; team performance evaluation.	8 Hrs

Text Books:

1. Stephen P. Robbins, Organizational Behavior, Pearson Education
2. L.M. Prasad, Management Principles and Practices, published by Sultan Chand & Sons

Reference Books:

1. Patrick Lencioni, The Five Dysfunctions of a Team, published by Jossey-Bass
2. Peter G. Northouse, Leadership, published by SAGE Publications
3. Daniel Goleman, Emotional Intelligence, published by Bantam Books

E Resources:

1. NPTEL – Organizational Behavior & Management Courses
2. LinkedIn Learning – Team Leadership & Management Modules
3. Harvard Business Review – Teamwork & Leadership Articles
4. Coursera / edX – Team Management and Leadership Courses

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE2.1	2	–	–	–	–	–	–	–	–	–	–			
3SH205OE2.2	–	2	2	–	–	–	–	3	2	–	–			
3SH205OE2.3	–	3	3	–	–	–	–	2	–	–	–			
3SH205OE2.4	–	2	2	–	–	2	3	3	–	–	–			
3SH205OE2.5	–	2	2	–	–	–	–	2	–	2	–			
3SH205OE2.6	–	2	2	–	–	2	–	3	2	–	2			
3SH205OE2 CO	1	2	2	-	-	1	1	2	1	1	1			

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5.0**	Course Code:	**3EE206PC1**	Course Category:	**PCC**
Course Name	**Network Analysis Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3EE206PC1Network Analysis Lab is a Program Core Course for Second Year B. Tech Electrical Engineering.

Course Objectives:

The objective of this course is to reinforce students' understanding of network analysis concepts through hands-on experiments and to develop competency in analyzing electrical circuits.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE206PC1.1	Demonstrate experimental skills in using mesh, nodal, and network theorems to analyse DC and AC circuits, enhancing both theoretical understanding and practical competency.	C-3, P-5
3EE206PC1.2	Analyse, interpret, and validate experimental results of electrical networks.	C-4
3EE206PC1.3	Participate collaboratively in planning, executing, and presenting practical skills in electrical circuit design and testing	C-3, P-4, A-2

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Experimental Study and Verification of Mesh analysis.
2. Experimental Study and Verification of Nodal analysis.
3. Experimental Study and verification of the superposition theorem.
4. Experimental Study and verification Thevenin's theorem
5. Experimental verification of reciprocity theorem
6. Verification of maximum power transfer theorem
7. Analyse of the electric circuit using Nortons theorem
8. Analysis of Series RLC Resonance and Determination of Resonant Frequency

9. Determination of Open-Circuit Impedance (Z) Parameters of a two-Port network
10. Determination of short circuit admittance (Y) parameters of a two-port network.

E-Resources:

1. https://asnm-iitkgp.vlabs.ac.in/exp/verification-norton-theorem/
2. https://asnm-iitkgp.vlabs.ac.in/exp/verification-thevenin-theorem/
3. https://asnm-iitkgp.vlabs.ac.in/exp/verification-superposition-theorem/
4. https://asnm-iitkgp.vlabs.ac.in/exp/rlc-circuit-analysis/
5. https://asnm-iitkgp.vlabs.ac.in/exp/verification-millman-theorem/
6. https://asnm-iitkgp.vlabs.ac.in/exp/maximum-power-transfer-theorem/
7. https://asnm-iitkgp.vlabs.ac.in/exp/two-port-network/

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3EE206PC1.1	3	1	-	-	3	-	-	2	-	-	-	2	2	1
3EE206PC1.2	3	1	-	2	3	-	-	2	2	-	-	2	2	1
3EE206PC1.3	3	1	-	1	3	-	-	2	1	-	-	2	2	1
3EE206PC1CO	3	1	-	1	3	-	-	2	1	-	-	2	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**3EE207PC1**		Course Category:	**PCC**
Course Name	**Electronic Devices & Circuits - Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3EE207PC1 Electronic Devices & Circuits - Lab is a compulsory Program Core Course for Second Year B.Tech. Electrical Engineering.

Course Objectives:

Objective of this course is to achieve hands-on proficiency with fundamental electronic components and lab equipment, and to design, characterize, and analyze basic analog circuits.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE207PC1.1	Apply the fundamentals of semiconductor physics to analyze the V-I characteristics and function of Diodes and Zener regulators.	P-4
3EE207PC1.2	Design and analyze basic diode circuits like half-wave, full-wave rectifiers, and simple section filters for DC power supply applications.	P-4
3EE207PC1.3	Explain the construction and operation of BJTs and UJT, and determine appropriate DC biasing circuits and stability factors for transistor operation.	P-3

List of Praticals:

Minimum eight practicals from the list mentioned below.

1. Study the V-I Characteristics of a PN Junction Diode and determine its Static and Dynamic Resistances in Forward and Reverse Bias.
2. Determine the Ripple Factor and Voltage Regulation of a Full Wave Rectifier.
3. Verify the various clipping and clamping circuits using PN junction diode in Hardware as well Using Multisim software.
4. Study the V-I characteristics of Zener diode.

5. Study the static and transfer characteristics of the FET using Hardware and multi sim software.
6. Obtain the input and output characteristics of transistor in Common Emitter Configuration using Hardware and multi sim software.
7. Obtain the input and output characteristics of transistor in Common Base configuration using Hardware and multi sim software.
8. Draw the volt ampere / static characteristics of UJT using Hardware as well as Multisim software.
9. Design the Voltage divider bias circuit using BJT in Hardware and Multisim software.
10. Design the Voltage divider bias circuit using JFET in Hardware and Multisim software.
11. Design the Switch with self-bias using BJT.
12. Calculate the band width of given amplifier.

E-Resources:

1. https://nptel.ac.in/courses/108101091
2. http://vlabs.iitkgp.ac.in/be/
3. https://www.multisim.com/
4. https://www.falstad.com/circuit/

Mapping of COs with Pos & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3EE207PC1.1	3	3	-	2	1	-	-	1	-	-	-	-	1	-
3EE207PC1.2	2	3	3	2	2	-	-	1	-	-	-	1	1	2
3EE207PC1.3	3	2	2	2	3	-	-	1	-	-	-	1	1	1
3EE207PC1CO	3	2	2	2	2	-	-		-	-	-	1	1	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**3EE208PC1**	Course Category:	**PCC**
Course Name	**Electrical Machines-I – Lab**			
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30Hrs**	Total SL Hours: **--**
Total Credit Hours	**30 Hrs**			
SEE Marks	**--**	SEE Time	**--**	CIA Marks **--**
EE Marks	**25**	PA Marks	**25**	Total Marks **50**

Course Description:

Subject Code 3EE208PC1Electrical Machines-I - Lab is a compulsory Program Core Course for Second Year B. Tech Electrical Engineering.

Course Objectives:

The objective of this course is to provide hands-on experience in measuring, calibrating, testing, and analyzing electrical machine parameters and characteristics to develop practical skills for accurate and reliable results.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE208PC1.1	Perform tests on DC machines and transformers to determine characteristics and improve understanding of machine performance.	C-2
3EE208PC1.2	Apply OCC, load tests, braking, polarity, ratio, and OC/SC methods to analyze machines for effective operation.	C-4
3EE208PC1.3	Interpret experimental results to validate theoretical concepts and enhance the ability to assess machine behavior.	C-5

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Plot the Open Circuit Characteristics of DC generator and find its critical resistance and critical speed.
2. Study the build-up of DC shunt generator, calculate critical resistance at different speeds.
3. Plot/Compare: External, Internal Characteristics of DC Shunt/series/compound generator.
4. Calculate the efficiency and voltage regulation of DC generator by the direct load test.

5. Speed Control of DC Shunt motor by armature control & Field Control method.
6. Perform Electric Braking Operation on DC shunt Motor.
7. Conduct the Polarity test and Ratio test on transformer
8. Perform Parallel operation of two single phase two winding transformers.
9. Calculate the Equivalent circuit parameters of three-phase transformer by performing OC & SC test on it and determine its efficiency and voltage regulation.
10. Conversion of three phase to two phase supply system using Scott Connection.

E-Resources:

1. https://nptel.ac.in/courses
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science
3. www.youtube.com/c/LearnEngineering

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3EE208PC1.1	3	2	1	1	1	-	-	1	1	-	-	3	2	1
3EE208PC1.2	3	3	2	2	1	-	-	1	1	-	-	3	2	1
3EE208PC1.3	3	3	3	2	1	-	1	1	1	-	-	2	2	1
3EE208PCCO	3	3	2	2	1	-	-	1	1	-	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**3EE209EM1**		Course Category:	**EEM**
Course Name	**Economics of Energy Markets**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**		**30 Hrs**		
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**--**	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 3EE209EM1 Economics of Energy Markets is an Electrical Engineering Management course for Second Year B.Tech Electrical Engineering students.

Course Objectives:

The objective of this course is to provide an overview of the power sector, focusing on data interpretation, regulatory structures, and global energy market trends.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE209EM1.1	Apply fundamental power sector cost metrics and load definitions to construct accurate power flow models and bid strategies.	C-3, P-3
3EE209EM1.2	Analyze the Indian tariff structure and billing components to defend opinions on regulatory fairness and cross-subsidization policies.	C-4, A-3
3EE209EM1.3	Evaluate global energy trends and emerging technologies to justify the economic and ethical adoption of sustainable solutions like EVs.	C-5, A-3

Course Contents:

Unit 1	**Data Foundations of Power Economics:** Power Systems Overview: Generation, Transmission, Distribution; Load Data Analysis: Connected Load, Maximum Demand, Load Factor, Cost Structuring: Fixed Cost (Capital) vs. Variable Cost (Fuel), Unit Costing: Per-Unit Cost (kWh) Calculation, Depreciation.	10 Hrs

Unit 2	**Advancements in Indian Power Sector & Tariff Structures:** Sector hierarchy involving generation (NTPC), transmission (Power Grid) and distribution (DISCOMs); role of regulatory and market bodies such as CERC and IEX; concept of Open Access and electricity trading. Renewable energy mechanisms including Renewable Energy Certificates (REC) and Green Energy Open Access. Electricity tariff structure covering fixed charges, energy charges, electricity duty and tariff types such as flat rate, block rate and Time-of-Day (ToD) tariff.	12 Hrs
Unit 3	**Global Energy Scenarios & Future Trends:** Global Energy Mix: Coal, Oil, Renewables, Trade Dynamics: Import/Export of Fuel and Solar Components, Emerging Technologies: Electric Vehicles (EVs), Rooftop Solar Economics, Sustainability Goals: Climate Change Targets, Energy Efficiency	8 Hrs

Text Books:

1. Subhes C. Bhattacharyya, Energy Economics: Concepts, Issues, Markets and Governance, Springer.
2. (Standard Author), Elements of Electrical Engineering, (Standard Publisher).
3. C.L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International.
4. U.A. Bakshi & V.U. Bakshi, Elements of Electrical Engineering, Technical Publications.

Reference Books:

1. A. J. Wood & B. F. Wollenberg, Power Generation, Operation, and Control, Wiley.
2. James Larminie & John Lowry, Electric Vehicle Technology Explained, Wiley.
3. TERI Energy & Environment Data Diary and Yearbook (TEDDY), TERI Press.
4. James Momoh, Smart Grid: Fundamentals of Design and Analysis, Wiley.

E-Resources:

1. https://www.iexindia.com/
2. https://powermin.gov.in/
3. https://cea.nic.in/
4. https://beeindia.gov.in/
5. https://nptel.ac.in/courses/110105078
6. https://www.vlab.co.in/

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3EE209EM1.1	3	3	3	2	3	-	-	-	2	-	3	3	2	-
3EE209EM1.2	-	3	-	2	-	2	-	2	2	2	-	2	3	2
3EE209EM1.3	-	-	-	-	-	2	3	3	2	2	-	2	2	3
3EE209EM1CO	1	3	1	2	1	2	3	2	2	2	1	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3SH210VE1**	Course Category:	**VEC**
Course Name	**Constitutional Values and Fundamental Duties**			
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours **30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	--	SEE Time	--	CIA Marks --
EE Marks	**25**	PA Marks	**25**	Total Marks **50**

Course Description:

Subject Code 3SH210VE1 Constitutional Values and Fundamental Duties is a compulsory Values enhancement Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to introduce the Indian Constitution, its historical background, fundamental values, rights, and duties.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH210VE1.1	Explain the historical background, making, and significance of the Indian Constitution to Understand the Constitution, Preamble, and core values.	C2
3SH210VE1.2	Interpret Fundamental Rights and Duties (Articles 12–35, 51A) to evaluate their implications through case studies in professional and civic life.	C3
3SH210VE1.3	Apply constitutional principles to engineering ethics, sustainability concerns (Articles 48A, 51A(g)), and demonstrate social commitment, innovation, and inclusive growth as nation builders.	C3

Course Contents:

Unit 1	**Introduction to the Constitution and Fundamental Values**: Overview of the Indian Constitution – Historical background and making of the Constitution; Meaning of Constitution; Preamble – Meaning and significance. Core Constitutional Values – Justice (Social, Economic, Political); Liberty (thought, expression, belief, faith, worship); Equality (status and opportunity); Fraternity (dignity and unity of the nation). Relevance of constitutional values for professionals and citizens.	10 Hrs

Unit 2	**Fundamental Rights and Duties**: Fundamental Rights (Articles 12–35) – Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies. Fundamental Duties (Article 51-A) – Importance and implications; Role of youth and professionals in upholding duties. Case studies highlighting real-life significance of rights and duties.	10 Hrs
Unit 3	**Application of Constitutional Values in Engineering and Public Life**: Ethical Responsibilities and Constitutional Alignment – Engineering ethics and public interest; Environment and sustainability as constitutional concern (Articles 48A, 51A(g)); Engineers as nation builders – Social commitment, innovation, and inclusive growth.	10 Hrs

Text Books:

1. Basu D. D., Introduction to the Constitution of India, LexisNexis Publication, New Delhi (Twenty-Third Edition).
2. Jain M. P., Constitution of India, LexisNexis Publication, New Delhi (Eighth Edition).
3. Laxmikanth M., Indian Polity, McGraw Hill Education, New Delhi (Sixth Edition).
4. Austin Granville, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, New Delhi.
5. Shukla V. N., Constitution of India, Eastern Book Company, Lucknow (Twelfth Edition).
6. Government of India, Constitution of India (Bare Act), Government of India Publication, New Delhi.

Reference Books:

1. Subhash Kashyap, Our Constitution, National Book Trust, New Delhi.
2. Durga Das Basu, Shorter Constitution of India, LexisNexis Publication.
3. P. M. Bakshi, The Constitution of India, Universal Law Publishing.
4. J. N. Pandey, Constitutional Law of India, Central Law Agency.
5. Seervai H. M., Constitutional Law of India, N. M. Tripathi Pvt. Ltd. (Vols. I–III).
6. B. Shiva Rao, The Framing of India's Constitution: A Study, Indian Institute of Public Administration.
7. D. C. Wadhwa, Political Science and Constitutional Law, Eastern Book Company.
8. Madhav Khosla, The Indian Constitution: Oxford India Short Introductions, Oxford University Press.

E-Resources:

1. NPTEL course on Constitutional Studies, Prof. Sudhir Krishnaswamy, National Law School of India University
2. Constitutional Values and Fundamental Duties (University of Delhi – aligned with NEP 2020, available via NPTEL/DU open learning) https://kmc.du.ac.in/kmcouter/collnews/download/40727448169063791359.pdf/LinkedContents/pdf/All/All

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH210VE1.1	3	2	-	1	-	-	-	-	-	-	-	2	2	
3SH210VE1.2	-	3	2	2	-	2	3	3	-	-	-	3	2	-
3SH210VE1.3	-	-	3	3	-	2	3	2	-	2	-	3	3	2
3SH210VE1CO	1	2	2	2	-	2	2	2	-	1	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**3EE400FP1**		Course Category:	**FP**
Course Name	**Field Project**				
Credits	**02**	Total L:T:P Hours	0:0: 4 **60 Hrs**	Total SL Hours	--
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3EE400FP1Field project is a compulsory Experiential Learning Course for Second Year B. Tech Electrical Engineering.

Course Objectives:

This course enables students to understand the project development cycle through mini projects, apply hardware and software implementation skills, and communicate technical information effectively through report writing.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE400FP1.1	Conduct field - based surveys and assessments to identify electrical, renewable energy, and power quality issues.	C-3, P-3, A-2
3EE400FP1.2	Apply electrical engineering principles to design and implement practical, safe, and low-cost solutions for community needs.	C-4, P-4, A-2
3EE400FP1.3	Execute performance evaluation and energy auditing to improve efficiency, reduce losses, and assess societal impact.	C-5, P-4, A-3

Note:

Students are required to select any one of the project types/domains listed below, working in groups with a minimum of 4 and a maximum of 10 members.

Project Type:

1. Survey and evaluation of schemes related to rural electrification or renewable energy.
2. Design of Solar installations
3. Electrical Energy auditing and conservation strategies in residential, industrial and institutional setups.
4. Investigation of performance of solar inverters, battery systems, or smart metering.

5. Design of low-cost electrical training kits or laboratory aids.
6. Study of power quality issues or losses in local power distribution.
7. Design and development of electrically powered smart agricultural tools or systems

General Guidelines (Domains):

1. Power Distribution Systems and Loss Reduction
2. Renewable Energy Applications
3. Agri-Electrical Mechanization
4. Electrical Safety Systems
5. Automation using Arduino/ IoT in Electrical Applications
6. Energy Conservation
7. Green Energy Initiatives
8. Power Quality Improvement

Project Report Format:

The Project Report shall contain the following sections:

1. Title, Certificate, and Index
2. Objectives
3. Introduction
4. Literature Survey
5. Methodology (Experimental Method, Data Collection & Analysis, Case Study, Survey Method, Research Method)
6. Analysis (Graphical Representation / Simulation / Experimentation / Survey / Testing)
7. Problem Identification
8. Probable Solution
9. Conclusion
10. References

E-Resources:

1. https://instrumentationtools.com/renewable-energy-projects/
2. https://innovatorsguru.com/category/engineering-projects/
3. https://in.pinterest.com/innovatorsguru/electrical-engineering-projects/
4. https://ece-eee.final-year-projects.in/renewable-green-energy-saving-project-ideas-project-topics
5. https://www.arelectroprojects.com/projects

Course Plan:

Lecture No.	Module Title	Topic	Hours
1	Module 1: Orientation & Sensitization	NEP 2020: Community Engagement & Role of Electrical Engineers, Ethics, Social Responsibility & SDGs for Electrical Engineers, Overview of Community Electrical and Renewable	4

		Energy Needs, Identification of Community Institutions and Stakeholders, Electrical Safety, Team Formation, Area & Theme Allocation, Reorganization	
2	Module 2: Field Visits & Problem Identification	Pre-Visit Study, Permissions & Planning	28
3		Site Identification and Electrical System / Energy Infrastructure Documentation	
4		Field Data Collection and Technical Observation	
5		Electrical Measurements, Energy Audit and System Data Recording	
6		Analysis of Collected Data and Comparison with Relevant Standards	
7		Problem Identification and Development of Electrical Engineering Solutions	
8	Module 3: Engineering Problem–Solution Design & Implementation	Analysis of Collected Field Data and Identification of Electrical / Renewable Energy Problems	16
9		Preparation of Simple Single-Line Diagrams, Layout Sketches or System Models and Development of a Basic Improvement Plan	
10		Identification of Electrical Engineering Deficiencies Related to Energy Use, Safety, Power Quality, Renewable Energy or Community Infrastructure	
11		Design, Simulation, Fabrication or Configuration of the Proposed Electrical Engineering Solution	
12		Performance Evaluation, Feasibility Assessment and Analysis of Expected Community Benefits	
13	Module 4: Documentation, Presentation & Reflection	Data Analysis and Graphical Representation; Writing Methodology and Analysis Sections; Results, Discussion and Conclusion	12
14		Project Report Structure and Guidelines, Report Finalization and Presentation Preparation	
15		Evaluation and Viva	

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3EE400FP1.1	3	3	-	-	-	-	-	2	3	-	3	3	3	-
3EE400FP1.2	3	3	3	3	3	-	-	-	3	3	3	3	3	-
3EE400FP1.3	3	3	-	3	3	3	3	-	3	3	3	3	3	3
3EE400FP1CO	3	3	1	2	3	2	1	1	3	2	3	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3AL001NC1**		Course Category:	**NC**
Course Name	**Disaster Management and Preparedness**				
Credits	--	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	--
Total Credit Hours	--				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	--	Total Marks	--

Course Description:

Subject Code 3AL001NC1 Disaster Management and Preparedness is a Compulsory Non-Credit course for Second Year B. Tech all disciplines.

Course Objectives:

The objective of this course is to provide students with a comprehensive understanding of disasters, their types, impacts, the complete disaster management cycle, and the roles of various agencies in Disaster Risk Reduction.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE001NC1.1	Identify the concepts of disaster, hazard, vulnerability and risk, and classify disasters to understand the basic nature, causes and profiles of disasters in India.	C-2
3CE001NC1.2	Analyze the disaster management cycle for risk assessment, mitigation, preparedness, response, recovery, and international disaster management frameworks.	C-4
3CE001NC1.3	Apply disaster management practices, including stakeholder roles, national policies, engineers' responsibilities, and preparedness measures for effective disaster risk reduction.	C-3

Course Contents:

Unit 1	**Introduction to Disaster Management:** Concepts and definitions – disaster, hazard, vulnerability, risk, severity, frequency, exposure, capacity, and impact; classification of disasters- Natural disasters: earthquakes, tsunami, landslides, mining, Hydro-Meteorological Disasters: floods, draught, cyclones, coastal erosion. Biological Disaster: epidemics, pest attacks, forest fire, Manmade disasters: Industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical	10 hrs

	spills, transportation accidents, vulnerability profile of India, ecological fragility; principles of disaster prevention and mitigation	
Unit 2	**Disaster Management Cycle and Framework:** Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development. Awareness During Disaster – Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation. Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action Phases of disaster management; vulnerability and capacity assessment, post-disaster environmental response	12 hrs
Unit 3	**Disaster Management practices:** Roles and responsibilities of government, community, local bodies, NGOs, and other stakeholders, National Policy on Disaster Management Act 2005 Mega Disasters of India and Lessons Learnt, Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster.	8 hrs

Textbooks:

1. Sharma, S. C. (2022). Disaster Management, Khanna Publication.
2. Subramanian, R. (2024). Disaster Management. Vikas Publication.

Reference Books:

1. Gaur, R. C. (2018). Environmental Engineering and Disaster Management. New Age International.
2. Pradeep Sahni, 2024, Disaster Risk Reduction in South Asia, Prentice Hall.
3. Mondal, D. (2022). Disaster Management. New Delhi: CBS Publishers & Distributors
4. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
5. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
6. Natural Disaster Management Policy , 2009,GOI
7. H.N. Shrivastava & G.D. Gupta, Management of Natural Disasters in developing Countries, Daya Publishers , Delhi
8. S.L. Goyal, Encyclopedia of disaster Management, Vol I,II & III Disaster Management Policy and administration, Deep & Deep, New Delhi,2006
9. Coppola D P, Introduction to International Disaster Management, Elsevier Science (B/H), London, 2007

10. Disaster Mitigation in Asia & Pacific, Asian Development Bank

Course Assignments

Internal Assessment at Institute level will be based on following assignments:

1. Study of Recent Disasters (at local, state and national level)
2. Preparation of Disaster Risk Management Plan of an Area or Sector
3. A Case study on Disaster Management

E Recourses:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed61/preview

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3CE001NC1.1	3	2	-	-	-	3	2	-	-	-	3	-	-	-
3CE001NC1.2	3	3	-	-	-	3	3	-	-	-	3	2	2	-
3CE001NC1.3	3	3	-	-	-	3	3	-	-	3	3	1	2	2
3CE001NC1.CO	3	3	-	-	-	3	3	-	-	1	3	1	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5.0**	Course Code:	**3EE211DH1**	Course Category:	**DH**
Course Name	**Futuristic Power Systems**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3EE211DH1Futuristic Power Systems is a Double Minor / Honors offered by the department of Electrical Engineering for Second Year B. Tech, of all disciplines.

Course Objectives:

The Objective of this course is to explore the state of the art and future trends in power systems, understand the technical, economic and social challenges in power system evolution and realize the role and importance of Microgrids in futuristic power systems.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE211DH1.1	Explain the present global scenario of electricity generation, transmission, and distribution, and understand the need for resilient and secure energy infrastructure to address social, technical, and economic challenges in modern power systems.	C-3
3EE211DH1.2	Analyze various renewable energy resources and technologies, and evaluate their role in reducing dependence on conventional energy sources and promoting sustainable power generation.	C-3
3EE211DH1.3	Interpret the concepts and challenges of renewable energy integration, including hybrid systems and forecasting, to ensure reliable, stable, and efficient large-scale power system operation.	C-3
3EE211DH1.4	Compare different energy storage technologies and their characteristics, and assess their role in enhancing grid stability, reliability, and continuity of renewable energy supply.	C-3
3EE211DH1.5	Describe smart grid and microgrid concepts, architectures, and control strategies, and	C-4

	understand their significance in enabling intelligent, flexible, and decentralized power systems.	
3EE211DH1.6	Examine microgrid implementation in India through rural electrification and case studies, and evaluate their contribution to achieving inclusive, reliable, and sustainable energy access considering technical, economic, and social factors.	C-5

Course Contents:

Unit 1	**Introduction:** Present status of worldwide scenario of electricity generation, transmission and distribution; Energy infrastructure-Resilience and Security; Social, Technical and economic challenges; Major trends driving power system evolution; State of the art technologies in power system.	7 Hrs
Unit 2	**Renewable Energy Resources:** Review of renewable energy (RE) resources and systems: Solar-PV, Solar Thermal, Wind, Biomass, Micro-hydro and Fuel Cell, comparison of various RE resources; Renewable Energy Policies and present status of integration with existing grid.	7 Hrs
Unit 3	**Renewable Energy Integration:** Renewable Energy Integration- Concept, Classification of hybrid energy systems; Large scale integration of renewable energy-Technical challenges, enabling technologies, International requirements; Renewable energy forecasting.	7 Hrs
Unit 4	**Energy Storage Systems:** Review of energy storage components: Battery, VRB, Ultra-capacitor, Fuel Cells, Pumped Hydro-Storage and flywheels, comparison of ESS technologies; Importance of ESS in futuristic power systems.	8 Hrs
Unit 5	**Micro-grid Evolution:** Smart-grid concept, Smart Grid versus conventional electrical networks, Smart-grid infrastructure. Micro-grid concept, importance in futuristic power system, basic architectures and control, objectives and state of the art technologies; Microgrid as a building block of Smart-grid.	8 Hrs
Unit 6	**Microgrids in India:** Microgrids for Rural Electrification, Review of Microgrid Best Practices through Case Studies: Strategic Planning, Operations: Commercial and Financial Considerations; Technical and Social Context.	8 Hrs

Text Books:

1. Microgrids Architectures and Control Edited by Nikos Hatziargyriou, IEEE and Wiley, 2014
2. Energy Storage for Sustainable Microgrid by David Wenzhong Gao, Elsevier, 2015
3. Introduction to the Smart Grid- Concepts, Technologies and Evolution by Salman K. Salman, IET, 2017
4. Energy Storage Systems and Components by Alfred Rufer, CRC Press, 2018

Reference Books:

1. Energy Efficiency and Renewable Energy Handbook Edited by D. Yogi Goswami and Frank Kreith, 2nd Edition-2016, CRC
2. Clean Energy Microgrids, Edited by Shin'ya Obara and Jorge Morel IET, 2017
3. Hybrid-Renewable Energy Systems in Microgrids- Integration, Developments and Control edited by Hina Fathimaby et al., Elsevier WoodHead Publishing, 2018
4. Smart Microgrids: Lessons from Campus Microgrid Design and Implementation edited by Hassan Farhangi, CRC Press 2017

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc25_ee79/preview
2. https://onlinecourses.nptel.ac.in/noc21_ee68/preview.
3. https://onlinecourses.nptel.ac.in/noc22_ee82/preview.
4. https://onlinecourses.swayam2.ac.in/arp19_ap60/preview

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3EE211DH1.1	3	2	1	1	1	1	–	–	-	-	-	3	2	1
3EE211DH1.2	3	3	2	2	3	1	–	–	-	-	-	2	3	2
3EE211DH1.3	3	3	2	1	3	2	–	–	-	-	-	2	2	2
3EE211DH1.4	3	3	2	2	3	3	1	-	-	-	-	3	2	2
3EE211DH1.5	3	3	3	2	3	3	1	-	-	-	-	3	3	2
3EE211DH1.6	3	3	3	1	3	2	1	-	-	-	-	2	2	2
3EE211DH1CO	3	3	2	2	3	2	1	-	-	-	-	3	2	2

Correlation levels- 1: Slight (Low),2: Moderate (Medium), 3: Substantial (High)

Level:	**5.0**	Course Code:	**3EE211DH2**	Course Category:	**DH**
Course Name	**Fundamentals of EVs: Technology & Economics**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3EE211DH2 Fundamentals of EVs: Technology & Economics is a Double Minor / Honors offered by the department of Electrical Engineering for Second Year B. Tech, of all disciplines.

Course Objectives:

The objective of this course is to provide fundamental knowledge of electric vehicle technologies, powertrain systems, global trends, and challenges to understand their role in sustainable and efficient transportation.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE211DH2.1	Explain the evolution of electric vehicles, including early developments, comparison with ICE vehicles, and technological advancements, to understand the transition toward sustainable and energy-efficient transportation systems.	C-3
3EE211DH2.2	Describe the fundamentals of electric vehicles, their types, electric machines, and transmission systems to develop foundational knowledge of EV architecture and current technological trends.	C-3
3EE211DH2.3	Analyze hybrid electric vehicle configurations, operating modes, and degrees of hybridization to understand their role in improving fuel efficiency and reducing emissions in modern transportation.	C-3
3EE211DH2.4	Interpret EV powertrain components, motor selection, transmission systems, and regenerative braking to understand performance characteristics and design considerations of efficient propulsion systems.	C-3
3EE211DH2.5	Examine global and Indian EV scenarios, including adoption trends, key players, and	C-4

	policies to understand market dynamics and regulatory frameworks influencing EV growth.	
3EE211DH2.6	Evaluate environmental, economic aspects, and challenges of EV adoption to understand sustainability benefits, cost implications, and barriers affecting large-scale implementation of electric mobility.	C-4

Course Contents:

Unit 1	**Evolution of Electric Vehicles:** History of EVs (19th century to early 20th century) Comparison with Internal Combustion Engine (ICE) vehicles - energy efficiency, performance, and emissions. Reasons for decline of early EVs, Energy crisis and environmental concerns, Advances in battery technology.	7 Hrs
Unit 2	**Electric Vehicles:** Basics of Electric Vehicles, Current Status and Trends for EVs, Battery Electric Vehicles (BEVs), Fuel-Cell Electric Vehicles (FCEVs), Electric Machines for EV applications, EV Transmission: Single-Speed EV Transmission, Multiple Ratio EV Transmissions.	8 Hrs
Unit 3	**Hybrid Powertrain:** Emergence of hybrid electric vehicles (HEVs), Types (HEV, PHEV, BEV, FCEV). Series HEVs, Parallel HEVs, Series–Parallel HEVs, Complex HEVs, Operating Modes, Degree of Hybridization, Comparison of HEVs, Plug-in Hybrid Electric Vehicles (PHEVs); Real Life examples of HEVs.	8 Hrs
Unit 4	**EV Powertrain and Propulsion Systems:** EV powertrain components and configurations. Electric motors for EVs: BLDC, PMSM, Induction motors – working and selection criteria. Transmission systems and regenerative braking. Performance characteristics and vehicle dynamics basics.	7 Hrs
Unit 5	**Global and Indian EV Scenario:** Global EV Scenario: Trends in worldwide EV adoption; major markets like China, USA, Europe, and Norway; key growth drivers including technology, environmental concerns, and policies, Global Policies and Initiatives. Indian EV Scenario: Current adoption status, market trends, major industry players, and key opportunities and challenges in India. Government Policies in India.	8 Hrs

Unit 6	**Environmental and Economic Aspects and Challenges:** Reduction in greenhouse gas emissions, Lifecycle emissions (basic concept), Cost comparison: EV vs ICE vehicles, Role of renewable energy in EV ecosystem. Challenges in Global EV Adoption: Battery cost and raw materials, Range anxiety, Charging time and infrastructure gaps, Grid readiness and energy supply issues.	7 hrs

Text Books:

1. James Larminie & John Lowry, Electric Vehicle Technology Explained, Wiley.
2. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press.
3. Mehrdad Ehsani, Modern Electric, Hybrid Electric and Fuel Cell Vehicles, CRC Press.

Reference Books:

1. Electric Vehicle Machines and Drives: Design, Analysis and Application, K. T. Chau, Wiley.
2. Modern Electric Vehicle Technology, C.C. Chan, Oxford University Press.
3. Energy Efficiency Services Limited (EESL), MNRE, NITI Aayog Reports on EV Policies.

E-Resources:

1. https://nptel.ac.in/courses/108106183
2. https://www.ieee.org/ev
3. https://www.energy.gov/eere/vehicles
4. https://www.beeindia.gov.in
5. https://evreporter.com

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3EE211DH1.1	3	2	1	1	–	1	-	1	–	-	–	3	1	2
3EE211DH1.2	3	3	3	2	2	1	-	–	–	-	–	2	3	2
3EE211DH1.3	3	2	2	3	2	1	-	–	–	-	–	2	3	3
3EE211DH1.4	3	3	3	2	3	1	-	–	–	-	2	3	3	2
3EE211DH1.5	2	3	2	2	–	2	-	2	–	1	2	2	2	3
3EE211DH1.6	2	3	3	3	2	1	-	2	–	1	2	2	2	3
3EE211DH1CO	3	3	2	2	2	1	-	1	-	1	2	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substa ntial (High)

Level:	**5.0**	Course Code:	**4EE212PC1**	Course Category:	**PCC**
Course Name	**Analog and Digital Circuits**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours:	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4EE212PC1 Analog and Digital Circuits is a compulsory Program Core Course for Second Year B. Tech Electrical Engineering.

Course Objectives:

The Objective of this course is to provide a foundational understanding of both analog and digital electronics, focusing on the operation, analysis, and design of fundamental circuits using diodes, transistors, and logic gates, while introducing basic concepts of feedback and conversion.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4EE212PC1.1	Apply knowledge of operational amplifiers and their internal circuits to analyze IC-based circuits and measure op-amp parameters.	C-3
4EE212PC1.2	Design and analyze operational amplifier (Op-Amp) circuits for practical applications like summing, integrating, and filtering.	C-4
4EE212PC1.3	Illustrate the concepts of linear ICs, SMPS, and IC 555 to analyze and implement regulator and timer-based electronic circuits.	C-4
4EE212PC1.4	Use Boolean algebra and Karnaugh Maps (K-Maps) to simplify and implement combinational logic circuits.	C-3
4EE212PC1.5	Demonstrate the operation of sequential logic circuits, including flip-flops, counters, and registers.	C-4
4EE212PC1.6	Evaluate the principles and architecture of Analog-to-Digital (ADC) and Digital-to-Analog (DAC) converters to understand the concept of ADC and DAC	C-4

Course Contents:

Unit 1	**Introduction to ICs:** Operational amplifier, Block schematic internal circuits, Level shifting, overload protection, study of IC Op-amp, Measurement of op-amp parameter.	7 Hrs
Unit 2	**Operational Amplifiers (Op-Amps):** Op-Amp characteristics (ideal and practical). Basic Op-Amp circuits: Inverting and Non-inverting amplifiers. Applications: Adder, Subtractor, Integrator, Differentiator, and Comparators. Introduction to positive and negative feedback.	7 Hrs
Unit 3	**Other linear ICs:** Block schematic of regulator IC 723 and its applications, study of 78XX, 79XX and its applications, SMPS, Block schematic of timer IC 555 and its applications as a timer, a stable, mono-stable, bi-stable multi-vibrator and other applications.	7 Hrs
Unit 4	**Combinational Digital Logic:** Number systems, Boolean algebra, and De Morgan's theorems. Logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR). Karnaugh Map (K-Map) simplification (up to 4 variables). Design and analysis of standard combinational circuits: Multiplexers, Demultiplexers, Encoders, and Decoders.	8 Hrs
Unit 5	**Sequential Digital Logic:** Latches and Flip-Flops (SR, JK, D, T). Conversion between flip-flops. Analysis of Synchronous and Asynchronous Counters (Ripple and Johnson). Shift Registers (SISO, SIPO, PISO, PIPO).	8 Hrs
Unit 6	**Data Conversion and Logic Families:** Digital-to-Analog Converters (DACs): R-2R ladder and weighted resistor types. Analog-to-Digital Converters (ADCs): Successive Approximation and Flash types. Introduction to logic families (TTL, CMOS) characteristics (Fan-out, Noise Margin, Propagation Delay).	8 Hrs

Text Books:

1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson.
2. M. Morris Mano, Digital Logic and Computer Design, Pearson.
3. Ramakant A. Gayakwad, Op-Amps and Linear Integrated Circuits, Prentice Hall.

Reference Books:

1. Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman and Christos C. Halkias, McGraw-Hill.
2. Fundamentals of Digital Circuits, Anand Kumar, Prentice Hall India Learning Private Limited.

E-Resources:

1. https://nptel.ac.in/courses/108/102/108102113
2. https://nptel.ac.in/courses/117/105/117105080
3. https://nptel.ac.in/courses/117/103/117103063
4. https://nptel.ac.in/courses/108/101/108101005

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4EE212PC1.1	3	2	1	2	1	-	-	-	-	-	-	1	2	1
4EE212PC1.2	3	3	2	2	2	1	-	-	-	-	-	1	2	1
4EE212PC1.3	3	3	2	2	2	3	-	-	1	-	-	1	2	1
4EE212PC1.4	2	3	2	1	3	2	-	-	1	-	-	-	2	1
4EE212PC1.5	2	3	2	2	3	2	-	1	1	-	-	-	1	1
4EE212PC1.6	2	2	2	1	3	1	-	-	-	-	-	1	2	1
4EE212PC1CO	3	3	2	2	2	2	-	-	1	-	-	1	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**4EE213PC1**	Course Category:	**PCC**
Course Name	**Electrical Measurement & Instrumentation**			
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours : **30Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4EE213PC1 Electrical Measurement & Instrumentation is a compulsory Program Core Course for Second Year B. Tech Electrical Engineering.

Course Objectives:

The objective of this course is to enable learners with electrical measuring instruments and transducers, and to develop skills for accurate measurement and analysis of electrical quantities.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4EE213PC1.1	Classify suitable measuring instruments (PMMC, MI, Electrodynamometer, Induction types) to select the correct device for accurate practical electrical measurements.	C-4
4EE213PC1.2	Demonstrate the construction, working principle, and torque equation of wattmeters and energy meters to understand their operation and ensure correct power and energy measurement.	C-3
4EE213PC1.3	Demonstrate the construction and working of Instrument Transformers and special purpose meters to ensure safe, isolated, and precise measurement in high-voltage and specialized applications.	C-3
4EE213PC1.4	Analyze AC/DC bridge techniques for measuring resistance, inductance, and capacitance to apply accurate testing methods in practical laboratory scenarios.	C-4
4EE213PC1.5	Demonstrate digital measuring instruments to achieve accurate, fast, and real-time electrical measurement in modern applications.	C-3

4EE213PC1.6	Illustrate instrumentation systems and transducers to understand how physical parameters are sensed, measured, and controlled in practical engineering systems.	C-3

Course Contents:

Unit 1	**Analog Instruments:** Classification of measuring instruments, Construction and theory of operation, Different torques in measuring instruments, Torque equation, Errors, Merits and demerits of Analog Ammeter, Voltmeter (PMMC, MI instruments) and Electro-dynamic type meter, Extension of ranges for ammeter & voltmeter	6 Hrs
Unit 2	**Analysis of Three Phase Balanced Load:** Blondell's theorem, Measurement of active and reactive power in single phase and three phase circuits.	4 Hrs
Unit 3	**Instrument Transformers:** Importance of C.T. and P.T., Theory and construction, Phasor diagram, Errors and applications. Special Instruments- Phase sequence indicator, Power factor meter, Synchroscope and Stroboscope.	5 Hrs
Unit 4	**Measurement of Circuit Parameters:** Different methods of measurement of low, medium, high value of resistance. **AC and DC Bridges:** Wheat-stone, Kelvin, Maxwell, Hay, De-Sauty, Schering, Anderson's bridge.	5 Hrs
Unit 5	**Digital Methods of Measurements:** Introduction to A/D, D/A conversion techniques, F/V and V/F conversion techniques, Digital voltmeter, ammeter, wattmeter, errors in digital meters.	5 Hrs
Unit 6	**Generalized Instrumentation System:** Characteristics of measurement and Instrumentation system. Transducers: Definition, classification, Specification, selection, loading effect, Displacement, velocity transducers, Resistive, inductive, Capacitive, strain gauge transducers, Piezoelectric, current and voltage transducers.	5 Hrs

Text-Books:

1. A.K. Sawhney, Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai & Co (P) Ltd.
2. R.K. Rajput, Electrical & Electronic Measurement and Instrumentation, S. Chand Publishing.
3. D. V. S. Murthy, Transducers and Instrumentation, New Delhi Prentice Hall of India.

4. Ernest O. Doebelin, Measurement Systems: Application and Design, Tata McGraw-Hill.
5. David A. Bell, Electronic Instrumentation & Measurements, Oxford University.

Reference Books:

1. E.W.Golding & F.C.Widdis, Electrical Measurements & Measuring Instruments, A.H.Wheeler & Co.
2. Albert D. Helfrick & William D. Cooper, Modern Electronic Instrumentation & Measurement Techniques, Prentice Hall of India.
3. Joseph. J. Carr, Elements of Electronic Instrumentation & Measurements, III edition, Pearson Education.
4. A.J. Bouwens, Digital Instrumentation, McGraw Hill Publications.

E-Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108105064
3. https://egyankosh.ac.in/
4. https://swayam.gov.in/

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4EE213PC1.1	3	2	2	1	2	1	-	-	-	-	1	2	2	-
4EE213PC1.2	3	2	2	2	2	1	-	-	-	-	-	2	2	-
4EE213PC1.3	3	2	2	2	2	1	-	-	-	-	1	2	1	-
4EE213PC1.4	2	3	3	2	2	1	-	-	-	-	1	1	1	-
4EE213PC1.5	2	3	2	2	3	1	-	-	-	-	-	-	2	1
4EE213PC1.6	2	3	3	2	3	2	-	-	-	-	-	1	1	1
4EE213PC1CO	3	2	2	2	2	1	-	-	-	-	1	2	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**4EE214PC1**		Course Category:	**PCC**
Course Name	**Power Systems - I**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4EE214PC1 Power Systems - I is a compulsory Program Core Course for Second Year B.Tech. Electrical Engineering.

Course Objectives:

The objective of this course is to build fundamental knowledge of power system structure, transmission line modelling, and line design, while developing analytical skills essential for reliable power transfer in modern networks.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4EE214PC1.1	Examine the structure and standards of modern power systems to explain the role of smart grids and microgrids.	C-3
4EE214PC1.2	Analyse transmission line inductance and capacitance to evaluate effects of conductor configuration and earth return.	C-3, C-5
4EE214PC1.3	Determine ABCD constants and assess voltage regulation, efficiency, and SIL to evaluate transmission line performance.	C-3
4EE214PC1.4	Apply sag–tension, loading, corona, and insulator concepts to ensure reliable and safe overhead line design.	C-3
4EE214PC1.5	Explain construction, insulation, and dielectric stress for analysing performance and suitability of different underground cable types.	C-4
4EE214PC1.6	Use per-unit representation and Y-Bus formation to analyse distribution networks and basic load-flow behaviour.	C-3

Course Contents:

Unit 1	**Introduction to Power Systems Restructuring:** Structure of modern power systems, Generation–Transmission–Distribution overview, Electrical supply standards (voltage levels,	3 Hrs

	frequency in Indian grid), Introduction to Smart Grids and Micro-grids.	
Unit 2	**Transmission Line Parameters:** Derivation for Inductance of single-phase & three-phase lines, Concept of GMR, GMD, transposition of lines, Skin effect, Proximity effect, Bundled conductors and its advantages, Derivation for Capacitance of single-phase & three-phase lines, Effect of earth return on line inductance & capacitance	7 Hrs
Unit 3	**Transmission Line Performance:** Classification of short, medium (nominal T and nominal) and long lines, Determination of ABCD constants & their applications, Voltage regulation & transmission efficiency, Ferranti effect, Surge impedance & surge impedance loading (SIL)	5 Hrs
Unit 4	**Mechanical Design of Overhead Transmission Lines:** Line supports, conductor types, Sag & tension calculations, Effect of wind and ice loading, Corona: critical voltages, power loss, factors affecting corona, Insulators: types, string efficiency, Methods to improve string efficiency.	5 Hrs
Unit 5	**Underground Cables:** Types of cables: single-core, three-core, Cable construction & insulation materials, Capacitance of cables, dielectric stress & grading, Overhead vs. underground comparison	4 Hrs.
Unit 6	**Per Unit System, Distribution systems and load flow Analysis:** Introduction & advantages of per unit systems, Representation of power system elements, PU conversion of impedances and single line impedance diagram. Types of distribution systems, comparison, Feeders and distributors, DC and AC distribution, Introduction to load flow studies, Y_{Bus} formation.	6 Hrs

Text Books:

1. V. K. Mehta, Rohit Mehta, Principles of Power System, First Multicolour edition S. Chand Publication (Reprint 2015).
2. Ashfaq Hussain, Electric Power System, 5th edition, CBS Publication.
3. I. J. Nagrath and D. P. Kothari, Modern Power System Analysis, 3rd edition, Tata McGraw Hill.

Reference Books:

1. W. D. Stevenson, Elements of Power System Analysis, 4th edition, MGH Publication.
2. C. L Wadhwa, Electrical Power system, 3rd edition, New Age International Publication.

E-Resources:

1. https://nptel.ac.in/courses/108102047
2. https://nptel.ac.in/courses/117105140

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4EE214PC1.1	3	2	1	-	-	-	-	1	-	-	-	3	-	2
4EE214PC1.2	3	3	2	1	-	-	-	-	-	-	1	3	1	1
4EE214PC1.3	3	3	2	2	3	-	-	-	-	-	-	3	1	1
4EE214PC1.4	3	2	3	2	2	-	-	1	-	-	-	3	1	1
4EE214PC1.5	3	2	2	1	1	-	-	-	-	-	-	3	-	1
4EE214PC1.6	3	3	2	2	-	-	-	1	-	-	1	3	1	2
4EE214PC1CO	3	3	2	2	1	-	-	1	-	-	1	3	1	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**4EE215MD2**		Course Category:	**MDM**
Course Name	**Renewable Energy Systems**				
Credits	**02**	Total L: T:P etc. Hours	2:0:0 **30Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**02 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 4EE215MD2 Renewable Energy Systems is a compulsory Multidisciplinary Minor Course offered by the department of Electrical Engineering for other Second Year B. Tech, major disciplines.

Course Objectives:

The objective of this course is to introduce primary renewable energy sources and develop analytical skills to assess their performance and grid integration.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4EE215MD2.1	Classify energy sources and analyze global energy trends to understand the need for renewable energy and sustainable development.	C-4
4EE215MD2.2	Explain the working and components of geothermal and tidal power plants to evaluate their feasibility and applications.	C-3
4EE215MD2.3	Explain the working principles, components, types and policies of hydrogen fuel, solar, and wind power systems to evaluate their role in sustainable and clean power generation.	C-4

Course Contents:

Unit 1	**Energy Fundamentals and Renewable Energy in India:** Energy Classification: Primary, Secondary, Commercial, Non-Commercial, Conventional, Non-Conventional energy Sources, Early Initiatives and Foundations, Policy and Development in the field of renewable energy. Global Energy Scenario: Overview of global primary energy reserves, Consumption trends, Necessity for a shift towards renewable sources.	06 Hrs

Unit 2	**Geothermal power plant**: Layout of Geothermal Power Plant, Working Principle, Types of Geothermal Power Plants, Components and Their Functions, Site Selection Criteria, Advantages and dis-advantages of Geothermal Power Plant, Applications and Examples of Geothermal Power Plants. **Tidal Power Plant:** Layout of Tidal Power Plant, Working Principle, Types of Tidal Power Plants, Site Selection Criteria, Advantages of Tidal Power Plant, Disadvantages of Tidal Power Plant, Applications, Examples of Tidal Power Plants.	10 Hrs
Unit 3	**Hydrogen Fuel Power Generation Plant:** Layout of Hydrogen Fuel Power Plant, Working Principle, Types of Hydrogen Power Generation Systems, Components and Their Functions, Hydrogen Production Methods, Advantages of Hydrogen Power Plant, Applications and examples of Hydrogen Fuel Power Generation Plant. **Solar Energy:** Solar cell and its types, Solar cell to module — series and parallel connections, Module to array — configuration and sizing , Principle of solar energy conversion into heat, Types of solar collectors, Solar energy policies and incentives in India (MNRE) **Wind Energy:** Wind Energy Conversion Principle, Wind Turbine Types and Components, Site Selection and Wind Farm Design. Wind energy policies and incentives in India (MNRE)	14 Hrs

Text Books:

1. D.P. Kothari, K. C. Singal, Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, Delhi PHI Learning.
2. V. V. N. Kishore, Renewable Energy Engineering and Technology, Khanna Publishers.
3. G. D. Rai, Non-Conventional Energy Sources, Khanna Publishers.

Reference Books:

1. L. L. Freris, David Infield, Renewable Energy Integration (Challenges and Solutions), Springer.
2. Mukund R. Patel, Wind and Solar Power Systems (Design, Analysis, and Operation), CRC Press.
3. M. Kathiresh (Editor), et al, Integration of Renewable Energy Sources with Smart Grid (Smart Grid technologies, Energy Storage Systems), Wiley.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc25_ee79/preview
2. https://onlinecourses.nptel.ac.in/noc22_ee18/preview

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4EE215MD2.1	3	2	1	-	1	2	2	-	-	-	1	2	1	2
4EE215MD2.2	3	2	1	-	3	2	3	2	-	-	1	2	1	2
4EE215MD2.3	3	3	2	-	3	3	3	2	-	1	1	2	1	2
4EE215MD2CO	3	2	2	-	2	2	2	1	-	1	1	2	1	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4SH216OE1**	Course Category:	**OE**
Course Name	**Quantitative and Logical Reasoning**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4SH216OE1Quantitative and Logical Reasoning is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the Course is to develop quantitative aptitude, logical reasoning, problem-solving efficiency, and decision-making skills for placements, competitive exams, and real-life applications

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE1.1	Apply arithmetic and numerical techniques to solve quantitative problems accurately.	C-3
4SH216OE1.2	Solve algebraic and equation-based problems using simplification and approximation methods to improve problem-solving efficiency.	C-3
4SH216OE1.3	Analyze logical reasoning problems using structured and critical thinking approaches to improve decision-making skills.	C-4
4SH216OE1.4	Interpret and analyze data using graphical and tabular methods for decision making for strategic planning.	C-4
4SH216OE1.5	Solve complex logical puzzles and advanced reasoning problems efficiently for competitive examination success.	C-3
4SH216OE1.6	Demonstrate effective aptitude test strategies integrating quantitative and logical reasoning skills for career advancement opportunities.	C-3

Course Contents:

Unit 1	**Number System & Arithmetic Foundations:** Number system fundamentals; LCM and HCF applications; divisibility rules; percentage calculations; ratio and proportion; averages; profit and loss; simple and compound interest; speed mathematics and shortcut techniques.	7Hrs
Unit 2	**Algebra, Equations & Simplification Techniques:** Linear and quadratic equations; algebraic expressions; simplification and approximation; indices and surds; inequalities; time and work; pipes and cisterns; time, speed and distance; mixtures and alligation.	7 Hrs
Unit 3	**Logical Reasoning: Analytical & Critical Thinking:** Coding–decoding; blood relations; direction sense; series and pattern recognition; analogies; ranking and ordering; syllogisms; statement and assumption; statement and conclusion; cause–effect reasoning.	7 Hrs
Unit 4	**Data Interpretation & Analytical Aptitude:** Tables; pie charts; line graphs; bar graphs; caselets; data sufficiency; DI shortcut techniques; approximation in data interpretation; comparative and predictive data analysis.	8Hrs
Unit 5	**Advanced Logical Reasoning & Puzzle Solving:** Seating arrangements (linear, circular, and complex); floor-based puzzles; scheduling puzzles; selection-based puzzles; Venn diagrams; logical grouping; critical reasoning frameworks	8 Hrs
Unit 6	**Placement Aptitude Mastery & Test Strategies:** Integrated quantitative and logical reasoning practice; decision-making and elimination strategies; speed improvement techniques; mock placement aptitude patterns (TCS, Infosys, Wipro, Accenture, Capgemini); common error analysis; test-taking strategies; aptitude and reasoning simulations.	8 Hrs

Text Books:

1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing
2. Arun Sharma, Logical Reasoning and Data Interpretation, McGraw Hill

Reference Books:

1. Arun Sharma, How to Prepare for Quantitative Aptitude, published by McGraw Hill Education.
2. R.S. Aggarwal, A Modern Approach to Logical Reasoning, published by S. Chand Publishing
3. M.K. Pandey, Analytical Reasoning, published by BSC Publishing Co. Pvt. Ltd.

4. Rajesh Verma, Fast Track Objective Arithmetic, published by Arihant Publications

E Resources:

1. NPTEL – Quantitative Aptitude & Logical Reasoning Courses
2. IndiaBIX – Quantitative and Logical Reasoning Practice
3. CareerRide – Aptitude Preparation Modules
4. PrepInsta / HackerEarth – Placement Aptitude Practice Platforms

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4SH216OE1.1	3	3	2	–	–	–	–	–	–	–	–			
4SH216OE1.2	3	3	2	–	–	–	–	–	–	–	–			
4SH216OE1.3	–	3	3	–	–	–	–	–	–	–	–			
4SH216OE1.4	–	3	2	–	–	–	–	–	–	–	–			
4SH216OE1.5	–	3	3	–	–	–	–	–	–	–	–			
4SH216OE1.6	–	3	2	–	–	–	–	–	–	2	3			
4SH216OE1 CO	1	3	3	–	–	–	–	–	–	1	1			

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4SH216OE2**	Course Category:	**OE**
Course Name	**Critical Thinking & Decision Making**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4SH216OE2 Critical Thinking & Decision Making is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The objective of this course is to develop critical thinking and decision-making competencies by strengthening analytical reasoning and structured problem-solving skills applicable to professional and real-world situations.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE2.1	Apply critical thinking frameworks to analyze problems systematically.	C-3
4SH216OE2.2	Evaluate information, assumptions, and arguments for logical consistency and validity.	C-5
4SH216OE2.3	Analyze complex situations and identify feasible alternatives for decision making.	C-4
4SH216OE2.4	Design rational and ethical decision-making strategies under uncertainty to ensure sustainable organizational outcomes.	C-6 A-3
4SH216OE2.5	Apply quantitative and qualitative tools to support decision-making processes.	C-3
4SH216OE2.6	Demonstrate effective decision making in simulated professional and team-based scenarios to resolve workplace challenges effectively	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundations of Critical Thinking:** Concept of critical thinking; elements of reasoning; logical vs illogical thinking; assumptions and inferences; inductive and deductive reasoning; common cognitive biases; barriers to critical thinking.	7 Hrs

Unit 2	**Analytical Reasoning & Problem Framing:** Problem identification and structuring; root cause analysis; issue trees; questioning techniques; systems thinking; analytical reasoning models.	7 Hrs
Unit 3	**Decision Making Models & Techniques:** Rational decision-making model; intuitive decision making; bounded rationality; decision trees; cost–benefit analysis; risk and uncertainty; heuristics.	7 Hrs
Unit 4	**Data-Driven & Ethical Decision Making:** Use of data in decision making; qualitative vs. quantitative data; basic decision matrices; ethical frameworks; professional ethics; social and environmental considerations in decisions.	8 Hrs
Unit 5	**Creativity, Innovation & Strategic Thinking:** Creative thinking techniques; lateral thinking; design thinking approach; scenario planning; strategic decision making; innovation in problem solving.	8 Hrs
Unit 6	**Applied Decision Making & Case Analysis:** Case studies from industry and management; individual and group decision simulations; conflict resolution through decision frameworks; decision-making under pressure; reflection and feedback	8 Hrs

Text Books:

1. Alec Fisher, Critical Thinking, published by Cambridge University Press.
2. John Adair, Decision Making and Problem Solving, published by Kogan Page.

Reference Books:

1. Daniel Kahneman, Thinking, Fast and Slow published by Farrar, Straus and Giroux.
2. Rolf Dobelli, The Art of Thinking Clearly, published by Sceptre.
3. John S. Hammond, Ralph L. Keeney, Howard Raiffa, Smart Choices, published by Harvard Business School Press.
4. Ken Watanabe, Problem Solving 101, published by Portfolio.

E Resources:

1. NPTEL – Critical Thinking & Decision Making Courses
2. Coursera – Critical Thinking and Decision-Making Modules
3. Harvard Business Review – Decision Making Articles
4. MIT Open CourseWare – Decision Analysis

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4SH216OE2.1	2	3	2	–	–	–	–	–	–	–	–	2	1	2
4SH216OE2.2	–	3	3	–	–	–	–	–	–	–	–	–	1	3
4SH216OE2.3	–	3	2	–	–	–	–	–	–	–	–	–	1	2
4SH216OE2.4	–	3	3	–	–	2	3	–	–	–	–	–	1	3
4SH216OE2.5	–	2	2	–	2	–	–	–	–	–	–	–	1	2
4SH216OE2.6	–	2	2	–	–	2	–	2	2	–	2	–	2	2
4SH216OE2. CO	1	3	3	-	1	1	1	1	1	-	1	1	1	3

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**4EE217PC1**		Course Category:	**PCC**
Course Name	**Electrical Measurement & Instrumentation Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours: 00	--
Total Credit Hours	**30 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 4EE217PC1 Electrical Measurement & Instrumentation Lab is a Program Core Course for Second Year B. Tech Electrical Engineering.

Course Objectives:

The objective of this course is to enable learners to provide hands-on experience in measuring electrical quantities using various instruments and transducers and to develop practical skills in calibration, testing, and analysis of measurement systems for accurate and reliable results.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4EE217PC1.1	Demonstrate the working principles and characteristics of various electrical measuring instruments and transducers used for measurement of electrical and physical quantities.	C-3, P-5
4EE217PC1.2	Perform accurate measurement of resistance, inductance, power, energy, pressure, force, displacement, and speed using appropriate bridges and electronic instruments.	C-4
4EE217PC1.3	Analyze experimental data, identify possible sources of error, and interpret measurement results to ensure reliability and precision in practical applications.	C-3, P-4, A-2

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Determine the value of unknown resistance using Post box office trainer.
2. Determine the value of unknown resistance using Kelvin bridge.
3. Identify the unknown inductance using Maxwell bridge.
4. Determine the value of unknown inductance using Hay's bridge.
5. Measurement of force by using Strain guage.
6. Measurement of high insulation resistance by using Megger.
7. Measurement of a pressure using pressure transducer.

8. Measurement of linear displacement using LVDT.
9. Measurement of Speed using Digital Tachometer.
10. Measurement of Energy using Single-phase Energy Meter
11. Measurement of Power using Wattmeter (2-wattmeter method).

E-Resources:

1. https://elms-iitr.vlabs.ac.in/exp/measuring-instruments/
2. https://elms-iitr.vlabs.ac.in/exp/wheatstone-bridge/
3. https://elms-iitr.vlabs.ac.in/exp/kelvin-sdouble-bridge/
4. https://elms-iitr.vlabs.ac.in/exp/schering-bridge/
5. https://elms-iitr.vlabs.ac.in/exp/three-phase-power/
6. https://elms-iitr.vlabs.ac.in/exp/maxwells-bridge/
7. https://elms-iitr.vlabs.ac.in/exp/energy-meter/

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4EE217PC1.1	3	2	1	1	1	1	1	1	-	-	-	2	2	-
4EE217PC1.2	3	2	2	3	2	1	1	1	-	-	-	1	2	-
4EE217PC1.3	2	3	2	3	1	1	1	-	-	-	-	1	2	-
4EE217PC1CO	3	2	2	3	1	1	1	1	-	-	-	2	2	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5.0**	Course Code:	**4EE218PC1**		Course Category:	**PCC**
Course Name		**Power Systems – I Lab**				
Credits		**01**	Total L:T:P etc. Hours	0:0:2 **30Hrs**	Total SL Hours	--
Total Credit Hours		**30Hrs**				
SEE Marks		--	SEE Time	--	CIA Marks	--
EE Marks		**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 4EE218PC1 Power Systems – I Lab is a compulsory Program Core Course for Second Year B.Tech. Electrical Engineering.

Course Objectives:

The objective of this course is to develop students' ability to design, simulate, and analyze transmission and distribution system components using laboratory hardware and utility software tools for understanding real-world power system operation and performance.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4EE218PC1.1	Analyse short and medium transmission line performance using ABCD parameters and Ferranti effect to understand power transfer behaviour.	P-4, A-2
4EE218PC1.2	Simulate insulators, overhead lines, and cables using utility software to compare characteristics and suitability under varying operating conditions.	P-5, P-7
4EE218PC1.3	Interpret distribution configurations and load flow results using software to understand system behaviour and enhance network operational efficiency.	P-7

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Design and Analyse the performance of short Transmission Line using transmission line kit
2. Design and Examine ABCD parameters of the "Pi" model Medium Transmission Line using transmission line kit
3. Design and Analyse the performance of "T" model Medium Transmission Line using transmission line kit

4. Analysis and verification of the Ferranti Effect of Transmission Line using transmission line kit
5. Evaluate the efficiency of the string of insulators with and without using guard ring
6. Create a single line diagram of a power system using utility software and study its application in power system analysis.
7. Simulate different types of insulators (eg; pin, suspension and strain) using utility software
8. Simulate the performance of ring, radial and interconnected distribution systems using utility software.
9. Compare performance of overhead lines and underground cables using utility software
10. Perform load flow analysis using utility software.

E-Resources:

1. https://vp-dei.vlabs.ac.in/Dreamweaver/
2. https://nitsri.ac.in/Department/DisplayDeptPage.aspx?page=magsm&ItemID=kagem&nDeptID=g
3. https://etap.com/demo-download

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4EE218PC1.1	1	2	-	1	2	1	-	2	2	1	1	3	2	1
4EE218PC1.2	2	2	1	1	3	1	-	2	2	-	1	2	2	1
4EE218PC1.3	1	2	-	1	3	-	-	2	2	1	1	2	2	1
4EE218PC1CO	2	2	2	3	3	-	-	2	2	-	1	2	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:		**4EE219VS1**	Course Category:	**VSC**
Course Name	**Electrical CAD**				
Credits	**02**	Total L:T:P etc. Hours	0:0:4 **60 Hrs**	Total SL Hours	**--**
Total Credit Hours	**60 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**--**	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 4EE219VS1 Electrical CAD is a Value-Added Skill Course for Second Year B.Tech Electrical Engineering students.

Course Objectives:

The objective of this course is to master the AutoCAD Electrical interface and Project Manager for organizing multi-sheet drawings.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4EE219VS1.1	Apply project management principles and file standards to initialize and organize multi-sheet electrical design projects.	C-3, P-3
4EE219VS1.2	Design professional electrical schematics and panel layouts using modern CAD automation tools and industry symbol libraries.	C-5, P-4
4EE219VS1.3	Generate and verify fabrication documentation (BOM, Wire Lists) adhering to professional ethics and engineering standards.	C-4, A-3

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. Apply basic CAD settings using coordinates, limits, layers, and simple modify tools.
2. Implement standard electrical symbols using approved CAD libraries.
3. Analyze and arrange the wiring layout for a 1 BHK unit, showing load points and earthing.
4. Design the SLD and power layout for a 2 BHK residential unit.
5. Apply drawing standards to show pipe and plate earthing cross-sections.
6. Analyze and organize the layout of a distribution board with MCBs, RCDs, and busbars.
7. Analyze and prepare the LT power distribution SLD for a small workshop.
8. Organize and prepare the power and control circuits for a DOL starter.

9. Design the power and control circuits for a timer-based or manual Star–Delta starter.
10. Apply planning to prepare the floor layout of an Electrical Machine Laboratory with panels and cable routing.
11. Analyze and develop routing, trench sections, and joint box details for an underground cable system.
12. Develop the SLD for an 11 kV / 33 kV substation showing transformer and switchgear.

Text-Books:

1. Prof. Sham Tickoo, AutoCAD Electrical 2024 for Electrical Control Designers, CADCIM Technologies.
2. Gaurav Verma, Matt Weber, AutoCAD Electrical 2024 Black Book, CADCAMCAE Works.
3. AutoCAD Electrical Essentials Training Guide, ASCENT Center for Technical Knowledge.

Reference Books:

1. NFPA 79: Electrical Standard for Industrial Machinery.
2. IEC 60617: Graphical Symbols for Diagrams, International Electrotechnical Commission.
3. Shawna Lockhart, Tutorial Guide to AutoCAD 2024, SDC Publications.
4. K.C. Agrawal, Industrial Power Engineering and Applications Handbook, Elsevier.

E-Resources:

1. https://knowledge.autodesk.com/
2. https://academy.autodesk.com/
3. https://www.linkedin.com/learning/topics/autocad-electrical
4. https://knowledge.autodesk.com/
5. https://nptel.ac.in/courses/108105053
6. https://www.electrical-technology.com/

Mapping of COs with POs& PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4EE219VS1.1	3	-	-	-	3	-	-	-	-	-	-	3	2	1
4EE219VS1.2	3	2	3	-	3	2	-	2	-	-	-	3	3	1
4EE219VS1.3	3	2	3	-	3	-	-	2	-	3	-	2	3	1
4EE219VS1CO	3	2	3	-	3	2	-	2	-	3	-	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**4SH220AE1**	Course Category:	**AEC**
Course Name	**Technical Writing**			
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours **15 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	--	SEE Time	--	CIA Marks --
EE Marks	--	PA Marks	**50**	Total Marks **50**

Course Description:

Subject Code 4SH220AE1 Technical Writing is common Ability Enhancement Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to enhance students' ability to write effective technical documents, professional correspondence, and research-oriented content with clarity, accuracy, and ethical standards.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH220AE1.1	Apply principles of technical writing in engineering documents.	C-3 P-2 A-2
4SH220AE1.2	Apply technical writing skills to prepare professional documents.	C-4 P-2 A-2
4SH220AE1.3	Create ethical, well-structured technical and research documents using IEEE referencing for professional and academic communication.	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Technical Writing:** Nature and importance of technical communication, characteristics of technical writing, audience analysis, technical vocabulary, grammar and style, clarity and conciseness, paragraph structure, coherence, technical descriptions, instructions and manuals.	7 Hrs
Unit 2	**Professional and Research Writing:** Technical reports and documentation, structure of reports, abstracts and summaries, research papers, project proposals, resumes and cover letters, business emails, documentation ethics, plagiarism, referencing styles (IEEE), editing and proofreading.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Analysis of Technical Communication to Identify the nature, purpose of given technical documents and evaluate their effectiveness.
2. Editing technical text for clarity and brevity
3. Technical description of an engineering device/system
4. Writing step-by-step technical instructions
5. Preparation of structured technical reports
6. Resume and cover letter drafting
7. Technical report writing based on laboratory work, case study, or project work
8. Abstract and executive summary writing for technical documents
9. Referencing and citation using IEEE format
10. Editing, proofreading, and plagiarism check of technical documents

Text Books:

1. Rizvi A. M. & Patnaik P., Effective Technical Communication, McGraw Hill Education (India), New Delhi (Second Edition).
2. Verma S., Technical Communication for Engineers, Vikas Publishing House Pvt. Ltd., New Delhi (First Edition).
3. Misra P. & Tyagi K., Advanced Technical Communication, PHI Learning Pvt. Ltd., New Delhi (Second Edition).

Reference Books:

1. Chauhan G. S., Kashiramka S. & Thimmesha L., Technical Communication, Cengage Learning India Pvt. Ltd., New Delhi (First Edition).
2. Alred G. J., Brusaw C. T. & Oliu B., Handbook of Technical Communication, Oxford University Press, New Delhi (Second Edition).
3. IEEE Editorial Style Manual, IEEE Standards Association, IEEE, USA (Latest Edition).
4. Joseph G. & Joseph B., Grammar and Usage for Technical Communication, Cambridge University Press India, Delhi (First Edition).

E-Resources :

1. NPTEL–SWAYAM, IIT Roorkee, Technical Communication for Engineers.
2. https://owl.purdue.edu
3. https://ieeeauthorcenter.ieee.org

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH220AE1.1	-	-	-	-	-	-	-	-		3	-	1	1	1
4SH220AE1.2	-	-	-	-	-	-	-	-	3	3	-	2	-	2
4SH220AE1.3	-	-	-	-	-	-	-	3		3	3	-	-	2
4SH220AE1 CO	-	-	-	-	-	-	-	1	1	3	1	1	1	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	4SH221EM1	Course Category:	**EEM**
Course Name	**Fundamentals of Book Keeping and Accounting**			
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours **15 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	--	SEE Time	--	CIA Marks --
EE Marks	--	PA Marks	**50**	Total Marks **50**

Course Description:

Subject Code 4SH221EM1 Fundamentals of Book Keeping and Accounting is an Ability Enhancement Course for Second Year B. Tech students that introduce basic accounting principles, bookkeeping processes, and financial statements for business applications.

Course Objectives:

The objective of the course is to develop students' skills in recording and analyzing financial transactions and to enable effective use of accounting information for decision-making.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH221EM1.1	Apply basic principles of bookkeeping and accounting for recording and maintaining financial transactions accurately.	C-3 P-2 A-2
4SH221EM1.2	Analyze financial statements such as income statement, balance sheet, and cash flow statement for supporting financial understanding and business decision-making.	C-4 P-2 A-2
4SH221EM1.3	Apply accounting tools and techniques for evaluating financial performance and improving business efficiency.	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundation of Book keeping and Accounting** Definition, objectives, and importance of accounting, Difference between accounting and bookkeeping, accounting equation, double entry system, Debit vs credit, accrual vs cash accounting, Terminology- depreciation, armotisation, CapEx vs OpEx.	8 Hrs

	Source of Document (invoice, receipt, Purchase Order), Work Flow (Journal, posting to the ledger), Preparing trial balance, Software Integration- A brief overview of ERP (SAP/ oracle and tools like a tally/ quick book).	
Unit 2	**Financial Statements & Decision Making** Income Statement, Balance Sheet, Cash flow Statement. Ratio Analysis (Current Ratio, Debt to equity, ROI), Cost Accounting (Fixed vs Variable, Break-even), Taxation Basics (Corporate IT)	7 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Categories a list of items (Laptop, Office Rent Deposit, Cash, Bank Loan, Software Licenses) into Assets, Liabilities, or Equity.
2. Use the Double-Entry System to record buying raw materials, paying technician wages, and receiving a client advance.
3. Identify discrepancies like uncashed cheques, bank charges, or direct deposits from clients.
4. Compare the Straight-Line Method vs. the Written Down Value (WDV) method (as per Indian Income Tax rules).
5. Distinguish between Direct Costs (raw materials, factory power) and Indirect Costs (office salary, marketing).
6. Analyze the Annual Report of an Indian tech giant (e.g., L&T or Tata Motors).
7. Calculate the Current Ratio (liquidity), Debt-to-Equity (solvency), and Return on Investment (ROI).
8. Input Fixed Costs (Rent, Machinery) and Variable Costs (Material per unit) into a spreadsheet to find the Break-Even Point.
9. Value the remaining stock after several purchases and sales using the First-In, First-Out (FIFO) method.
10. Enter 5 basic transactions into a trial version of Tally Prime or a cloud-based tool like Zoho Books.

Text Books:

1. S.N. Maheshwari S.K. Maheshwari & S.K. Maheshwari., Financial Accounting, Vikas Publishing House (Eleventh Edition)
2. N. Ramachandran, Ramkumar Kakani., Financial Accounting for Management, McGraw Hill Education (Sixth Edition)

Reference Books:

1. R. L. Gupta & U. K. Gupta., Financial Accounting, Sultan Chand & Sons, (Ninth revised Edition)
2. Dr. Santanu Chakrabarty & Dr. Nilanjan Singha Roy., Accounting & Finance for engineering, Lawpoint Publications (Second Edition)
3. Bhushan Kumar Goyal., Accounting for Everyone, Taxmann Publications Pvt. Ltd (First Edition)

E-Resources:

1. SWAYAM, Financial Accounting / Business Accounting
2. National Digital Library of India, https://ndl.iitkgp.ac.in
3. Tally Education, https://tallyeducation.com

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH221EM1.1	2	2	-	-	-	-	-	-	-	-	-	-	-	-
4SH221EM1.2	3	3	-	-	-	-	-	-	-	3	-	-	-	-
4SH221EM1.3	2	3	-	-	3	-	-	-	-	3	-	-	-	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**4CE222VE1**		Course Category:	**VEC**
Course Name	**Environmental Science**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 4CE222VE1 Environmental Science is a Value Education course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop understanding of environmental systems, natural resource management, ecological balance, and sustainable development practices to promote awareness and responsibility toward environmental protection and societal well-being.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE222VE1.1	Analyze renewable and non-renewable natural resources and associated problems to promote sustainable utilization for future generations.	C-4
4CE222VE1.2	Analyze food chains, webs, and ecological pyramids to evaluate ecological interactions and succession processes.	C-4
4CE222VE1.3	Examine shift from unsustainable to sustainable development to promote responsible resource planning for society.	C-3

Course Contents:

Unit 1	Renewable and non-renewable resources Environmental Science, Definition, scope and importance, Need for public awareness, Renewable and non-renewable resources, Natural resources and associated problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life styles.	10 hrs
Unit 2	**Ecosystem:** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the	10 hrs

	ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem.	
Unit 3	**Social Issues & Environment:** From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions, Environment Protection Act. Air (Prevention and Control of Pollution) Act., Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, public awareness.	10 hrs

Text Books:

1. Suresh K. Dhameja, Environmental Studies, Katson Books
2. Benny Joseph, Environmental Studies, McGraw Hill Education

Reference Books:

1. Gilbert M. Masters & Wendell Ela, Introduction to Environmental Engineering and Science, Pearson Education
2. William Cunningham & Mary Cunningham, Environmental Science, McGraw Hill

E Recourses:

1. https://www.vlab.co.in/broad-area-civil-engineering

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE222VE1.1	3	2	-	-	-	2	2	-	-	-	-	-	-	-
4CE222VE1.2	3	2	-	-	-	3	2	-	-	-	-	-	1	-
4CE222VE1.3	3	2	-	-	-	3	3	-	-	-	-	-	1	-
4CE222VE1.CO	3	2	-	-	-	3	3	-	-	-	-	-	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5.0**	Course Code:	**4EE223DH1**	Course Category:	**DH**
Course Name	**Microgrid Engineering**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45Hrs**	Total SL Hours:	**45Hrs**
Total Credit Hours	**90Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4EE223DH1 Microgrid Engineering is a Double Minor / Honors offered by the department of Electrical Engineering for Second Year B. Tech, of all disciplines.

Course Objectives:

The objective of this course is to provide fundamental knowledge of microgrids and smart grids while developing skills to analyze their power converters, control methods, stability, protection, and operation.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4EE223DH2.1	Explain the fundamentals of conventional power systems and the need for transitioning to smart grid technologies to understand the limitations of existing grids and the motivation for modernization.	C-3
4EE223DH2.2	Describe the architecture, components, and key technologies used in smart grid systems to gain insight into their structure and functional operation.	C-4
4EE223DH2.3	Identify and compare communication technologies and standards used for smart grid data exchange and monitoring to ensure effective and reliable information flow within the grid.	C-3
4EE223DH2.4	Analyze the integration of distributed energy resources and microgrids within the smart grid framework to support efficient and sustainable energy utilization.	C-2
4EE223DH2.5	Apply basic concepts of demand-side management, demand response, and energy management in smart grid operation to improve energy efficiency and load management.	C-4

4EE223DH2.6	Discuss applications, cybersecurity concerns, and emerging trends in smart grid technologies at national and global levels to understand future challenges and advancements in power systems.	C-3

Course Contents:

Unit 1	**Fundamentals of Power Systems and Need for Smart Grid:** Structure of conventional power system (generation, transmission, distribution), Limitations of existing grid, Concept and definition of Smart Grid, Evolution of smart grid technologies, Key drivers for smart grid development.	7 Hrs
Unit 2	**Smart Grid Architecture and Components:** Smart grid architecture (NIST model – basic idea), Key components: smart meters, sensors, intelligent electronic devices (IEDs), Advanced Metering Infrastructure (AMI), Wide Area Measurement Systems (WAMS) and PMUs, Role of SCADA and automation.	7 Hrs
Unit 3	**Communication Technologies in Smart Grid:** Need for communication systems in smart grid, Communication technologies: wired and wireless (PLC, fiber optics, Wi-Fi, Zigbee, cellular), Network architecture and data flow, Interoperability and standards (overview), Challenges in communication systems.	7 Hrs
Unit 4	**Distributed Energy Resources and Integration:** Concept of Distributed Generation (DG), Renewable energy integration in smart grid, Role of microgrids, Net metering and grid interconnection, Impact on grid performance.	8 Hrs
Unit 5	**Smart Grid Operation and Management:** Demand Side Management (DSM) and Demand Response (DR), Fundamentals of Load forecasting, Energy management systems (EMS), Power quality and reliability improvement, Outage management systems	8 Hrs
Unit 6	**Applications, Cybersecurity and Future Trends:** Smart homes, smart cities, and electric vehicles, Cybersecurity issues in smart grid, Data analytics and role of AI/IoT (introductory), Smart grid policies and initiatives (India & global), Future trends and challenges	8 Hrs

Text Books:

1. Nikolaos Hatziargyriou, Microgrids: Architecture and Control, IEEE Press / Wiley.
2. James Momoh, Smart Grid: Fundamentals of Design and Analysis
3. Clark W. Gellings, The Smart Grid: Enabling Energy Efficiency and Demand Response
4. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Smart Grid: Technology and Applications, Wiley.

Reference Books:

1. Stuart Borlase, Smart Grids: Infrastructure, Technology, and Solutions, CRC Press.
2. Josep Guerrero, Control and Optimization of Microgrids, Springer.
3. Haitham Abu-Rub, Malinowski, Al-Haddad, Power Electronics for Renewable Energy Systems, Transportation and Industrial Applications, Wiley.

E-Resources:

1. https://nptel.ac.in/courses/108105155
2. https://nptel.ac.in/courses/108104013
3. https://smartgrid.ieee.org
4. https://nsgm.gov.in

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4EE215MD2.1	3	2	1	1	2	-	-	-	-	-	1	3	2	1
4EE215MD2.2	3	3	1	1	3	-	-	-	-	-	1	3	3	1
4EE215MD2.3	3	3	3	1	3	-	-	-	-	-	1	2	3	-
4EE215MD2.4	3	2	1	1	2	-	-	-	-	-	1	3	2	1
4EE215MD2.5	3	2	2	1	3	-	-	-	-	-	1	2	3	1
4EE215MD2.6	3	3	3	1	3	-	-	-	-	-	1	2	3	-
4EE215MD2CO	3	3	2	1	3	-	-	-	-	-	1	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5.0**	Course Code:	**4EE223DH2**	Course Category:	**DH**
Course Name	**Automotive Engineering and Electric Vehicle Systems**				
Credits	**03**	Total L:T:P Hours	4:0:0 **60Hrs**	Total SL Hours	**60Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4EE223DH2 Automotive Engineering and Electric Vehicle Systems is a Double Minor / Honors offered by the department of Electrical Engineering for Second Year B. Tech, of all disciplines.

Course Objectives:

This course provides students comprehensive knowledge of automotive systems and electric vehicle technologies, enabling students to understand, analyze, and evaluate vehicle mechanics, powertrains, subsystems, energy storage, and control systems for improved performance, efficiency, safety, and sustainable mobility.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4EE223DH2.1	Explain the evolution, configuration, and structural aspects of automobiles, including body, chassis, and materials, to understand their influence on vehicle design, performance, safety, and durability.	C-3
4EE223DH2.2	Analyze automotive powertrains, suspension, steering, NVH, and various drive configurations (FWD, RWD, AWD, 4WD), to evaluate vehicle motion, ride comfort, and drivability characteristics.	C-3
4EE223DH2.3	Describe and compare transmission systems (MT, AT, AMT, CVT), including gear mechanisms, clutch operation, and power flow, to understand torque transmission, gear ratio selection, and efficiency optimization.	C-3
4EE223DH2.4	Evaluate automotive subsystems such as aerodynamics, braking, tyres, and instrumentation, to assess their impact on vehicle handling, stability, safety, and energy efficiency.	C-3

4EE223DH2.5	Explain the operation and control of electric machines (DC, IM, PMSM, BLDC) and auxiliary electrical systems, to understand electric propulsion and support systems in modern EVs.	C-4
4EE223DH2.6	Analyze battery technologies, charging systems, and automotive sensors (including MEMS), to understand energy management, safety, and intelligent monitoring in electric vehicles.	C-4

Course Contents:

Unit 1	**Vehicle Mechanics:** History of Vehicle Development, General Configuration of Automobile, Body and Chassis Fundamentals: General Packaging, Types of Structural System, Backbone Construction; Body and Chassis Materials. Automotive Powertrain, Mechanical Suspensions system, Steering System, NVH, Control System Integration and Implementation. Front-Wheel Drive (FWD) Powertrains, Rear-Wheel Drive Powertrains (RWD), Multi-Wheel Drive Powertrains (AWD and 4WD)	10 Hrs
Unit 2	**Transmission Systems:** Transmission gears, Manual Transmission (MT), Automatic Transmission (AT), Automated Manual Transmissions (AMT) and Continuously Variable Transmissions (CVT). Manual Transmissions Powertrain Layout and Manual Transmission Structure, Power Flows and Gear Ratios, Manual Transmission Clutch and its structure. Drivetrain and Differential	10 Hrs
Unit 3	**Automotive Subsystems:** Automotive Aero-dynamics, Vehicle Power Demand Analysis; Types of suspension and drive, Braking systems; Tyre Mechanics: Tyres and wheels, Tyre characteristics; Vehicle handling & stability; Automotive instrumentation	8 Hrs
Unit 4	**EV Motor Systems & Auxiliaries:** Electric Machines Used in EVs: DC motors, Induction motors (3-phase concept, torque production), Permanent Magnet Synchronous Motor (PMSM), Brushless DC (BLDC) motors, Torque-speed characteristics and efficiency curves. Motor Connections and Control Basics: Star and delta connections, Basic motor starting methods, Speed control concepts (voltage/frequency control basics). Auxiliary Electrical Systems in EVs:	12 Hrs

	Lighting systems (LED technology), HVAC (Heating, Ventilation, Air Conditioning), Power steering systems (electric assist), Wipers, infotainment, and low-voltage loads.	
Unit 5	**EV Energy Storage & Charging Systems:** Battery types (Lead-acid, Li-ion, Li-Po, solid-state), performance parameters, SoC and SoH. Series/parallel configuration, voltage & capacity scaling, thermal management, packaging and safety. AC (slow/fast) and DC fast charging, On-board chargers vs off-board chargers, standards and connectors. Power flow (grid–battery–motor), charging/discharging cycles, system efficiency losses.	10 Hrs
Unit 6	**Sensors:** Overview of Micro-Electro-Mechanical (MEM) devices and processes. Concepts of MEMs and equations in different domains (electrical-mechanical) Different types of Sensors viz. Pressure, position, temperature, speed, acceleration, ambient light, infrared sensor, gesture, touch screen sensors, etc.	10 Hrs

Text Books:

1. Gregory L. Plett, Battery Management Systems: Design, Artech House.
2. Mohammad Rezvanizaniani, Lithium-Ion Batteries and Battery Management Systems, Engineering Asset Management 2011: Proceedings of the Sixth World Congress
3. Mehrdad Ehsani, Electric and Hybrid Vehicles, CRC Press.

Reference Books:

1. Lithium-Ion Battery Systems, Elsevier
2. Advanced Battery Management Technologies, Springer
3. IEEE and SAE Battery Standards Documents

E-Resources:

1. https://nptel.ac.in/courses/108106170
2. https://batteryuniversity.com
3. https://ieee.org
4. https://sae.org

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4EE223DH2.1	2	2	1	1	1	1	1	-	-	-	-	-	-	1
4EE223DH2.2	1	1	2	2	1	1	1	-	-	-	-	-	-	-
4EE223DH2.3	1	1	2	2	1	1	-	-	-	-	-	-	-	-
4EE223DH2.4	1	1	2	2	1	1	1	-	-	-	-	-	1	-
4EE223DH2.5	1	1	2	2	1	1	-	-	-	-	-	-	1	1
4EE223DH2.6	1	1	2	2	1	1	1	-	-	-	-	-	1	1
4EE223DH1CO	1	1	2	2	1	1	1	-	-	-	-	-	1	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:	**5EE224EC1**	Course Category:	**EC**
Course Name	**Solar Panel Design and Implementation**			
Credits	**04**	Total L:T:P etc. Hours	2:0:4 **90 Hrs**	Total SL Hours **30 Hrs**
Total Credit Hours	**120 Hrs**			
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks **20**
EE Marks	**25**	PA Marks	**25**	Total Marks **100**

Course Description:

Subject Code 5EE224EC1 Solar Panel Design and Implementation is an optional Exit Course for second Year B.Tech. Electrical Engineering.

Course Objectives:

The objective of this course is to develop students with understanding of solar energy fundamentals and PV technology, and to analyze system components and perform design calculations for solar PV systems.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5E2124EC1.1	Apply principles of solar energy conversion and PV effect to analyse photovoltaic operation.	C-3
5E2124EC1.2	Identify balance of System components to choose appropriate devices like batteries, charge controllers, and inverters and solar system sizing.	C-3
5E2124EC1.3	Analyse site assessment and feasibility to determine suitability for solar PV installation.	C-4

Course Contents:

Unit 1	**Fundamentals of Solar Energy & Photovoltaic Technologies:** Solar radiation: characteristics, spectrum, irradiance, insolation. Solar energy conversion principles. Solar photovoltaic (PV) effect and semiconductor basics. Types of solar cells: Mono-crystalline, Poly-crystalline, Thin-film. PV module construction, I–V and P–V characteristics. Factors affecting performance: temperature, shading, dust, tilt angle, orientation. Standards and ratings of PV modules.	10 Hrs

Unit 2	**Solar PV System Components & Design Calculations:** Classification of PV systems: Grid-tied, Off-grid, Hybrid systems. Balance of System (BoS): Charge controllers (MPPT & PWM), batteries (types, sizing, DoD, cycle life), inverters (types, efficiency, protections), mounting structures, wiring, connectors, safety devices. Solar system sizing: Load calculation and energy estimation, selection of PV modules, tilt angle, array sizing, battery sizing, inverter sizing, cable sizing, protection device selection. Introduction to PV design software (PV*SOL / PVsyst).	10 Hrs
Unit 3	**Installation, Implementation & Maintenance of Solar PV Systems:** Site assessment and feasibility study. Steps in installation of solar PV systems (mechanical and electrical). Earthing, surge protection, safety codes (IEC/IS standards). Commissioning procedures and checklist. Operation & Maintenance (O&M): monitoring, performance evaluation, troubleshooting faults, cleaning and preventive maintenance. Case studies: rooftop solar system, small off-grid system, solar street lighting.	10 Hrs

List of Practicals:

Minimum Ten Practical's from the list mentioned below.

1. Measurement of solar irradiance using a pyranometer or solar meter and observation of variations with time and tilt.
2. Determine mono-crystalline, poly-crystalline, and thin-film PV modules and comparison of their specifications.
3. Plot I–V and P–V curves under different irradiance and temperature conditions.
4. Measurement of PV module output for different tilt angles and orientations.
5. Perform inspection, fault identification, and minor repair/cleaning of washing machine or vacuum cleaner.
6. Demonstrate datasheets, module ratings, efficiency, temperature coefficients, and standards (IEC/IS).
7. Testing battery parameters (SoC, DoD, voltage, AH rating) and performing sizing calculations.
8. Demonstrate inverter specifications, wiring, protections, and efficiency measurements.
9. Calculation of daily energy consumption and designing a small PV system (module, battery, inverter sizing).
10. Practical calculation of cable size, fuse/MCB rating, earthing, and surge protection requirements.

11. Hands-on practice of mounting structure assembly, wiring, connections, and safety checks.
12. Monitoring system output, identifying faults (low generation, wiring issues, inverter faults), and suggesting corrective actions.

Textbooks:

1. N. D. Kaushika, Anuradha Mishra & Anil K. Rai, Solar Photovoltaics: Technology, System Design, Reliability and Viability, Springer.
2. L. Ashok Kumar & K. Mohana Sundaram S.L. Uppal, Solar PV System: Design, Installation, Operation and Maintenance, Electricity and Appliances, Khanna Publishers.

Reference Books:

1. S. P. Sukhatme & J. K. Nayak, Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw-Hill Education.
2. Chetan Singh Solanki, Solar Photovoltaics: Fundamentals, Technologies and Applications, PHI Learning Pvt. Ltd.
3. R. Gupta, Handbook of Electrical Installation Practice, Wiley India.
4. V. V. Kishore, Renewable Energy Engineering and Technology: A Knowledge Compendium, TERI (The Energy and Resources Institute).
5. M. P. Agrawal, Integrated Renewable Energy for Rural Development Allied Publishers.

E- Resources:

1. https://nptel.ac.in/courses/115/108/115108081/
2. https://nptel.ac.in/courses/108/104/108104114/
3. https://www.solarenergy.org/resources/
4. https://solarrooftop.gov.in/

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
5E2124EC1.1	3	3	2	2	-	-	2	-	-	-	-	1	3	2
5E2124EC1.2	3	2	3	-	2	-	-	-	-	-	2	1	2	2
5E2124EC1.3	2	3	2	1	2	1	2	-	1	-	1	-	3	2
5E2124EC1CO	3	3	2	2	2	1	2	-	1	-	2	1	3	2

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code:		**5EE225EC1**	Course Category:	**EC**
Course Name	**Repairing and Maintenance of Electrical Machines**				
Credits	**02**	Total L:T:P etc. Hours	2:0:4 **90 Hrs**	Total SL Hours :	**30Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:

Subject Code 5EE225EC1 Repairing and maintenance of Electrical Machines is an optional Exit Course for Second Year B. Tech Electrical Engineering.

Course Objectives:

The objective of this course is to enable learners with Repairing and Maintenance of Electrical Machines to develop skills for accurate testing.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5EE225EC1.1	Describe the construction, components, and essential testing methods of electrical machines to evaluate their condition and performance in practical applications.	C-3
5EE225EC1.2	Apply the knowledge of electrical machines to solve basic maintenance and repair issues.	C-3
5EE225EC1.3	Analyse the operational parameters of electrical machines to evaluate their performance under different conditions.	C-4

Course Contents:

Unit 1	**Construction and Components of Electrical Machines:** DC Machines: Armature, field winding, commutator, brush assembly, etc. AC Machines: Stator, rotor, slip rings (for synchronous machines), squirrel cage rotor (for induction machines), etc. Transformers: Core, windings, bushings, tap changer. Insulation Resistance Testing: Importance of insulation in electrical machines and how to test it. Testing and Measuring Instruments: Megger, clamp meter, tachometers, etc. Motor Testing: No-load, locked rotor, and full-load tests.	10 Hrs

Unit 2	**Faults in Electrical Machines:** Types of Faults: Open circuits, short circuits, ground faults, and mechanical failures. Diagnosis of Fault: Using instruments like multi-meters, insulation resistance testers, and oscilloscopes. Common Faults in DC/AC Motors and Transformers: Overheating, vibration, electrical imbalance, wear and tear.	10 Hrs
Unit 3	**Maintenance and Repair Techniques:** Preventive and Corrective Maintenance: Regular checks, cleaning, lubrication, and insulation testing. Predictive Maintenance: Vibration analysis, thermal imaging, and other techniques for anticipating failures before they occur. Winding Repair and Rewinding: Understanding the process for rewinding armatures, stators, and transformers. Brush and Commutator Maintenance, Bearings and Shaft Repair.	10 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. Study of Tools, Testing Instruments, and Safety Precautions used in machine maintenance.
2. To Measurement of Insulation Resistance of Electrical Machines Using megger.
3. To perform the Testing and Maintenance of Brushes and Commutator in DC Machines.
4. Perform the Troubleshooting of Single-Phase Induction Motor to Identifying faults like overheating, low torque, vibration.
5. To perform the Maintenance and Testing of Three-Phase Induction Motor.
6. Perform the Rewinding of a Small Single-Phase Motor.
7. Study the Maintenance and Testing of Transformer.
8. The Identification and Repair of Common Electrical Machine Faults.
9. To perform Load Testing of a Repaired Electrical Machine.
10. To Prepare maintenance schedule and logbook for electrical machines.
11. Study the vibration analysis and noise diagnosis in rotating machines.
12. Identify and replace damaged windings in a small transformer or motor.

Text-Books:

1. S. K. Sahdev, Electrical Machine Maintenance and Testing, Cambridge University Press & Assessment.
2. Madhvi Gupta, Installation, Maintenance & Repair of Electrical Machines & Equipment, S.K. Kataria & Sons.

Reference Books:

1. A.E. Fitzgerald, Charles Kingsley Jr., and Stephen D. Umans, Electrical Machines and Equipment, McGraw-Hill.

2. Robert Rosenberg, Electric Motor Repair: A Practical Book on the Winding, Repair, and Troubleshooting of A-C and D-C Motors and Controllers, Rinehart & Company, Technical Division, 1960.
3. S. M. Chaudhari, Maintenance of Electrical Machines, Nirali Prakashan.

E-Resources:

1. https://www.electrical4u.com.
2. https://www.automationdirect.com/adc/Overview/Catalog/Motors.
3. https://new.siemens.com/global/en/products/industrial/motion-control/motors/technical-support.html.
4. https://www.fluke.com/en-us/learn/blog/electrical.
5. https://www.practicalmachinist.com

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
5EE225EC1.1	3	2	1	-	3	-	-	-	-	-	-	-	1	-
5EE225EC1.2	2	3	1	-	2	-	-	-	-	-	-	-	1	-
5EE225EC1.3	1	2	3	-	2	-	-	-	-	-	-	-	1	-
5EE225EC1CO	2	2	2	-	2	-	-	-	-	-	-	-	1	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial (High)

ANNEXURE –I

Syllabus of III and IV Semester Courses for Four-Year Multidisciplinary Undergraduate B.Tech. Degree Programme in Electronics & Telecommunication Engineering

(In view of NEP-2020)

For students admitted in academic session 2025-26 and onwards



03/09/2026

SHRI JAWAHARLAL DARDA EDUCATION SOCIETY'S
JAWAHARLAL DARDA
INSTITUTE OF ENGINEERING AND TECHNOLOGY, YAVATMAL
AN AUTONOMOUS INSTITUTE
Affiliated to Sant Gadge Baba Amravati University, Approved by AICTE, New Delhi and DTE Maharashtra
93VP+PWF: P6, MIDC Area, Lohara, Yavatmal - 445 001, Maharashtra (www.jdiet.ac.in)

1. Vision:

To be a centre of excellence for Electronics & Telecommunication Engineering education by creating skilled, innovative and ethical engineers for the benefit of industry and society.

2. Mission:

1. To provide quality engineering education through effective and compatible teaching learning methodologies.
2. To encourage students and faculty for research and innovations by providing facilities.
3. To facilitate students for pursuing higher education, entrepreneurial and professional career.
4. To create a bond with alumni, industry and society for up gradation and social responsibility.

3. Programme Education Objectives

PEO 1: Fundamental Knowledge: Students of the program will be skilled in fundamental concepts of Electronics & Telecommunication Engineering and allied branches by developing strong background in applied sciences & Engineering.

PEO 2: Design & Experimentation Skills: Students of the program will be prepared with skills of design & experimentation along with problem solving in the area of Electronics & Telecommunication Engineering and allied branches.

PEO 3: Specialization: Students will be prepared to develop skills that are necessary for success in industry or higher studies such that they can pursue their career in the field of Electronics & Telecommunication Engineering and allied branches.

PEO 4: Professional Skills: The students will be prepared to enhance their communication skills, presentation skills, ability to work in a team and ethical values that are necessary to thrive in their career.

PEO 5: Self Learning: The students will be prepared to continue their professional development through continuing education so that they can adapt to ever changing technical environment.

4. SDG of United Nation

1. **No Poverty** – End poverty in all its forms everywhere.
2. **Zero Hunger** – End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
3. **Good Health and Well-being** – Ensure healthy lives and promote well- being for all at all ages.

4. **Quality Education** – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
5. **Gender Equality** – Achieve gender equality and empower all women and girls.
6. **Clean Water and Sanitation** – Ensure availability and sustainable management of water and sanitation for all.
7. **Affordable and Clean Energy** – Ensure access to affordable, reliable, sustainable, and modern energy for all.
8. **Decent Work and Economic Growth** – Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.
9. **Industry, Innovation, and Infrastructure** – Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
10. **Reduced Inequalities** – Reduce inequality within and among countries.
11. **Sustainable Cities and Communities** – Make cities and human settlements inclusive, safe, resilient, and sustainable.
12. **Responsible Consumption and Production** – Ensure sustainable consumption and production patterns.
13. **Climate Action** – Take urgent action to combat climate change and its impacts.
14. **Life Below Water** – Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.
15. **Life on Land** – Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.
16. **Peace, Justice, and Strong Institutions** – Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.
17. **Partnerships for the Goals** – Strengthen the means of implementation and revitalize the global partnership for sustainable development.

5. WK: Washington Accord Knowledge Profile-Attributes for engineering program

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modeling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Outcomes (NBA, Jan 2025)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/ develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii)

adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

7. Programme Specific Indicators

Telecommunications

1. Remember key protocols (e.g. TCP/IP LTE) for configuring telecommunication networks.
2. Understand principles of signal modulation for reliable data transmission.
3. Apply antenna design techniques to optimize wireless network coverage.
4. Analyze network performance metrics to identify connectivity issues.
5. Evaluate efficiency of 5G/6G network architectures for high-speed applications.
6. Create scalable network topologies for increased data traffic.
7. Design error-correction algorithms to enhance data integrity.
8. Develop software for network management systems to automate fault detection.
9. Assess cybersecurity risks in telecommunication networks for data protection.
10. Integrate satellite communication systems with terrestrial networks.
11. Optimize bandwidth allocation for real-time multimedia streaming.

Consumer Electronics

12. Remember specifications of microcontrollers used in consumer devices.
13. Understand power consumption principles for energy-efficient gadgets.
14. Apply embedded system programming for smart device firmware.
15. Analyze circuit designs to improve wearable technology performance.
16. Evaluate user interface designs for usability and customer satisfaction.
17. Create innovative display technologies for next-generation smartphones.
18. Design compact power management circuits for portable devices.
19. Develop wireless charging systems for consumer electronics.
20. Assess product reliability through stress testing of components.
21. Integrate sensors for real-time environmental monitoring in smart appliances.
22. Optimize audio signal processing for high-fidelity sound in devices.

Information Technology

23. Explain Python programming concepts and write scripts to automate network and IT infrastructure tasks, incorrating variables, loops, functions, and error handling.

24. Implement network automation workflows using Python libraries (e.g., Netmiko, Paramiko) for device configuration, backups, and routine maintenance.
25. Configure IT infrastructure using standard network protocols and integrate IoT devices for enhanced data analytics.
26. Describe cloud computing architectures and design scalable IT solutions for enterprise environments.
27. Apply cybersecurity frameworks, analyze network traffic, and mitigate real-time cyber threats.
28. Evaluate software performance and optimize database systems for enterprise-level IT applications.
29. Create APIs to integrate telecommunication systems with IT platforms and design secure data storage solutions for sensitive information.
30. Develop automation scripts for IT system monitoring and implement basic Ansible playbooks for deployment tasks.
31. Parse and interpret structured data formats (JSON, YAML) and create configuration templates for automated deployments.
32. Demonstrate professional communication, teamwork, documentation skills, and the use of version control (Git) in collaborative IT and networking projects.

Healthcare Equipment Manufacturing

33. Remember regulatory standards (e.g. FDA IEC) for medical device development.
34. Understand biomedical signal processing for diagnostic equipment.
35. Apply embedded systems design for reliable medical monitoring devices.
36. Analyze sensor data to improve precision of diagnostic tools.
37. Evaluate safety and efficacy of medical imaging systems.
38. Create wearable health monitors for real-time patient data collection.
39. Design low-power circuits for implantable medical devices.
40. Develop software for real-time analysis of medical sensor data.
41. Assess electromagnetic compatibility of medical devices.
42. Integrate wireless communication modules into medical devices.
43. Synthesize AI-driven solutions for diagnostic imaging systems.

Defense and Aerospace

44. Remember military standards for electronic systems in defence applications.
45. Understand radar signal processing for accurate target detection.
46. Apply embedded systems design for avionics in aircraft navigation.
47. Analyze communication systems for secure data transmission.
48. Evaluate reliability of components under extreme aerospace conditions.
49. Create fault-tolerant systems for satellite communication

networks.

50. Design high-frequency circuits for radar and surveillance systems.
51. Develop encryption algorithms for secure military communications.
52. Assess electromagnetic interference in aerospace electronic systems.
53. Integrate GPS and inertial navigation systems for precise positioning.
54. Optimize power systems for unmanned aerial vehicles (UAVs).

Automotive

55. Remember automotive communication protocols (e.g. CAN LIN for vehicle systems.
56. Understand electric vehicle powertrain architectures for efficient design.
57. Apply sensor fusion techniques for advanced driver-assistance systems (ADAS).
58. Analyze vehicle communication networks for real-time data exchange.
59. Evaluate battery management systems for EV performance and safety.
60. Create embedded software for autonomous vehicle control systems.
61. Design power electronics for efficient energy conversion in EVs.
62. Develop diagnostic tools for vehicle system troubleshooting.
63. Assess electromagnetic compatibility of automotive electronic systems.
64. Integrate V2X communication for smart traffic systems.
65 Synthesize AI-based solutions for predictive maintenance in automotive systems.

Power Electronics

66. Remember principles of power conversion for designing efficient inverters.
67. Understand thermal management techniques for high-power systems.
68. Apply control strategies to stabilize voltage in power supply systems.
69. Analyze power losses in converters to improve energy efficiency.
70. Evaluate reliability of power electronics in renewable energy systems.
71. Create high-efficiency power converters for solar and wind energy.
72. Design switching circuits for high-frequency power applications.
73. Develop control algorithms for smart grid power distribution.
74. Assess safety standards compliance in power electronic systems.
75. Integrate energy storage systems with power electronics for grid stability.
76. Optimize power factor correction in industrial power systems.

Research and Academia

77. Remember fundamental theories of electronics for teaching.
78. Understand emerging trends in telecommunication technologies for research.
79. Apply simulation tools to model electronic circuits for experiments.
80. Analyze experimental data to validate telecommunication theories.
81. Evaluate feasibility of novel electronic designs for research applications.
82. Create innovative research methodologies for wireless technologies.
83. Design experimental setups for testing electronic components.
84. Develop open-source tools for educational purses in electronics.
85. Assess impact of research findings on industry applications.
86. Integrate interdisciplinary approaches in electronics research.
87. Synthesize new theoretical frameworks for telecommunication protocols.

Broadcasting and Media

88. Remember broadcasting standards (e.g. ATSC DVB) for media transmission.
89. Understand signal compression techniques for high-quality media streaming.
90. Apply digital signal processing to enhance audio and video quality.
91. Analyze transmission errors to improve broadcasting reliability.
92. Evaluate performance of media delivery networks for low-latency streaming.
93. Create adaptive streaming algorithms for variable network conditions.
94. Design satellite broadcasting systems for global content distribution.
95. Develop software for real-time media encoding and decoding.
96. Assess signal interference in broadcasting systems for optimal performance.
97. Integrate IP-based technologies for hybrid broadcasting solutions.
98. Optimize bandwidth usage for 4K/8K video streaming applications.

Semiconductor Industry

99. Analyze the characteristics and behaviour of semiconductor devices for application in ICs.
100. Design VLSI circuits and systems using industry-standard EDA tools.
101. Apply semiconductor fabrication processes to create functional devices.
102. Evaluate the performance, yield, and reliability of semiconductor devices and systems.

103. Implement FPGA/ASIC solutions for specific applications.
104. Integrate semiconductor packaging and testing techniques to meet industry standards.
105. Develop low-power, high-performance microelectronic systems considering scalability and cost-effectiveness.
106. Create simulation models to verify and validate semiconductor circuit designs.

Basic Science

107. Apply mathematical techniques such as algebra, trigonometry, calculus, differential equations, linear algebra, probability and statistics to solve problems.
108. Apply physical principles such as motion, forces, energy and materials to solve problems.
109. Apply knowledge of chemical properties and reactions for construction material and environment (Corrosion, polymer, electrochemistry etc.).

Engineering Science Courses

110. Demonstrate proficiency in basic workshop operations (fitting, carpentry, welding, sheet metal, plumbing and machining etc.).
111. Apply the principles of engineering mechanics to analyse and solve problems involving forces, moment, equilibrium, friction, centred and MOI etc.
112. Apply the principles electrical engineering to analyse and maintain electrical systems, circuits, machines and power systems.
113. Demonstrate ability to interpreted and create drawings using geometric constructions, orthographic projections, isometric projections and CAD tools.
114. Demonstrate ability to apply fundamental principles of algorithms, programming, data structures and computing system to solve conceptual problems.

Generic Competencies

A. Problem-Solving Skills

115. Analytical Thinking: Ability to analyze complex problems, break them down into smaller components, and find effective solutions.
116. Critical Thinking: Ability to evaluate multiple solutions to a problem and choose the best course of action based on available data, safety, and cost-efficiency.

B. Communication Skills

117. Oral Communication: Ability to communicate complex technical information clearly to a variety of audiences, including clients, stakeholders, contractors, and team members.
118. Written Communication: Proficiency in drafting reports, proposals, technical specifications, and documentation that are clear, concise, and accurate.
119. Interpersonal Communication: Ability to collaborate effectively

with multidisciplinary teams, clients, and project stakeholders.

C. Project Management

120. Time Management: Efficiently managing time and prioritizing tasks to meet deadlines in a dynamic project environment.
121. Resource Management: Ability to plan, allocate, and manage resources such as labour, materials, and equipment to ensure project efficiency.
122. Budgeting and Cost Control: Skills in estimating project costs, monitoring budgets, and ensuring projects are completed within financial constraints.
123. Risk Management: Ability to identify, assess, and mitigate risks during the planning and execution of engineering projects.

D. Teamwork and Leadership

124. Team Collaboration: Working effectively as part of a team, contributing to the success of the project through collaboration, open communication, and respect for others' expertise.
125. Leadership Skills: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
126. Conflict Resolution: Ability to resolve conflicts between team members, clients, or contractors, ensuring that project objectives are still achieved.

E. Attention to Detail

127. Accuracy: Ensuring all engineering calculations, designs, and project plans are accurate and align with building codes, regulations, and standards.
128. Quality Assurance: Ensuring that the materials and processes used in construction adhere to high standards of quality and safety.

F. Ethical and Professional Integrity

129. Ethical Decision Making: Adhering to a strict code of ethics, ensuring public safety, environmental protection, and transparency in all dealings.
130. Accountability: Taking responsibility for the success or failure of a project, being proactive in addressing issues, and delivering results.

G. Adaptability and Flexibility

131. Openness to Change: Being able to adapt to new technologies, tools, and methods, as well as evolving project requirements or environmental conditions.
132. Learning and Development: Actively seeking opportunities for professional growth, staying current with industry trends, and acquiring new skills to remain competitive.

H. Creativity and Innovation

133. Creative Problem Solving: Thinking outside the box and coming up with novel solutions to engineering challenges.
134. Innovative Design: Contributing new ideas for designs and

processes that can improve efficiency, reduce costs, or make better use of resources.

I. Cultural and Environmental Awareness

135. Sustainability Awareness: Knowledge of sustainable construction methods, green building practices, and the importance of reducing the environmental impact of engineering projects.
136. Cultural Sensitivity: Understanding and respecting cultural differences when working in diverse teams or international projects.
137. Environmental Impact Understanding: Considering the environmental consequences of engineering decisions and striving to minimize negative impacts through design and construction methods.

J. Decision-Making Skills

138. Data-Driven Decisions: Using available data, facts, and technical analysis to make informed decisions about the design, execution, and management of projects.
139. Prioritizing Decisions: Knowing which decisions need immediate attention and which can be deferred, especially in a high-pressure environment.

K. Regulatory and Legal Knowledge

140. Familiarity with Building Codes and Standards: Understanding and ensuring compliance with local, national, and international building codes, safety regulations, and legal standards.
141. Health and Safety: Knowledge of safety regulations and best practices for ensuring the health and safety of workers, the public, and the environment throughout the project lifecycle.

L. Client-Focused Mindset

142. Client Management: Building and maintaining strong relationships with clients, understanding their needs, and ensuring their expectations are met throughout the project.
143. Customer Service Orientation: Ensuring that client concerns are addressed promptly, and working toward providing value-added solutions that meet their goals.

8. Scheme of Electronics & Telecommunication Engineering Department

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electronics & Telecommunication Degree Programme

Semester - I (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - I	BSC	1SH101BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Physics	BSC	1SH102BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Programming for Problem Solving	ESC	1CS103ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Mechanics	ESC	1CE104ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Applied Physics Lab	BSC	1SH105BS1	0	0	2	0	2	1					25	25	50	25	50	
6	Programming for Problem Solving Lab	ESC	1CS106ES1	0	0	2	0	2	1					25	25	50	25	50	
7	Engineering Mechanics Lab	ESC	1CE107ES1	0	0	2	0	2	1					25	25	50	25	50	
8	Workshop	ESC	1ME108ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Electronic Workshop	VSC	1ET109VS1	1	0	2	1	4	2						50	50	25	50	
10	Communication Skills	AEC	1SH110AE1	1	0	2	1	4	2					25	25	50	25	50	
11	Sports & Yoga	CC	1SH111CC1	0	0	4	0	4	2						50	50	25	50	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electronics & Telecommunication Degree Programme

Semester - II (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - II	BSC	2SH112BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Chemistry	BSC	2SH113BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Basic Electrical Engineering	ESC	2EE114ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Graphics	ESC	2ME115ES1	2	0	0	2	4	2	60	40	100	40					100	4 Hrs.
5	Introduction to Digital Logic	PCC	2ET116PC1	1	0	2	1	4	2						50	50	25	50	
6	Indian Knowledge System (IKS) in Electronics & Telecommunication	IKS	2ET117IK1	1	0	2	1	4	2						50	50	25	50	
7	Applied Chemistry - Lab	BSC	2SH118BS1	0	0	2	0	2	1					25	25	50	25	50	
8	Basic Electrical Engineering - Lab	ESC	2EE119ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Engineering Graphics/CAD Lab	ESC	2ME120ES1	0	0	2	0	2	1					25	25	50	25	50	
10	Universal Human Values	SEC	2CE121VS1	1	0	2	1	4	2						50	50	25	50	
11	Digital Wellness	CC	2SH122CC1	1	0	2	1	4	2						50	50	25	50	
Total				**15**	**0**	**14**	**15**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 15x15 = 225 Hrs]

Exit Option (Level 4.5) for Undergraduate Certificate in Odd Semester of next Academic Year as approved by BOS																			
12	Electronics Servicing and Maintenance	EC	3ET123EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Assembly & Maintenance of Personal Computer	EC	3ET124EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	3ET125EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	3ET126OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electronics & Telecommunication Degree Programme

Semester - III (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Electronic Devices & Circuits	PCC	3ET201PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Signals & Systems	PCC	3ET202PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Analog & Digital Communication	PCC	3ET203PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - I	MDM	3_204MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - I	OE	3_205OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Electronic Devices & Circuits Lab	PCC	3ET206PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Signals & Systems Lab	PCC	3ET207PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Analog & Digital Communication Lab	PCC	3ET208PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Basic Financial Management	EEM	3ET209EM1	2	0	0	2	4	2						50	50	25	50	
10	Constitutional Values and Fundamental Duties	VEC	3SH210VE1	2	0	0	2	4	2						50	50	25	50	
11	Field Project	FP	3ET400FP1	0	0	4	0	4	2					25	25	50	25	50	
12	Disaster Management and Preparedness	NC	3AL001NC1	2	0	0	0	2	-						50	50	25	50	
Total				**19**	**0**	**10**	**17**	**46**	**22**			**450**				**300**		**750**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 17x15 = 255 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
13	Double Minor / Honours Course - I	DH	3__211DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electronics & Telecommunication Degree Programme

Semester - IV (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Electromagnetic Fields	PCC	4ET212PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Analog & Digital Electronics	PCC	4ET213PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Network Analysis	PCC	4ET214PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - II	MDM	4_215MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - II	OE	4_216OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Analog & Digital Electronics Lab	PCC	4ET217PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Network Analysis Lab	PCC	4ET218PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Python Programming Lab	SEC	4ET219VS1	0	0	4	0	4	2						50	50	25	50	
9	Technical Writing	AEC	4SH220AE1	1	0	2	1	4	2						50	50	25	50	
10	Fundamentals of Book Keeping and Accounting	EEM	4SH221EM1	1	0	2	1	4	2						50	50	25	50	
11	Environmental Science	VEC	4CE222VE1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
Total				**16**	**0**	**12**	**16**	**44**	**22**			**500**				**250**		**750**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 28x15 = 420 Hrs] + [Learner-engaged time 16x15 = 240 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
12	Double Minor / Honours Course - II	DH	4__223DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5) for Undergraduate Diploma in Odd Semester of next Academic Year as approved by BOS																			
13	Microprocessors/Microcontrollers based Product Design	EC	5ET224EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
14	Signal Processing with MATLAB	EC	5ET225EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
15	Internship / Apprenticeship in Industry	EI	5ET226EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
16	Two MOOC/NPTEL Courses	EC	5ET227OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electronics & Telecommunication Degree Programme

Semester - V (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Fiber Optics & Satellite Communication	PCC	5ET228PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Microcontroller & Applications	PCC	5ET229PC1	3	1	0	4	8	4	60	40	100	40					100	3 Hrs.
3	Digital Signal Processing	PCC	5ET230PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - I	PEC	5ET231PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - III	MDM	5_232MD_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Open Elective - III	OE	5_233OE_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Microcontroller Lab	PCC	5ET234PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Digital Signal Processing Lab	PCC	5ET235PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - I - Lab	PEC	5ET236PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Multidisciplinary Minor - III - Lab	MDM	5_237MD_	0	0	2	0	2	1					25	25	50	25	50	
Total				**17**	**1**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - III	DH	5__238DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electronics & Telecommunication Degree Programme

Semester - VI (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Embedded Systems	PCC	6ET239PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Digital Image Processing	PCC	6ET240PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Control System	PCC	6ET241PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - II	PEC	6ET242PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Programme Elective Course - III	PEC	6ET243PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Multidisciplinary Minor - IV	MDM	6_244MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Embedded Systems lab	PCC	6ET245PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Digital Image Processing Lab	PCC	6ET246PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - II- Lab	PEC	6ET247PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Personal Skills (GD& PI)	SEC	6SH248VS1	1	0	2	1	4	2						50	50	25	50	
Total				**18**	**0**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]

Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - IV	DH	6__249DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5.5) for B. Voc in Odd Semester of next Academic Year as approved by BOS																			
12	PC Hardware and Computer networking	EC	7ET250EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Embedded system design IoT	EC	7ET251EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	7ET252EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	7ET253OC__	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electronics & Telecommunication Degree Programme

Semester - VII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mobile Communication and Networks	PCC	7ET301PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	VLSI Design	PCC	7ET302PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Programme Elective Course - IV	PEC	7ET303PE_	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - V	PEC	7ET304PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - V	MDM	7_305MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
6	VLSI Design Lab	PCC	7ET306PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Programme Elective Course – IV Lab	PCC	7ET307PE_	0	0	2	0	2	1					25	25	50	25	50	
8	Research Methodology	RM	7ET401RM1	2	0	4	2	8	4	30	20	50	20		50	50	25	100	2 Hrs.
9	Project	PR	7ET402PR1	0	0	8	0	8	4					50	100	150	75	150	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**500**				**300**		**800**	
Optional Course for Double Minor / Honours Degree																			
10	Double Minor / Honours Course - V	DH	7__308DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
Optional Course for Honours with Research Degree																			
11	Research Project	RP	7ET403RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Electronics & Telecommunication Degree Programme

Semester - VIII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Biomedical Electronics (Online)	PCC	8ET309PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Programme Elective Course - V (Online)*	PEC	8ET310PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Multidisciplinary Minor - VI (Online)	MDM	8_311MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
4	On Job Training (Internship/Apprenticeship)	OJT	8ET404IN1	0	0	24	0	24	12					100	100	200	100	200	
Total				**8**	**0**	**24**	**8**	**40**	**20**			**250**				**200**		**450**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 32x15 = 480 Hrs] + [Learner-engaged time 8x15 = 120 Hrs]																			
Optional Course for Honours with Research Degree																			
5	Research Project	RP	8ET405RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

* Can be considered for MOOCS/NPTEL courses.

9. List of Programme Elective Courses

Students will have an option to choose the PEC offered by their respective Major Discipline offered during semester V to VIII Programme Elective Courses offered by Electronics & Telecommunication Engineering

Sr. No.	Semester	Programme Elective Course/Subjects Name	Course Code
1	V	Sensors and Transducers (PEC-I)	5ET231PE1
2		Sensors and Transducers – Lab (PEC- Lab I)	5ET236PE1
		OR	
3		Communication Network (PEC-I)	5ET231PE2
4		Communication Network - Lab (PEC- Lab I)	5ET236PE2
5	VI	IoT & Applications (PEC-II)	6ET242PE1
6		IoT & Applications -Lab (PEC-Lab II)	6ET246PE1
		OR	
7		Cryptography & Network Security (PEC-II)	6ET242PE1
8		Cryptography & Network Security-Lab (PEC- Lab II)	6ET246PE1
9		Computer Architecture (PEC-III)	6ET243PE2
		OR	
10		Introduction to AI (PEC-III)	6ET243PE2
11	VII	Microwave Theory and Techniques (PEC-IV)	7ET303PE1
12		Microwave Theory and Techniques (PEC- Lab IV)	7ET307PE1
		OR	
13		Advance Digital Signal Processing (PEC-IV)	7ET303PE2
14		Advance Digital Signal Processing (PEC- Lab IV)	7ET307PE2
15		Power Electronics (PEC-V)	7ET304PE2
		OR	
16		PLC & Industrial Automation (PEC-V)	7ET304PE2
17	VIII	*Information Theory & Coding (PEC-VI)	8ET310PE1
		OR	
18		* Antenna & Wave Propagation (PEC-VI)	8ET310PE2

10. Syllabus for Semester III & IV

Level:	**5**	Course Code:	**3ET201PC1**	Course Category:	**PCC**
Course Name	**Electronic Devices & Circuits**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3ET201PC1 Electronic Devices & Circuits is a compulsory Program Core Course for Second Year B. Tech Electronics & Telecommunication Engineering.

Course Objectives:

The objective of this course is to introduce the fundamentals of semiconductor electronic devices, their construction, characteristics, working principle and applications in various electronic circuits.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ET201PC1.1	Describe the working of diodes to understand its applications.	C-2
3ET201PC1.2	Illustrate the application of diodes as a component for simple circuits.	C-3
3ET201PC1.3	Describe Bipolar Junction Transistor in details to understand its applications.	C-3
3ET201PC1.4	Explain basics of JFET, MOSFET, UJT to interpret their operational parameters.	C-2
3ET201PC1.5	Explain the feedback concept, topologies and their applications in sinusoidal oscillators.	C-2
3ET201PC1.6	Describe the multistage amplifiers and emitter followers.	C-3

Course Contents:

Unit 1	**Introduction to Diodes:** PN junction diode: Construction, Working, diode equation, V-I characteristics. Zener diode: Construction, Working, V-I characteristics LED: Construction, Working, V-I Characteristics. Photodiode: Construction, Working, V-I Characteristics.	7 Hrs
Unit 2	**Applications of Diodes:** PN junction diode: As a Switch, rectifier, analysis of Half Wave Rectifier, Full Wave Rectifier, filters C, L, LC and CLC filters, Clipping and Clamping circuits. Zener diode: As a voltage regulator.	8 Hrs
Unit 3	**Bipolar Junction Transistors:** BJT configurations: CB, CE and CC with characteristics and parameters, transistor as a switch, Transistor switching times, dc load line, transistor biasing methods, bias stability, h-parameters and hybrid model.	8 Hrs
Unit 4	**JFET, MOSFET and UJT:** JFET: Theory, construction and characteristics, parameters (μ, gm & rd), MOSFET: Theory, construction and characteristics of enhancement & depletion type MOSFET, UJT**:** Theory, construction and characteristics; UJT as relaxation oscillator.	7 Hrs
Unit 5	**Feedback amplifiers and Sinusoidal oscillators:** Feedback amplifiers: Feedback concept, effects of negative feedback, basic feedback topologies, Sinusoidal oscillators: Barkhausen's criteria, Hartley, Colpitts, RC Phase shift, Wein bridge and crystal oscillators.	7 Hrs
Unit 6	**Multistage Amplifiers and Emitter Followers:** Multistage Amplifiers: Need of multistage, RC coupled amplifier, transformer coupled amplifier direct coupled amplifier. Emitter Followers: Basic emitter follower, Darlington emitter follower, Bootstrapping principle.	8 Hrs

Text Books:

1. David Bell, Electronic Devices and Circuits, Oxford University Press.
2. Milliman and Halkias, Integrated Electronics, Tata McGraw Hill, New Delhi

References:

1. Robert L.Boylestad, Electronic Devices and Circuit Theory, Pearson Education
2. Donald A Neamen, Electronic Circuit Analysis and Design Tata McGraw Hill,

E Resources :

1. Electronics Tutorials: https://www.electronics-tutorials.ws/
2. e-book: Electronic Devices and Circuit Theory, Robert Boylestad - 11th Edition: https://kolegite.com/EE_library/books_and_lectures/.pdf

Mapping of COs with POs and PSOs

COs	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ET201PC1.1	3	2	2	-	2	-	-	-	-	-	-	3	1	-
3ET201PC1.2	3	3	2	-	2	-	-	-	-	-	-	3	1	-
3ET201PC1.3	3	2	2	-	2	-	-	-	-	-	-	3	1	-
3ET201PC1.4	3	3	2	2	2	-	-	-	-	-	-	3	1	-
3ET201PC1.5	3	3	2	2	2	-	-	-	-	-	-	3	1	-
3ET201PC1.6	3	3	2	2	2	-	-	-	-	-	-	3	1	-
3ET201PC1CO	3	3	2	2	2	-	-	-	-	-	-	3	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3ET202PC1**	Course Category:	**PCC**
Course Name	**Signals & Systems**			
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours **02 30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks **40**
EE Marks	**--**	PA Marks	**--**	Total Marks **100**

Course Description:

Subject Code 3ET202PC1 Signals & Systems is a compulsory Program Core Course for Second Year B. Tech Electronics & Telecommunication Engineering.

Course Objectives:

The objective of the course is to develop a clear understanding of the fundamental characteristics and classifications of signals and systems, along with signal analysis in both time and transform domains using tools such as Fourier and Laplace transforms.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ET202PC1.1	Describe the continuous time signals and systems for mathematical operations and their classification.	C-2
3ET202PC1.2	Apply concepts of Fourier series to understand the spectral characteristics of continuous-time periodic signals.	C-3
3ET202PC1.3	Apply concepts of Fourier Transform to analyse the spectral characteristics of continuous-time aperiodic signals.	C-3
3ET202PC1.4	Apply the Laplace transform for analysis of continuous-time systems.	C-3
3ET202PC1.5	Describe the Discrete Time signals and systems for mathematical operations and their classification.	C-2
3ET202PC1.6	Describe the concept of sampling to the conversion of analog signals into discrete signals.	C-2

Course Contents:

Unit 1	**Continuous time signals and systems**: Signal types, Signal Operations, Signal Classification, Energy and Power Signal, Even and Odd functions, Convolution, System Classification.	5 Hrs
Unit 2	**Continuous-Time Signal Analysis -The Fourier Series:** Periodic Signal Representation by Trigonometric Fourier Series, Existence and Convergence of Fourier Series, Exponential Fourier Series.	5 Hrs
Unit 3	**Continuous-Time Signal Analysis-The Fourier Transform:** Aperiodic Signal Representation by Fourier Integral, Properties of Fourier Transform, Inverse Fourier Transform, Fourier Spectrum.	5 Hrs
Unit 4	**Continuous-Time System Analysis Using Laplace Transform**: Laplace Transform, Region of convergence, Properties of Laplace transform, Inverse Laplace transforms	5 Hrs
Unit 5	**Time-Domain Analysis of Discrete-Time Signals & Systems:** Signal Operations, Classification of Discrete-Time Systems, convolution sum, Properties of linear Convolution.	5 Hrs
Unit 6	**Sampling and Reconstruction** Sampling Theorem, Nyquist rate and Aliasing, Reconstruction of signals samples, Ideal and practical sampling techniques.	5 Hrs

Text Books:

1. Lathi B. P., Principles of Linear Systems and Signals, Second Edition (International Version) Oxford University Press.
2. Alan V. Oppenheim & Alan S. Willsky with S. Hamid Nawab, Signals & Systems, PHI Publication, Second Edition.
3.A.Anand Kumar, Signals and Systems, PHI Publication, Second Edition.

Reference Books:

1. Ambardar A., Analog and Digital Signal Processing, Thomson Learning-2005.
2. Simon Haykin, Barry Van Veen, Signals & Systems, II Edition, Wiley Pub.
3. Michael J. Roberts, Signals and Systems Analysis Using Transform Methods and MATLAB, Mc Hill Publication.

E Resources:

1. NPTEL Course: https://onlinecourses.nptel.ac.in/noc21_ee28/preview

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ET202PC1.1	3	2	1	2	–	–	–	–	–	–	–	3	2	–
3ET202PC1.2	3	3	2	2	1	–	–	–	–	–	–	3	2	–
3ET202PC1.3	3	3	2	3	1	–	–	–	–	–	–	3	3	–
3ET202PC1.4	3	3	2	3	1	–	–	–	–	–	–	3	3	1
3ET202PC1.5	3	2	1	2	–	–	–	–	–	–	–	3	2	–
3ET202PC1.6	3	2	1	3	1	–	–	–	–	–	–	3	2	1
3ET202PC1.CO	3	3	2	3	1	–	–	–	–	–	–	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3ET203PC1**	Course Category:	**PCC**
Course Name	**Analog & Digital Communication**			
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours **45 Hrs**
Total Credit Hours	**90 Hrs**			
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks **40**
EE Marks	**--**	PA Marks	**--**	Total Marks **100**

Course Description:

Subject Code 3ET203PC1 Analog & Digital Communication is a compulsory Program Core Course for Second Year B. Tech Electronics & Telecommunication Engineering.

Course Objectives:

The objective of the course is to provide a solid foundation in analog and digital communication by introducing modulation techniques, transmitter–receiver architectures, noise analysis, sampling, pulse modulation, and digital modulation methods.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ET203PC1.1	Explain AM modulation methods and their mathematical representation and describe transmitter–receiver operation and key receiver characteristics to understand the functioning and performance of AM communication systems.	C-2
3ET203PC1.2	Analyze FM generation techniques and pre-emphasis/de-emphasis, and explain FM receiver operation and discriminator circuits to understand the behavior and performance of FM communication systems.	C-3
3ET203PC1.3	Apply the sampling theorem, compare sampling techniques, and describe analog pulse modulation methods such as PAM, PWM, and PPM to analyze signal conversion and transmission processes.	C-3
3ET203PC1.4	Demonstrate PCM, DPCM, DM, and ADM techniques, and apply companding and line coding methods to understand efficient digital representation and transmission of signals.	C-3
3ET203PC1.5	Explain digital communication system blocks and analyze information theory concepts including entropy and information rate to evaluate the limits	C-3

	and efficiency of digital communication.	
3ET203PC1.6	Illustrate digital modulation schemes like BPSK, QPSK, FSK, and QASK, and describe carrier, bit, and symbol synchronization methods to understand modern digital communication techniques.	C-3

Course Contents:

Unit 1	**AM Transmitters and Receivers:** Need of modulation, AM Modulation (Mathematical expression), Single sideband communication: Principles of DSB-FC, DSBSC, SSB-SC modulation with its comparison. Superheterodyne receiver: block diagram, need of AGC. Receiver characteristics: selectivity, sensitivity, fidelity, Image frequency & its rejection, double spotting.	8 Hrs
Unit 2	**FM Transmitters and Receivers:** FM modulation, FET reactance modulator (circuit & analysis), basic concept of indirect FM generation, narrowband and wideband FM, its comparison. Pre-emphasis and de-emphasis. FM receiver block diagram with amplitude limiter. Foster-Seeley discriminator.	8 Hrs
Unit 3	**Techniques of sampling:** Sampling theorem in time domain, Nyquist criteria, aliasing effect. Types of sampling: ideal, natural, flat-top. Aperture effect. Comparison of sampling techniques. Introduction to pulse Analog modulation: PAM, PWM, PPM.	7 Hrs
Unit 4	**Digital Pulse Modulation:** Types of digital pulse modulation techniques. Generation & reception of Pulse Code Modulation. Quantization. Generation & reception of Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation.	7 Hrs
Unit 5	**Introduction to Digital Communication System:** Functional blocks of digital communication system. Scrambler and unscrambler. Digital representation of signals: Desirable properties of line coding. Information theory: measure of information, entropy, information rate. Introduction to Binary symmetric channel.	7 Hrs
Unit 6	**Digital Modulation:** Introduction, Types of digital modulation techniques, Generation and detection of BPSK, DPSK, QPSK, BFSK and QASK. Comparison of digital modulation systems. Synchronization: Carrier synchronization using M^{th} power loop, Bit & symbol synchronization-Clock recovery.	8 Hrs

Text Books:

1. Kennedy G., Electronic Communication System, Tata Mc-Graw Hill Co., New Delhi (Third Ed).
2. Taub and Schilling D.L., Principles of Communication Systems, Mc-Graw Hill Co., New Delhi
3. (Second Ed.).
4. Shanmugam K.S., Digital & Analog Communication Systems, John Wiley & Sons, NewYork, 1996.
5. Lathi B. P., Modern Digital and Communication Systems, Holt Rinchart and Winston Inc.,New York, 1993.

Reference Books:

1. Proakis J. K., Digital Communication, Mc-Graw Hill Book Co., London (Second Edition).
2. Glover and Grant, Digital Communication, Prentice Hall Publication.
3. Collins Dennis, Collins John, Electronic Communications, PHI.
4. Wayne Tomasi, Electronic Communication Systems, Pearson Education, (Fifth Edition).

E Resources :

2. Principles of Communication Systems: https://ocw.mit.edu/courses/6-450-principles-of-digital-communication-i-fall-2006
3. Digital Communication: https://web.stanford.edu/class/ee179/
4. https://www.allaboutcircuits.com/textbook/communications/

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ET203PC1.1	3	2	-	1	1	-	-	-	-	1	-	2	2	-
3ET203PC1.2	3	3	-	2	1	-	-	-	-	1	-	2	-	-
3ET203PC1.3	3	2	-	2	1	-	-	-	-	1	-	2	2	-
3ET203PC1.4	3	3	-	2	1	-	-	-	-	1	-	2	-	-
3ET203PC1.5	3	3	-	1	1	-	-	-	-	1	1	2	-	-
3ET203PC1.6	3	3	-	2	1	-	-	-	-	1	1	2	-	-
3ET203PC1CO	3	3	-	2	1	-	-	-	-	1	-	2	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3ET204MD1**	Course Category:	**MDM**
Course Name	**Principles of Electronics**			
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours **30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks **20**
EE Marks	**--**	PA Marks	**--**	Total Marks **50**

Course Description:

Subject Code 3ET204MD1 Principles of Electronics is compulsory Multi-Disciplinary Minor course offered by the department of Electronics & Telecommunication Engineering for other Second Year B. Tech Major Disciplines.

Course Objectives:

The objectives of this course is to introduce the basic of semiconductor devices and application to develop basic circuits of electronics application

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ET204MD1.1	Describe the construction, working, and characteristics of diodes (PN, Zener, LED) to analyze their applications in rectifiers and voltage regulation.	C-2
3ET204MD1.2	Illustrate the construction, operation, and characteristics of BJT, to apply as switch and amplifier in electronic circuits.	C-3
3ET204MD1.3	Illustrate the construction and operation of JFET, MOSFET and UJT to understand the characteristic behavior of these devices.	C-2

Course Contents:

Unit 1	**Introduction to diodes and its application:** PN junction diode: Construction, Working, diode equation, V-I characteristics, as a Switch, rectifier, analysis of Half Wave Rectifier, Full Wave Rectifier, Zener diode: Construction, Working, V-I characteristics, Zener diode as a voltage regulator, LED: Construction, Working and V-I Characteristics.	10 Hrs
Unit 2	**Bipolar Junction Transistors:** Principles, PNP, NPN Transistor, BJT configurations common base, common emitter and common collector with characteristics and parameters, transistor as a switch, transistor as an amplifier.	10 Hrs

Unit 3	**JFET, MOSFET and UJT:** JFET- Theory, construction and characteristics, parameters (μ, gm & rd) MOSFET-Theory, construction and characteristics of enhancement & depletion type MOSFET. UJT-Theory, construction and characteristics	10 Hrs

Text Books:

1. David Bell, Electronic Devices and Circuits, Oxford University Press,2010
2. Milliman and Halkias, Integrated Electronics Tata McGraw Hill, New Delhi

References:

1. Robert L.Boylestad, Electronic Devices and Circuit theory, Publ. Pearson Education.
2. Donald A Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill, 3rd Edition, 2003

E Resources :

1. https://open.umn.edu/opentextbooks/textbooks/
2. https://www.coursera.org/learn/transistor-field-effect-transistor-bipolar-junction-transistor

Mapping of COs with POs & PSOs

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3ET204MD1.1	3	3	2	2	1	–	–	–	–	–	–	3	2	1
3ET204MD1.2	3	3	3	3	1	–	–	–	–	–	1	3	3	1
3ET204MD1.3	3	3	3	3	2	–	–	–	–	–	–	3	2	–
3ET204MD1.CO	3	3	2	3	1	–	–	–	–	–	1	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3SH205OE1**	Course Category:	**OE**
Course Name	**Soft Skills & Profile Building**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3SH205OE1Soft Skills & Profile Building is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The objective of this course is to focus on developing advanced communication skills, leadership qualities and professional etiquette among engineering graduates.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE1.1	Apply advanced interpersonal, analytical, and persuasive communication techniques in professional contexts for effective professional interactions.	C-3
3SH205OE1.2	Demonstrate professional workplace etiquette, business communication, and group discussion skills to enhance employability.	C-3 A-3
3SH205OE1.3	Analyze leadership styles, emotional intelligence, and team dynamics for effective collaboration.	C-4 A-3
3SH205OE1.4	Design a structured and realistic career plan aligned with industry expectations and personal goals for professional growth.	C-6
3SH205OE1.5	Create ATS-friendly résumés, professional portfolios, and digital profiles for personal branding.	C-6 P-4
3SH205OE1.6	Perform effectively in interviews, workplace simulations, and job-search processes with professional confidence for enhanced employability.	C-3 P-3 A-3

Course Contents:

Unit 1	**Advanced Communication Dynamics:** Advanced interpersonal communication strategies; speech articulation; structuring thoughts and fluency techniques; analytical and critical communication; storytelling techniques for impactful presentations; persuasive communication models.	7 Hrs
Unit 2	**Global Workplace Etiquettes, Email Writing & GD–PI Perspective:** Professional greetings and workplace conduct; giving and receiving feedback; handling criticism and adaptability issues; professional values such as punctuality and attire; types of handshakes and significance; effective business email writing; types of Group Discussions, purpose of GDs; mock GDs (video-based); interview strategies and techniques.	8 Hrs
Unit 3	**Leadership, Team Dynamics & Corporate Skills:** Personality types using 9/9 matrix; leadership styles; emotional intelligence and leadership relationship; conflict resolution and negotiation techniques; team-building skills (Johari Window perspective); cross-cultural communication; creativity and design thinking; structured problem-solving and decision-making**.**	7 Hrs
Unit 4	**Strategizing Career Planning:** SMART goal setting; mapping skills to career paths; understanding industry expectations; emerging futuristic soft and hard skills (domain-wise); personalized career roadmap; certification planning (technical and non-technical); networking skills and participation in professional communities	7 Hrs
Unit 5	**Profile Building, Portfolio & Personal Branding:** ATS-friendly résumé preparation and common mistakes; video résumé creation and self-marketing pitch; LinkedIn profile optimization and networking strategies; developing online portfolios using platforms such as GitHub, Behance, Google Sites, and Toastmasters	8 Hrs
Unit 6	**Employment Readiness & Industry Integration:** Workplace simulation activities (mock emails, meetings, discussions); mock personal interviews; understanding sector-specific industry dynamics; unconventional career opportunities after engineering; job-hunting strategies and popular job platforms	8 Hrs

Text Books:

1. Alex K., Soft Skills, S. Chand Publishing
2. Meenakshi Raman & Prakash Singh, Business Communication, Oxford University Press

Reference Books:

1. Stephen R. Covey,The 7 Habits of Highly Effective People,Free Press Publication
2. Daniel Goleman, Emotional Intelligence,published by Bantam Books.
3. Shiv Khera, You Can Win,published by Bloomsbury Publishing
4. Richard N. Bolles, What Color Is Your Parachute? Published by Ten Speed Press, Crown Publishing Group

E Resources:

1. NPTEL: Soft Skills and Personality Development
2. LinkedIn Learning – Communication & Career Development Courses
3. Harvard Business Review – Communication & Leadership Articles
4. Coursera /edX – Career Development & Employability Skills Modules

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE1.1	2				–	–	–	2	3	–	–	3	2	1
3SH205OE1.2	–				–	2	3	3	3	–	–	1	3	1
3SH205OE1.3	–				–	2	2	3	–	–	–	3	-	1
3SH205OE1.4	–				–	2	–	–	–	2	3	1	2	1
3SH205OE1.5	–				3	–	–	–	2	–	2	3	3	1
3SH205OE1.6	–					2	–	2	3	–	2	3	2	1
3SH205OE1.CO	1				1	2	1	2	2	1	1	2	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3SH205OE2**	Course Category:	**OE**
Course Name	**Team Building & Management**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3SH205OE2 Team Building & Management is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the course is to develop teamwork capabilities, leadership and managerial skills, collaborative problem-solving abilities, conflict management techniques, and effective decision-making skills required in professional and organizational settings.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE2.1	Explain the principles and importance of effective team building in organizations to foster collaborative work culture.	C-2
3SH205OE2.2	Apply team dynamics and collaboration strategies to achieve common goals.	C-3 A-3
3SH205OE2.3	Analyze leadership styles and managerial roles for effective team performance.	C-4
3SH205OE2.4	Demonstrate conflict resolution, negotiation, and interpersonal management skills for effective team performance.	C-3 A-3
3SH205OE2.5	Apply motivation and performance management techniques in team-based environments for achieving organizational goals.	C-3
3SH205OE2.6	Perform effectively as a team member or leader in simulated managerial scenarios to develop leadership competencies	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Team Building:** Concept of teams; types of teams; stages of team development; characteristics of effective teams; roles and responsibilities of team members; barriers to effective teamwork; team norms and values.	7 Hrs

Unit 2	**Team Dynamics & Interpersonal Relationships:** Group behavior and dynamics; interpersonal communication in teams; trust and collaboration; listening as a team skill; diversity and inclusion in teams; cross-cultural team management	8 Hrs
Unit 3	**Leadership in Teams:**Leadership concepts; leadership styles; emotional intelligence and leadership; situational leadership; influence and power in teams; leadership ethics and responsibilities.	7 Hrs
Unit 4	**Conflict Management & Negotiation:** Sources and types of conflict; conflict resolution techniques; negotiation strategies; managing difficult team members; stress management; maintaining team harmony	7 Hrs
Unit 5	**Motivation, Performance & Team Effective ness:** Motivation theories; team motivation techniques; goal setting and performance measurement; feedback and appraisal systems; decision-making in teams; problem-solving techniques.	8 Hrs
Unit 6	**Managerial Skills & Team-Based Applications:** Managerial roles and functions; planning, organizing, and controlling teams; delegation and coordination; workplace simulations (team meetings, role plays); case studies on team management; team performance evaluation.	8 Hrs

Text Books:

1. Stephen P. Robbins, Organizational Behaviour, Pearson Education
2. L.M. Prasad, Management Principles and Practices, published by Sultan Chand & Sons

Reference Books:

1. Patrick Lencioni, The Five Dysfunctions of a Team, published by Jossey-Bass
2. Peter G. Northouse, Leadership, published by SAGE Publications
3. Daniel Goleman, Emotional Intelligence, published by Bantam Books

E Resources:

1. NPTEL – Organizational Behavior & Management Courses
2. LinkedIn Learning – Team Leadership & Management Modules
3. Harvard Business Review – Teamwork & Leadership Articles
4. Coursera / edX – Team Management and Leadership Courses

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3SH205OE2.1	2	–	–	–	–	–	–	–	–	–	–	3	2	1
3SH205OE2.2	–	2	2	–	–	–	–	3	2	–	–	1	3	1
3SH205OE2.3	–	3	3	–	–	–	–	2	–	–	–	3	-	1
3SH205OE2.4	–	2	2	–	–	2	3	3	–	–	–	1	2	1
3SH205OE2.5	–	2	2	–	–	–	–	2	–	2	–	3	3	1
3SH205OE2.6	–	2	2	–	–	2	–	3	2	–	2	3	2	1
3SH205OE2. CO	1	2	2	-	-	1	1	2	1	1	1	2	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	3ET206PC1		Course Category:	PCC
Course Name		Electronic Devices & Circuits Lab				
Credits		01	Total L:T:P Hours	0:0:2	Total SL Hours	--
Total Credit Hours		30 Hrs		30 Hrs		
SEE Marks		--	SEE Time	--	CIA Marks	--
EE Marks		25	PA Marks	25	Total Marks	50

Course Description:

Subject Code 3ET206PC1Electronic Devices & Circuits Lab is a compulsory Program Core Course for Second Year B. Tech Electronics & Telecommunication Engineering.

Course Objectives:

The objective of this course is to perform practicals based on Electronic Devices to analyze their application in the electronic circuits.

Course Outcomes:

After completing the course, students will be able to:

CO	Course Outcome	Domain Level
3ET206PC1.1	Demonstrate ability to perform experiments related semiconductor diodes to understand their applications.	C-3, P-5
3ET206PC1.2	Illustrate experimentation related to BJT, FETs and UJT to demonstrate their parametric performance along with their applications.	C-3 P-5
3ET206PC1.3	Recognise applications of BJT to demonstrate its performance in sinusoidal oscillators, multistage amplifier and emitter followers.	C-3, P-4, A1

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Verify V-I characteristics of p-n junction diode and obtain static and dynamic resistance values.
2. Verify V-I characteristics of Zener diode.
3. Verify V-I characteristics of LED.
4. Obtain the efficiency and ripple factor of half-wave rectifiers without and with filters (C-input filter).
5. Obtain the efficiency and ripple factor of full-wave rectifiers without and with filters (C-input filter).
6. Demonstrate Zener diode as a voltage regulator and calculate line and load regulation factor.
7. Demonstrate diode as a clipper and Clamper for various reference levels.
8. Verify characteristics of CE mode of BJT and compute its h-parameters.

9. Demonstrate voltage divider biasing of CE mode of BJT and determine operating point.
10. Plot the drain and transfer characteristics of JFET (Junction Field Effect Transistor) and calculate rd, gm and μ.
11. Plot the drain and transfer characteristics of depletion MOSFET.
12. Plot the drain and transfer characteristics of enhancement MOSFET .
13. Plot the characteristics of UJT and to calculate the Intrinsic Stand-Off Ratio (η).
14. Demonstrate UJT as a relaxation oscillator.
15. Compute theoretical and practical frequency of Hartley oscillator.
16. Compute theoretical and practical frequency of Colpitts oscillator.
17. Compute theoretical and practical frequency of RC Phase shift oscillator.
18. Obtain frequency response of RC coupled amplifier and verify cut off frequencies and bandwidth
19. Verify performance of emitter follower circuit.

E Resources:

1. Virtual labs by IITS- https://www.vlab.co.in/broad-area-electronics-and-communications/

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ET206PC1.1	3	2	-	-	1	-	-	2	2	1	1	3	1	-
3ET206PC1.2	3	2	-	1	1	-	-	2	2	1	1	3	1	-
3ET206PC1.3	3	2	-	1	1	-	-	2	2	1	1	3	1	-
3ET206PC1CO	3	2	-	1	1	-	-	2	2	1	1	3	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3ET207PC1**	Course Category: **PCC**		
Course Name	**Signals & Systems Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	--
Total Credit Hours	**30 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3ET207PC1 Signals & Systems Lab is a compulsory Program Core Course for Second Year B. Tech Electronics & Telecommunication Engineering.

Course Objectives:

The objective of this course is to provide a fundamental understanding of signal generation, analysis, and transformation using MATLAB/SCILAB.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ET207PC1.1	Generate different plots and explore results to draw valid conclusions and inferences in Signal Processing	C-6, P-5 A-2
3ET207PC1.2	Apply simulation tools to determine signal processing needs and develop suitable system designs.	C-3 P-5 A-2
3ET207PC1.3	Apply sampling theorem to converting continuous-time signals into discrete-time signals.	C-3, P-5, A-2

List of Practicals:

Minimum eight practical's from the list mentioned below.

1. Study of Signal Processing Functions used in MATLAB / SCILAB
2. Program to generate standard continuous Time Signals
3. Program to generate standard discrete Time Signals.
4. Program to perform basic operations on signals.
5. Program to find Even and Odd parts of a signal.
6. Program to check Periodicity of signals.
7. Program to identify a given system as linear/ non-linear property of a given system
8. Program to identify a given system as time variance/ invariance system
9. Program to find Fourier transform of given signal

10. Program to demonstrate the time domain sampling of band limited signals (Nyquist theorem).

E Resources:

1. Mathwork: Browser-based Matlab.
   https://www.mathworks.com/mwaccount/account/create?cid=getmatlab&wid=&uri=https%3A%2F%2Fmatlab.mathworks.com%2F

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ET207PC1.1	3	3	2	2	1	–	–	–	–	–	–	3	3	–
3ET207PC1.2	3	3	2	3	1	–	–	–	–	–	–	3	3	1
3ET207PC1.3	3	2	1	2	1	–	–	–	–	–	–	3	2	1
3ET207PC1.CO	3	2	2	2	1	–	–	–	–	–	–	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3ET208PC1**	Course Category:	**PCC**
Course Name	**Analog & Digital Communication Lab**			
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3ET208PC1Analog & Digital Communication Labis a compulsory Program Core Course for Second Year B. Tech Electronics & Telecommunication Engineering.

Course Objectives:

The objective of this course is to provide students with hands-on experience in analog and digital communication systems through practical implementation and analysis of modulation, demodulation, coding, and multiplexing techniques.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ET208PC1.1	Perform the AM/FM transmitter–receiver operations and single sideband techniques such as DSB-SC to understand the functioning and characteristics of analog communication systems.	C-3, P-4
3ET208PC1.2	Implement pulse and digital modulation schemes using hardware and MATLAB for waveform and spectral analysis.	C-3, P5
3ET208PC1.3	Participate in a team to demonstrate, perform, and present laboratory experiments with proper documentation to develop collaborative skills and effective technical reporting.	C-3, P-3, A-2

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Explore the operation of AM transmitters and receivers in a communication system.
2. Explore the operation of FM transmitters and receivers.
3. Study the generation of DSB-SC signals.
4. Verify the operation of PWM, PAM, and corresponding demodulation techniques.
5. Explore Time Division Multiplexing (TDM) as an application of PAM.
6. Verify the process of Pulse Code Modulation (PCM) and its demodulation.

7. Verify the output of Delta Modulation (DM) and Demodulation.
8. Implement various line coding schemes and observe their spectra.
9. Generate and observe ASK, FSK, and PSK waveforms using MATLAB.
10. Analyze and compare the performance of:
    a) Binary Phase Shift Keying (BPSK)
    b) Differential Phase Shift Keying (DPSK)
    c) Quadrature Phase Shift Keying (QPSK)

E Resources:

1. Analog, digital pulse and digital communication techniques with theory and experimental understandings.
    i. https://nptel.ac.in/courses/117/105/117105083
    ii. https://nptel.ac.in/courses/108/104/108104091
    iii. https://www.electronics-tutorials.ws/
2. Line Coding, PCM, Digital Mod simulation codes, Signal spectra, Receiver analysis. https://in.mathworks.com/help/comm/examples.html

Mapping of COs with Pos & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3ET208PC1.1	3	2	2	1	2	-	-	-	-	1	-	2	-	-
3ET208PC1.2	3	2	2	2	3	-	-	-	-	1	-	2	2	-
3ET208PC1.3	3	-	1	-	1	-	-	-	3	3	2	2	-	-
3ET208PC1CO	3	1	2	1	2	-	-	-	1	2	1	2	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	3ET209EM1	Course Category:	EEM
Course Name	**Basic Financial Management**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 3ET209EM1 Basics Financial Management is a compulsory Engineering Economics & Management course for Second Year B. Tech. Electronics & Telecommunication Engineering.

Course Objectives:

The objective of this course is to introduce the fundamentals of financial management to understand financial terminologies for interpretation in practice.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcomes	Domain Level
3ET209EM1.1	Describe basics of financial management to understand Indian financial system.	C-2
3ET209EM1.2	Explain fundamentals of accounting and financial statements to practice in professional life.	C-2
3ET209EM1.3	Interpret concept of costing for project budgeting and evaluation for applying in professional career.	C-2

Course Contents:

Unit 1	**Basics of Financial Management:** Meaning and importance of financial management, meaning of terminologies -assets, liabilities, equity, role of finance in engineering projects and startups. Introduction to the Indian financial system: Banks, Financial markets, Regulatory bodies (RBI, SEBI – basic idea and functions only), Time value of money – simple concept of present and future value.	10 Hrs
Unit 2	**Fundamentals of Accounting & Financial Statements:** Basic purpose of accounting, Simple interpretation of: Accounts Payable, Accounts Receivable, Budget,Capital,Cash Flow, Depreciation, Revenue, Net	10 Hrs

	Income (Net Profit), Working Capital, Liquidity, Solvency. Introduction to: Journal, Ledger, Trial balance, Financial statements (only understanding, not detailed preparation): Profit & Loss Account, Balance Sheet, Basic idea of depreciation (straight line method only).	
Unit 3	**Basic Costing, Budgeting & Project Evaluation:** Direct, Indirect, Fixed, Variable cost, simple cost sheet concept. Break-even concept (only meaning and simple numerical examples).Budgeting – meaning and need for engineers. Introduction to project evaluation methods: Payback period (only concept + small example), Basic idea of Net Present Value NPV (no complex calculation)Applications in engineering and startups: Costing of a small electronics project, Budgeting for a lab prototype.	10 Hrs

Text Books:

1. O.P.Khanna, Industrial Management, Dhanpat Rai Publications
2. M.Y.Khan & P.K. Jain, Financial Management, Tata McGraw Hill

Reference Books:

1. Prasanna Chandra, Financial Management: Theory & Practice, Mc Hill Publications
2. I.M. Pandey, Financial Management, Vikas Publishing House Pvt. Ltd.

E Resources :

5. E-book- O.P.Khanna, Industrial Management, https://www.scribd.com/document/432344678/o-p-Khanna-Industrial-Engineering

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ET209EM1.1	-	-	-	-	2	1	-	-	-	-	3	-	-	1
3ET209EM1.2	-	-	-	-	2	1	-	-	-	-	3	-	-	1
3ET209EM1.3	-	-	-	-	2	1	-	-	-	-	3	-	-	1
3ET209EM1CO	-	-	-	-	2	1	-	-	-	-	3	-	-	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3SH210VE1**	Course Category:	**VEC**
Course Name	**Constitutional Values and Fundamental Duties**			
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours **30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	**--**	SEE Time	**--**	CIA Marks **--**
EE Marks	**25**	PA Marks	**25**	Total Marks **50**

Course Description:

Subject Code 3SH210VE1 Constitutional Values and Fundamental Duties is a compulsory Valus enhancement Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to introduce the Indian Constitution, its historical background, fundamental values, rights, and duties.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH210VE1.1	Explain the historical background, making, and significance of the Indian Constitution to Understand the Constitution, Preamble, and core values.	C2
3SH210VE1.2	Interpret Fundamental Rights and Duties (Articles 12–35, 51A) to evaluate their implications through case studies in professional and civic life.	C3
3SH210VE1.3	Apply constitutional principles to engineering ethics, sustainability concerns (Articles 48A, 51A(g)), and demonstrate social commitment, innovation, and inclusive growth as nation builders.	C3

Course Contents:

Unit 1	**Introduction to the Constitution and Fundamental Values**: Overview of the Indian Constitution – Historical background and making of the Constitution; Meaning of Constitution; Preamble – Meaning and significance. Core Constitutional Values – Justice (Social, Economic, Political); Liberty (thought, expression, belief, faith, worship); Equality (status and opportunity); Fraternity (dignity and unity of the nation). Relevance of constitutional values for professionals and citizens.	10 Hrs

Unit 2	**Fundamental Rights and Duties**: Fundamental Rights (Articles 12–35) – Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies. Fundamental Duties (Article 51-A) – Importance and implications; Role of youth and professionals in upholding duties. Case studies highlighting real-life significance of rights and duties.	10 Hrs
Unit 3	**Application of Constitutional Values in Engineering and Public Life**: Ethical Responsibilities and Constitutional Alignment – Engineering ethics and public interest; Environment and sustainability as constitutional concern (Articles 48A, 51A(g)); Engineers as nation builders – Social commitment, innovation, and inclusive growth.	10 Hrs

Text Books:

1. Basu D. D., Introduction to the Constitution of India, LexisNexis Publication, New Delhi (Twenty-Third Edition).
2. Jain M. P., Constitution of India, LexisNexis Publication, New Delhi (Eighth Edition).
3. Laxmikanth M., Indian Polity, McGraw Hill Education, New Delhi (Sixth Edition).
4. Austin Granville, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, New Delhi.
5. Shukla V. N., Constitution of India, Eastern Book Company, Lucknow (Twelfth Edition).
6. Government of India, Constitution of India (Bare Act), Government of India Publication, New Delhi.

Reference Books:

1. Subhash Kashyap, Our Constitution, National Book Trust, New Delhi.
2. Durga Das Basu, Shorter Constitution of India, LexisNexis Publication.
3. P. M. Bakshi, The Constitution of India, Universal Law Publishing.
4. J. N. Pandey, Constitutional Law of India, Central Law Agency.
5. Seervai H. M., Constitutional Law of India, N. M. Tripathi Pvt. Ltd. (Vols. I–III).
6. B. Shiva Rao, The Framing of India's Constitution: A Study, Indian Institute of Public Administration.
7. D. C. Wadhwa, Political Science and Constitutional Law, Eastern Book Company.
8. Madhav Khosla, The Indian Constitution: Oxford India Short Introductions, Oxford University Press.

E Resources :

1. NPTEL course on Constitutional Studies, Prof. Sudhir Krishnaswamy, National Law School of India University
2. Constitutional Values and Fundamental Duties (University of Delhi – aligned with NEP 2020, available via NPTEL/DU open learning) https://kmc.du.ac.in/kmcouter/collnews/download/40727448169063791359.pdf/LinkedContents/pdf/All/All

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH210VE1.1	3	2	-	1	-	-	-	-	-	-	-	2	2	1
3SH210VE1.2	-	3	2	2	-	2	3	3	-	-	-	3	2	2
3SH210VE1.3	-	-	3	3	-	2	3	2	-	2	-	3	2	1
3SH210VE1CO	1	2	2	2	-	2	2	2	-	1	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3ET400FP1**	Course Category:	**FP**
Course Name	**Field Project**				
Credits	**02**	Total L:T:P Hours	0:0:4 **60 Hrs**	Total SL Hours	**--**
Total Credit Hours	**60 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3ET400FP1 Field Project is a compulsory Experiential Learning Course for Second Year B. Tech Electronics & Telecommunication Engineering.

Course Objectives:

The objective of this course is to expose students to community-based field problems related to electronics and communication through field visits and surveys, enable them to identify and analyze such problems using basic E&TC concepts, and inculcate professional ethics, teamwork, communication skills, and social responsibility through experiential learning.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ET400FP1.1	Identify community problems related to electronics & communication systems	C-3, P-4, A-2
3ET400FP1.2	Design socially relevant, low-cost E&TC engineering solutions	C-4, P-4, A-2
3ET400FP1.3	Demonstrate professional ethics, teamwork, and communication skills	C-4, P-4, A-3

Course Contents:

Module	Description	Hours
Module 1	Orientation & Sensitization	4
Module 2	Field Visit & Problem Identification	16
Module 3	Problem–Solution Design & Implementation	28
Module 4	Documentation, Presentation & Reflection	12

Note:

1. Students must collaborate within their assigned practical batches. Each batch should be further divided into subgroups, with five students per subgroup, in accordance with the prescribed guidelines.

2. Typical E&TC Field Problems Identified

1. Poor mobile signal / internet connectivity
2. Digital divide in schools
3. Lack of emergency alert systems
4. Inefficient power usage in electronic systems
5. Absence of low-cost assistive electronic devices
6. Poor awareness of e-waste & renewable energy

3. Suggested E&TC Project Themes

1. Rural mobile signal enhancement models
2. Solar-powered public announcement systems
3. IoT-based water / agriculture monitoring
4. Smart classroom solutions for rural schools
5. Emergency alert & safety systems
6. Assistive devices for elderly / disabled
7. Energy-efficient communication setups
8. E-waste awareness & sustainable electronics

4. Documentation /Project Report Format:

The Documentation /Project Report shall contain the following sections:

1. Title Page
2. Certificate & Declaration
3. Abstract
4. Introduction (Community + E&TC relevance)
5. Objectives
6. Literature Survey
7. Methodology (Survey + Technical)
8. Problem Identification
9. Proposed E&TC Solution
10. Implementation / Simulation
11. Results & Analysis
12. Community Feedback & Social Impact
13. Conclusion & Future Scope
14. References
15. Appendices (Photos, questionnaires, certification letter issued by the Gram Panchayat office)

Course Plan:

Lecture No.	Module Title	Topic	Hours
1	**Module1: Orientation & Sensitization**	NEP 2020: Community Engagement & Role of Engineers, Overview of Rural & Urban Communication Infrastructure, Identification of Community Institutions (GP, School, Self Help Group (SHG), Health Centre), Field Safety, Team Formation, Area & Theme	4

		Allocation. Community survey planning & questionnaire design	
2	**Module 2: Field Visits & Problem Identification**	**Field Visit–I:** 1. Village/Ward, survey identification of communication infrastructure, interaction with local residents 2. Rural school / Anganwadi / Health centre – study of digital divide and ICT facilities 3. Gram Panchayat / Nagarpalika office, observation of public services and schemes,Swachh Bharat / MGNREGS site, observation of technology use, data consolidation.	16
3		**Field Visit–II**: Village/Ward /Rural school / Anganwadi / Health centre/ Gram Panchayat / Nagarpalika office – Interaction, Discussion & Problem Identification to channelize project work.	
4		**Field Visit–III**: Onsite Field Work: Project Installation, Implementation/ Testing/ Troubleshooting, and Problem Resolution.	
5		**Field Visit–IV**: Final onsite Project Installation, Implementation/ Testing/ Troubleshooting, and Problem Resolution	
6	**Module3: Engineering Problem–Solution Design & Implementation**	**Problem Understanding & Literature Review:** Problem–solution mapping, Review of similar solutions & literature, Identification of gaps and relevance to community needs	28
7		**Technology Selection & System Design:** Selection of appropriate E&TC technologies, Block diagram and functional flow design, System-level working description	
8		**Component Analysis & Feasibility:** Component identification and working principle, Cost estimation and feasibility analysis, Sustainability considerations (energy, maintenance)	

9		**Ethics, Impact & Design Refinement:** Ethical and social impact assessment, Community feedback on proposed solution, Design refinement and approval	
10		**Modeling & Implementation:** Simulation / software modeling (where applicable), Hardware planning / conceptual prototype, IoT / sensor / communication module planning	
11		**Integration & Performance Evaluation:** Power supply and energy-efficient design, Integration of subsystems, Testing, validation, performance analysis	
12		**Optimization, Validation & Finalization:** Alignment with SDGs, Final improvements and project finalization	
13	**Module4: Documentation, Presentation & Reflection**	Field diary completion, data analysis, Results, Discussion & Conclusion	12
14		Report Finalization, Presentation Preparation	
15		**Evaluation and Viva:** Poster / PPT / Demonstration, Community-Level Feedback	

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ET400FP1.1	3	3	–	3	3	–	–	–	–	–	–	3	3	-
3ET400FP1.2	–	3	3	3	3	–	–	–	3	–	–	3	3	-
3ET400FP1.3	–	–	–	–	–	3	3	3	3	3	3	3	3	3
3ET400FP1CO	1	2		2	2	1	1	1	2	1	1	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: **3AL001NC1**		Course Category: **NC**		
Course Name	**Disaster Management and Preparedness**				
Credits	--	Total L:T:P Hours	2:0:0 30 Hrs	Total SL Hours	--
Total Credit Hours	--				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	--	Total Marks	--

Course Description:

Subject Code 3ET001NC1Disaster Management and Preparedness is a Compulsory Non-Credit course for Second Year B. Tech all disciplines.

Course Objectives:

The objective of this course is to provide students with a comprehensive understanding of disasters, their types, impacts, the complete disaster management cycle, and the roles of various agencies in Disaster Risk Reduction.

Course Outcomes:

After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3ET001NC1.1	Identify the concepts of disaster, hazard, vulnerability and risk, and classify disasters to understand the basic nature, causes and profiles of disasters in India.	C-2
3ET001NC1.2	Analyze the disaster management cycle for risk assessment, mitigation, preparedness, response, recovery, and international disaster management frameworks.	C-4
3ET001NC1.3	Apply disaster management practices, including stakeholder roles, national policies, engineers' responsibilities, and preparedness measures for effective disaster risk reduction.	C-3

Course Contents:

Unit 1	**Introduction to Disaster Management:** Concepts and definitions – disaster, hazard, vulnerability, risk, severity, frequency, exposure, capacity, and impact; classification of disasters- Natural disasters: earthquakes, tsunami, landslides, mining, Hydro-Meteorological Disasters: floods, draught, cyclones, coastal erosion. Biological Disaster: epidemics, pest attacks, forest fire, Manmade disasters: Industrial pollution, artificial flooding in	10 hrs

	urban areas, nuclear radiation, chemical spills, transportation accidents, vulnerability profile of India, ecological fragility; principles of disaster prevention and mitigation	
Unit 2	**Disaster Management Cycle and Framework:** Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development. Awareness During Disaster – Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation. Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action Phases of disaster management; vulnerability and capacity assessment, post-disaster environmental response	12 hrs
Unit 3	**Disaster Management practices:** Roles and responsibilities of government, community, local bodies, NGOs, and other stakeholders, National Policy on Disaster Management Act 2005 Mega Disasters of India and Lessons Learnt, Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster.	8 hrs

Textbooks:

1. Sharma, S. C. (2022). Disaster Management, Khanna Publication.
2. Subramanian, R. (2024). Disaster Management. Vikas Publication.

Reference Books:

1. Gaur, R. C. (2018). Environmental Engineering and Disaster Management. New Age International.
2. Pradeep Sahni, 2024, Disaster Risk Reduction in South Asia, Prentice Hall.
3. Mondal, D. (2022). Disaster Management. New Delhi: CBS Publishers & Distributors
4. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
5. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
6. Natural Disaster Management Policy , 2009,GOI
7. H.N. Shrivastava& G.D. Gupta, Management of Natural Disasters in developing Countries, Daya Publishers , Delhi
8. S.L. Goyal, Encyclopedia of disaster Management, Vol I,II & III Disaster Managemnt Policy and administration, Deep & Deep, New Delhi,2006
9. Coppola D P, Introduction to International Disaster Management, Elsevier Science (B/H), London, 2007

10. Disaster Mitigation in Asia & Pacific, Asian Development Bank

Course Assignments

Internal Assessment at Institute level will be based on following assignments:

1.	Study of Recent Disasters (at local, state and national level)
2.	Preparation of Disaster Risk Management Plan of an Area or Sector
3.	A Case study on Disaster Management

E Recourses:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed61/preview

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3AL001NC1.1	3	2	-	-	-	3	2	-	-	-	3	-	-	-
3AL001NC1.2	3	3	-	-	-	3	3	-	-	-	3	2	2	-
3AL001NC1.3	3	3	-	-	-	3	3	-	-	3	3	1	2	2
3AL001NC1.CO	3	3	-	-	-	3	3	-	-	1	3	1	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3ET211DH1**	Course Category:	**DH**
Course Name	**Fundamentals of Artificial Intelligence**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3ET211DH1 Fundamentals of Artificial Intelligence is a Double Minor/Honours Course offered by the Department of Electronics & Telecommunication Engineering for Second Year B.Tech. students of all disciplines.

Course Objectives:
The objective of this course is to introduce the basic concepts of Artificial Intelligence, intelligent systems, problem-solving techniques, knowledge representation and applications of AI in engineering and everyday life.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ET211DH1.1	Explain the basic concepts, history and applications of Artificial Intelligence.	C-2
3ET211DH1.2	Apply simple search techniques to solve AI problems.	C-3
3ET211DH1.3	Explain methods of knowledge representation and expert systems.	C-2
3ET211DH1.4	Describe the fundamentals of machine learning techniques.	C-2
3ET211DH1.5	Identify AI applications in engineering and communication systems.	C-3
3ET211DH1.6	Discuss ethical issues and future trends in Artificial Intelligence.	C-2

Course Contents:

Unit 1	**Introduction to Artificial Intelligence:** Introduction to Artificial Intelligence, History and Evolution of AI, Characteristics of AI, Types of AI, Intelligent Systems, Intelligent Agents, Applications of AI in Daily Life, Applications of AI in Engineering.	7 Hrs
Unit 2	**Problem Solving Techniques:** Problem Definition; State Space Representation; Problem Formulation; Breadth First Search (BFS); Depth First Search (DFS); Heuristic Search; Best-First Search; Simple Examples.	8 Hrs
Unit 3	**Knowledge Representation and Expert Systems:** Knowledge Representation Concepts; Propositional Logic; Predicate Logic; Semantic Networks; Frames; Rule-Based Systems; Expert Systems and their Architecture; Applications of Expert Systems.	8 Hrs

Unit 4	**Machine Learning Fundamentals:** Introduction to Machine Learning, Artificial Intelligence vs Machine Learning, Supervised Learning; Unsupervised Learning; Classification, Applications of Machine Learning.	7 Hrs
Unit 5	**Applications of Artificial Intelligence:** Natural Language Processing, Computer Vision, Robotics, AI in Agriculture, AI in Healthcare, AI in Electronics & Communication Engineering, AI in Smart Cities	7 Hrs
Unit 6	**Ethics and Future Trends in AI:** Ethical Issues in AI, Bias and Fairness, Privacy and Security, Responsible AI, Introduction to Generative AI, Future Trends in AI, Career Opportunities in AI	8 Hrs

Text Books:

1. E. Balagurusamy, Artificial Intelligence McGraw Hill Education (India).
2. S. Kaushik, Artificial Intelligence, Cengage Learning India.
3. N. P. Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press India.

References:

1. V. S. Janakiraman and K. Sarukesi, Foundations of Artificial Intelligence and Expert Systems, Macmillan India.
2. R. Rajesh, Artificial Intelligence, Tata McGraw-Hill Education.
3. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education.

E Resources:

1. NPTEL – Artificial Intelligence
2. SWAYAM – Artificial Intelligence
3. Spoken Tutorial – IIT Bombay
4. AICTE Learning Portal
5. Google AI Learning Resources

Mapping of COs with POs and PSOs

COs	**POs**											**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3ET211DH1.1	3	2	–	–	2	–	–	–	2	–	2	3	2	–
3ET211DH1.2	3	3	2	2	3	–	–	–	2	–	2	3	3	2
3ET211DH1.3	3	3	2	2	2	–	–	–	2	–	2	3	2	2
3ET211DH1.4	3	2	2	2	2	–	–	–	2	–	2	3	2	2
3ET211DH1.5	3	3	3	2	3	1	–	–	3	–	3	3	3	2
3ET211DH1.6	2	2	–	2	2	2	2	2	3	2	3	3	2	2
3ET211DH1CO	3	3	2	2	2	1	1	1	2	1	2	3	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3ET211DH2**	Course Category:	**DH**
Course Name	**Solid State Electronics for VLSI**			
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours **45 Hrs**
Total Credit Hours	**90 Hrs**			
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks **40**
EE Marks	**--**	PA Marks	**--**	Total Marks **100**

Course Description:

Subject Code 3ET211DH2 Solid State Electronics for VLSI is a Double Minor/ Honours Course offered by the department of Electronics & Telecommunication Engineering for Second Year B. Tech., of all discipline.

Course Objectives:

The objective of the course is to build foundational knowledge of solid-state devices and semiconductor processes, and to apply these concepts in integrated circuit and VLSI design.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ET211DH2.1	Explain crystal structures, quantum concepts, energy bands to identify semiconductor classifications.	C-2
3ET211DH2.2	Analyze carrier transport, recombination, to determine continuity relations in semiconductors.	C-4
3ET211DH2.3	Examine PN junction operation to understand diode characteristics, and breakdown mechanisms.	C-3
3ET211DH2.4	Interpret metal–semiconductor contacts and optoelectronic to explain device behavior.	C-3
3ET211DH2.5	Describe BJT operation to understand characteristics and high-frequency limitations.	C-2
3ET211DH2.6	Summarize basic semiconductor process steps relevant to integrated circuits.	C-3

Course Contents:

Unit 1	**Crystal Structure & Quantum Basis of Semiconductors:** Crystal lattices, unit cells, Miller indices, diamond structure of Si; crystal defects; quantum mechanics basics; Bloch theorem; band theory; density of states; effective mass.	8 Hrs

Unit 2	**Semiconductor Carrier Physics:** Intrinsic & extrinsic semiconductors; Fermi–Dirac statistics; drift, diffusion; scattering; mobility; continuity equation; recombination (SRH, radiative, Auger); quasi-Fermi levels; carrier lifetime.	9 Hrs
Unit 3	**PN Junctions and Diodes:** PN junction formation and depletion region, Built-in potential and equilibrium conditions, Current-voltage characteristics of PN junction, Zener diode: breakdown mechanism and applications,	9 Hrs
Unit 4	**Metal–Semiconductor & Optoelectronic Devices:** Schottky barriers, ohmic contacts; heterojunctions; photodiodes, LEDs, solar cells; PIN diode; avalanche photodiode; tunnel diode; introduction to quantum devices.	8 Hrs
Unit 5	**Bipolar Junction Transistors (BJTs):** BJT structure and principle of operation, Modes of operation: cutoff, active, saturation, Input-output characteristics of BJT, Current gain (α, β) and relationships, BJT as amplifier, BJT as switch: digital applications, Limitations of BJTs in VLSI scaling.	6 Hrs
Unit 6	**Semiconductor Technology Overview:** Wafer preparation; bulk crystal growth; diffusion & implantation overview; thin-film deposition; evolution of IC technologies toward CMOS and FinFETs.	5 Hrs

Text Books:

1. Neil H.E. Weste, David Harris, CMOS VLSI Design: A Circuits and Systems Perspective (4th Edition), Pearson Education
2. Ben G. Streetman, Sanjay Kumar Banerjee, Solid State Electronic Devices (7th Edition), PHI Learning
3. R.K. Verma, Ashish Chaudhury, Solid State Electronics Ram Prasad Publications
4. K. Lal Kishore, V.S.V. Prabhakar, VLSI Design I.K. International Publishing House.

Reference Books:

1. Simon M. Sze, VLSI Technology McGraw Hill Education India
2. Morris Mano, Digital Logic and Computer Design Pearson Education

E Resources :

1. NPTEL Online Courses, Solid State Devices and Digital VLSI Design video lectures
2. VLSI Resources Portal Tutorials on fabrication, MOSFETs, CMOS circuits, vlsiresources.com

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ET211DH2.1	3	2	–	2	1	–	–	–	–	–	2	3	2	–
3ET211DH2.2	3	3	2	2	2	–	–	–	–	–	2	3	2	–
3ET211DH2.3	3	3	2	2	2	–	–	–	–	–	3	3	2	–
3ET211DH2.4	3	2	2	2	2	–	–	–	–	–	2	3	1	–
3ET211DH2.5	3	3	2	2	2	–	–	–	–	–	3	3	1	–
3ET211DH2.6	3	2	-	2	2	2	1	–	–	2	3	3	1	1
3ET211DH2.CO	3	3	2	2	2	1	1	-	-	1	3	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	4ET212PC1	Course Category:	PCC
Course Name	**Electromagnetic Fields**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4ET212PC1Electromagnetic Fields is a compulsory Program Core Course for Second Year B. Tech. in Electronics & Telecommunication Engineering.

Course Objectives:

The objective of the course is to familiarize the student to the concept and calculations pertaining to electric and magnetic field, Boundary conditions, Maxwell's equations and EM wave propagation in electromagnetic theory.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ET212PC1.1	Explain coordinate systems and its use for solving the problems of electromagnetic fields.	C-2
4ET212PC1.2	Apply the basics of electrostatics to obtain the electric field intensity for static conditions.	C-3
4ET212PC1.3	Apply the basics of magnetostatics to obtain the magnetic field intensity for static conditions.	C-3
4ET212PC1.4	Use boundary conditions and Maxwell's equations to solve problems in electrostatics and magnetostatics.	C-3
4ET212PC1.5	Use EM wave equations in different media to calculate attenuation, skin depth and apply Poynting's theorem to calculate power flow in EM fields.	C-3
4ET212PC1.6	Explain the scalar, vector magnetic potentials and mechanism of radiation from a current element to calculate the radiation resistance and total power radiated.	C-2

Course Contents:

Unit 1	**Vector Analysis and Co-ordinate Systems:** Introduction to Vector Analysis, Product of vectors, Cartesian, Cylindrical, Spherical Co-ordinate systems. Transformation of Vectors. Types of integral used in Electromagnetic theory. Gradient, Divergence, Curl, Divergence Theorem and Stokes Theorem	10 Hrs
Unit 2	**Electrostatics:** Coulombs Law, Electric field intensity, Types of charge distributions. Electric field intensity due to Line charge, Surface charge, Volume charge. Electric flux, Electric flux density, Gauss's law. Electrostatic potential, Relation between potential V and field intensity E'	7 Hrs
Unit 3	**Magnetostatics:** Magnetic field intensity, Magnetic flux density. Biot- Savarts law. Magnetic field intensity due to infinite, finite and circular current carrying conductor. Amperes-Circuital law.	7 Hrs
Unit 4	**Boundary Conditions and Maxwell's Equations:** Electric Boundary condition between conductor and dielectric, two perfect dielectrics. Magnetic boundary condition. Maxwell's equations for static & time varying field.	7 Hrs
Unit 5	**Electromagnetic Wave Propagation:** Electromagnetic wave equations for free space, lossy dielectric medium and perfect conductor. Attenuation constant, phase constant, propagation constant. Skin depth. Poynting theorem.	7 Hrs
Unit 6	**Radiation:** Scalar magnetic potential, vector magnetic potential, retarded vector magnetic potential. Power radiated and radiation resistance of current element, half wave dipole.	7 Hrs

Text Books:

1. W. H. Hyat, Engineering Electromagnetics, Tata McGraw Hill
2. E. C.Jorden and K. G. Balmain, Electromagnetic waves and Radiating Systems, Prentice Hall of India
3. M.N.O. Sadiku, Principles of Electromagnetics, Oxford University Press

Reference Books:

1. J. D. Kraus, Electromagnetics, McGraw Hill International Edition
2. S. Bhooshan, Fundamentals of Engineering Electromagnetics, Oxford University Press
3. T. V. S. Arun Murthy, Electromagnetic Fields (Theory & Problems), S. Chand

E Resources :

1. Swayam online course on 'Electromagnetic Fields in 3D'
2. E Book: P. Lorrain, D. R. Corson and F. Lorrain, 'Electromagnetic Fields and Waves' Link: https://hostnezt.com

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4ET212PC1.1	3	3	-	-	-	-	-	-	-	-	-	3	2	-
4ET212PC1.2	3	3	2	-	-	-	-	-	-	-	-	3	2	-
4ET212PC1.3	3	3	2	-	-	-	-	-	-	-	-	3	2	-
4ET212PC1.4	3	3	2	-	-	-	-	-	-	-	-	3	2	-
4ET212PC1.5	2	2	2	2	-	-	-	-	-	-	-	2	1	-
4ET212PC1.6	3	2	1	-	-	-	-	-	-	-	-	3	1	-
4ET212PC1CO	3	3	2	1	-	-	-	-	-	-	-	3	2	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	4ET213PC1	Course Category:	PCC
Course Name	**Analog & Digital Electronics**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4ET213PC1Analog & Digital Electronics is a compulsory Program Core Course for Second Year B. Tech. Electronics & Telecommunication Engineering.

Course Objectives:

The objective of this course is to introduce the fundamentals of analog and digital circuits and their applications with emphasis on integrated circuits to develop analytical and digital logic development capability.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcomes	Domain Level
4ET213PC1.1	Describe basics of operational amplifier IC 741 to demonstrate its performance parameters.	C-2
4ET213PC1.2	Demonstrate linear and non-linear application circuits of op-amp. to analyze their performance.	C-4
4ET213PC1.3	Illustrate operation of linear ICs of timer, voltage regulator and PLL to understand their applications.	C-2
4ET213PC1.4	Explain number system conversions and binary codes to demonstrate arithmetic operations using 1's and 2's complements.	C-2
4ET213PC1.5	Use logic gates to implement combinational logic circuits.	C-3
4ET213PC1.6	Demonstrate applications of flip flops to implement sequential logic circuits like registers and counters.	C-2

Course Contents:

Unit 1	**Introduction to Operational Amplifier:** Basics of differential amplifier, configurations, OP-amp block diagram, Op-amp IC 741, parameters, transfer characteristics.	5 Hrs
Unit 2	**Linear and non liner applications of op-amp:** Op-amp as Inverting, non-inverting amplifier, scaling/ summing amplifier, Integrator, differentiator, Comparator, Schmitt trigger, clipper.	5 Hrs

Unit 3	**Linear ICs:** IC 555, internal schematic, IC 555 applications- Astable, Monostable multivibrator. Voltage regulator IC 78XX, 79XX. PLL IC 565- Internal schematic, parameters.	5 Hrs
Unit 4	**Number Systems and Binary Codes:** Decimal, Binary, Octal, Hexadecimal number systems and their conversions. BCD, Octal, Hexadecimal, Excess-3, Grey Code. Arithmetic operations using 1's and 2's complement. Introduction to Logic gates and Boolean Algebra.	5 Hrs
Unit 5	**Combinational Logic Design:** Introduction to Karnaugh Map. Design of Multiplexer, De-multiplexer, Decoder, Encoder, Comparator, Code Converters. Combinational logic design using ROM.	5 Hrs
Unit 6	**Sequential Logic Design:** Introduction to Flip flops, Shift registers and their types. Design of Asynchronous and Synchronous counters. Ring counter, Johnson Counter.	5 Hrs

Text Books:

1. Ramakant Gayakwad, Op-Amps & Linear Integrated Circuits,Prentice-Hall India
2. D. Roy Choudhury & S. B. Jain, Linear Integrated Circuits, New Age International Publishers.
3. M. Morrios Mano, Digital Design, Prentice-Hall India
4. Anand Kumar, Switching Theory and Logic Design, Prentice-Hall India
5. R. P. Jain, Modern Digital Electronics, TMH

Reference Books:

1. K.R. Botkar, Integrated Circuits, Khanna Publications.
2. Adel S. Sedra & Kenneth Carless Smith, Microelectronic Circuits, Oxford University Press.
3. Samuel C. Lee, Digital Circuits and Logic Design, PHI
4. Charles H. Roth, Fundamentals of Logic Design, Jaico Publication
5. G. K. Kharate, Digital Electronics, Oxford University Press

E Resources :

1. Swayam online course: 'Integrated Circuits'. https://onlinecourses.nptel.ac.in/noc24_ee73/preview
2. E-book: James M. Fiore, Operational Amplifiers & Linear Integrated Circuits: Theory and Application / 3E' https://www2.mvcc.edu/users/faculty/jfiore/books/OperationalAmplifiersAndLinearICs_3E.pdf
3. Swayam online course: Digital Electronics
4. E Book: Digital Electronics Principals, Devices and Applications, A. K. Maini

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4ET213PC1.1	3	3	2	-	-	-	-	-	-	-	-	2	-	-
4ET213PC1.2	3	3	2	1	-	-	-	-	-	-	1	3	1	-
4ET213PC1.3	3	3	2	1	-	-	-	-	-	-	1	3	1	-
4ET213PC1.4	3	3	2	-	-	-	-	-	-	-	-	2	-	-
4ET213PC1.5	3	3	2	2	-	-	-	-	-	-	1	3	1	-
4ET213PC1.6	3	3	2	2	-	-	-	-	-	-	1	3	1	-
4ET213PC1CO	3	3	2	1	-	-	-	-	-	-	1	3	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4ET214PC1**	Course Category:	**PCC**
Course Name	**Network Analysis**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4ET214PC1 Network Analysis is a compulsory Program Core Course for Second Year B. Tech Electronics & Telecommunication Engineering.

Course Objectives:

The objective of the course is to introduce students to the foundational principles of electrical circuit analysis, including nodal and mesh techniques, and apply network theorems, evaluate network functions using pole-zero analysis, and model two-port networks for practical engineering applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ET214PC1.1	Apply elementary network theorems such as source transformation, node, and mesh analysis to solve electrical circuit problems.	C-3
4ET214PC1.2	Analyze DC networks using Superposition, Thevenin's, Norton's, and Maximum Power Transfer theorems to determine circuit parameters.	C-4
4ET214PC1.3	Apply network theorems to AC circuits including mesh and node analysis and superposition theorem for effective circuit analysis.	C-3
4ET214PC1.4	Apply initial and final value theorems to evaluate RL, RC, and RLC networks using Laplace transforms including with and without initial conditions.	C-3
4ET214PC1.5	Apply concept of network functions, poles and zeros to determine time-domain behavior of networks.	C-3
4ET214PC1.6	Apply concept of two-port networks to determine two-port network parameters and conditions for reciprocity and symmetry.	C-3

Course Contents:

Unit 1	**Elementary Network Theorems**: Sources of electrical energy: Dependent and independent sources, Source transformation, Node and mesh analysis.	5 Hrs
Unit 2	**Network Theorems (Dc Networks)**: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem.	5 Hrs
Unit 3	**Network Theorems (Ac Circuits)**: Mesh analysis, Node Analysis, Superposition Theorem.	5 Hrs
Unit 4	**Laplace Transform And Its Application**: Initial and Final value theorems. Evaluation of RL, RC and RLC networks using Laplace transform and inverse Laplace transform with and without initial conditions.	5 Hrs
Unit 5	**Network Functions**: Concept of complex frequency, Ports and terminal pairs, Network functions, poles and zeros, driving points and transfer functions of ladder network structures, Time domain behavior from pole-zero plot of immittance function (by partial method).	5 Hrs
Unit 6	**Two-Port Networks**: Open circuit impedance, short circuit admittance, ABCD and hybrid parameters of Two port networks. Conditions for reciprocity & symmetry of a two port networks.	5 Hrs

Text Books:

1. Ravish R. Singh, Network Analysis & Synthesis, Tata McGraw Hill Education (India) Private Limited.
2. D.Roy Choudhary, Networks and Systems, 2nd Edition, New Age International Publishers.

Reference Books:

1. Van Valkenburg , Network analysis, Prentice hall of India, 2000.
2. A William Hayt, Engineering Circuit Analysis, 8th Edition, McGraw-Hill Education.
3. Sudhakar, A., Shyammohan, S. P. Circuits and Network, Tata McGraw-Hill New Delhi, 1994.

E Resources:

1. https://onlinecourses.nptel.ac.in/noc21_ee14/

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4ET214PC1.1	3	3	-	-	-	-	-	-	-	-	-	2	2	-
4ET214PC1.2	3	3	2	-	-	-	-	-	-	-	-	2	3	-
4ET214PC1.3	3	3	-	-	-	-	-	-	-	-	-	2	3	-
4ET214PC1.4	3	3	-	2	-	-	-	-	-	-	-	3	2	-
4ET214PC1.5	3	3	-	2	2	-	-	-	-	-	-	3	3	-
4ET214PC1.6	3	3	2	2		-	-	-	-	-	-	2	3	1
4ET214PC1CO	3	3	1	1	1	-	-	-	-	-	-	2	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4ET215MD1**	Course Category:	**MDM**
Course Name	**Digital Electronics**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 4ET215MD1Digital Electronics is a Multi Disciplinary Minor Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to provide the basic knowledge of digital circuit and its design, enabling them to simplify logic expressions and design combinational logic circuits.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ET215MD1.1	Explain number system conversions and the rules of Boolean algebra to simplify logic expressions.	C-2
4ET215MD1.2	Describe the operation of logic gates and method of minimization technique to simply the hardware requirements of digital circuits.	C-2
4ET215MD1.3	Use logic gates and flip flops to implement combinational circuits and sequential circuits.	C-3

Course Contents:

Unit 1	**Number System and Boolean Algebra:** Decimal, Binary, Octal and Hexadecimal number systems and their conversions. BCD code, Grey Code, Excess 3 Code. Boolean Algebra, Boolean Laws, De-Morgan's Theorem, Simplifications of logic expressions using Boolean Algebra.	10 Hrs
Unit 2	**Logic Gates and Karnaugh Map:** Logic gates, Universal Gates, Realization of logic gate using Universal gates. SOP and POS form of logic expressions. Realization of logic expressions using gates. Simplification of logic expressions using Karnaugh Map upto 4 variables.	10 Hrs
Unit 3	**Combinational & Sequential Logic Circuits:** Combinational logic circuits such as Adder, Subtractor, Multiplexer, De-multiplexer. Flip Flops, Asynchronous counters, Introduction to registers.	10 Hrs

Text Books:

1. M. Morrios Mano, Digital Design, Prentice-Hall India
2. Anand Kumar, Switching Theory and Logic Design, Prentice-Hall India
3. R. P. Jain, Modern Digital Electronics, TMH

Reference Books:

1. Samuel C. Lee, Digital Circuits and Logic Design, PHI
2. Charles H. Roth, Fundamentals of Logic Design, Jaico Publication
3. G. K. Kharate, Digital Electronics, Oxford University Press

E-Resources:

1. Swayam online course: Digital Electronics
2. E Book: A. K. Maini, Digital Electronics Principals, Devices and Applications,

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4ET215MD1.1	2	2	1	-	-	-	-	-	-	-	-	3	2	-
4ET215MD1.2	3	3	2	-	1	-	-	-	-	-	-	2	2	-
4ET215MD1.3	3	3	3	2	2	-	-	-	-	-	2	3	3	-
4ET215MD1CO	3	3	2	1	1	-	-	-	-	-	1	3	3	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4SH216OE1**	Course Category:	**OE**
Course Name	**Quantitative and Logical Reasoning**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4SH216OE1Quantitative and Logical Reasoning is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the Course is to develop quantitative aptitude, logical reasoning, problem-solving efficiency, and decision-making skills for placements, competitive exams, and real-life applications

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE1.1	Apply arithmetic and numerical techniques to solve quantitative problems accurately.	C-3
4SH216OE1.2	Solve algebraic and equation-based problems using simplification and approximation methods to improve problem-solving efficiency.	C-3
4SH216OE1.3	Analyze logical reasoning problems using structured and critical thinking approaches to improve decision-making skills.	C-4
4SH216OE1.4	Interpret and analyze data using graphical and tabular methods for decision making for strategic planning.	C-4
4SH216OE1.5	Solve complex logical puzzles and advanced reasoning problems efficiently for competitive examination success.	C-3
4SH216OE1.6	Demonstrate effective aptitude test strategies integrating quantitative and logical reasoning skills for career advancement opportunities.	C-3

Course Contents:

Unit 1	**Number System & Arithmetic Foundations:** Number system fundamentals; LCM and HCF applications; divisibility rules; percentage calculations; ratio and proportion; averages; profit and loss; simple and compound interest; speed mathematics and shortcut techniques.	7 Hrs
Unit 2	**Algebra, Equations & Simplification Techniques:** Linear and quadratic equations; algebraic expressions; simplification and approximation; indices and surds; inequalities; time and work; pipes and cisterns; time, speed and distance; mixtures and alligation.	7 Hrs
Unit 3	**Logical Reasoning: Analytical & Critical Thinking:** Coding–decoding; blood relations; direction sense; series and pattern recognition; analogies; ranking and ordering; syllogisms; statement and assumption; statement and conclusion; cause–effect reasoning.	7 Hrs
Unit 4	**Data Interpretation & Analytical Aptitude:** Tables; pie charts; line graphs; bar graphs; caselets; data sufficiency; DI shortcut techniques; approximation in data interpretation; comparative and predictive data analysis.	8 Hrs
Unit 5	**Advanced Logical Reasoning & Puzzle Solving:**Seating arrangements (linear, circular, and complex); floor-based puzzles; scheduling puzzles; selection-based puzzles; Venn diagrams; logical grouping; critical reasoning frameworks	8 Hrs
Unit 6	**Placement Aptitude Mastery & Test Strategies:** Integrated quantitative and logical reasoning practice; decision-making and elimination strategies; speed improvement techniques; mock placement aptitude patterns (TCS, Infosys, Wipro, Accenture, Capgemini); common error analysis; test-taking strategies; aptitude and reasoning simulations.	8 Hrs

Text Books:

1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing
2. Arun Sharma, Logical Reasoning and Data Interpretation, McGraw Hill

Reference Books:

1. Arun Sharma, How to Prepare for Quantitative Aptitude, McGraw Hill Education.
2. R.S. Aggarwal, A Modern Approach to Logical Reasoning, S. Chand Publication
3. M.K. Pandey, Analytical Reasoning, published by BSC Publishing Co. Pvt. Ltd.
4. Rajesh Verma, Fast Track Objective Arithmetic, Arihant Publications

E Resources:

1. NPTEL – Quantitative Aptitude & Logical Reasoning Courses
2. IndiaBIX – Quantitative and Logical Reasoning Practice
3. CareerRide – Aptitude Preparation Modules
4. PrepInsta / HackerEarth – Placement Aptitude Practice Platforms

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH216OE1.1	3	3	2	–	–	–	–	–	–	–	–	3	2	1
4SH216OE1.2	3	3	2	–	–	–	–	–	–	–	–	1	3	1
4SH216OE1.3	–	3	3	–	–	–	–	–	–	–	–	3	-	1
4SH216OE1.4	–	3	2	–	–	–	–	–	–	–	–	1	2	1
4SH216OE1.5	–	3	3	–	–	–	–	–	–	–	–	3	3	1
4SH216OE1.6	–	3	2	–	–	–	–	–	–	2	3	3	2	1
4SH216OE1 CO	1	3	3	–	–	–	–	–	–	1	1	2	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4SH216OE2**	Course Category:	**OE**
Course Name	**Critical Thinking & Decision Making**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4SH216OE2 Critical Thinking & Decision Making is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The objective of this course is to develop critical thinking and decision-making competencies by strengthening analytical reasoning and structured problem-solving skills applicable to professional and real-world situations.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE2.1	Apply critical thinking frameworks to analyze problems systematically.	C-3
4SH216OE2.2	Evaluate information, assumptions, and arguments for logical consistency and validity.	C-5
4SH216OE2.3	Analyze complex situations and identify feasible alternatives for decision making.	C-4
4SH216OE2.4	Design rational and ethical decision-making strategies under uncertainty to ensure sustainable organizational outcomes.	C-6 A-3
4SH216OE2.5	Apply quantitative and qualitative tools to support decision-making processes.	C-3
4SH216OE2.6	Demonstrate effective decision making in simulated professional and team-based scenarios to resolve workplace challenges effectively	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundations of Critical Thinking:** Concept of critical thinking; elements of reasoning; logical vs illogical thinking; assumptions and inferences; inductive and deductive reasoning; common cognitive biases; barriers to critical thinking.	7 Hrs
Unit 2	**Analytical Reasoning & Problem Framing:** Problem identification and structuring; root cause analysis; issue trees; questioning techniques; systems thinking; analytical reasoning models.	7 Hrs
Unit 3	**Decision Making Models & Techniques:** Rational decision-making model; intuitive decision making; bounded rationality; decision trees; cost–benefit analysis; risk and uncertainty; heuristics.	7 Hrs
Unit 4	**Data-Driven & Ethical Decision Making:** Use of data in decision making; qualitative vs. quantitative data; basic decision matrices; ethical frameworks; professional ethics; social and environmental considerations in decisions.	8 Hrs
Unit 5	**Creativity, Innovation & Strategic Thinking:** Creative thinking techniques; lateral thinking; design thinking approach; scenario planning; strategic decision making; innovation in problem solving.	8 Hrs
Unit 6	**Applied Decision Making & Case Analysis:** Case studies from industry and management; individual and group decision simulations; conflict resolution through decision frameworks; decision-making under pressure; reflection and feedback	8 Hrs

Text Books:

1. Alec Fisher, Critical Thinking, published by Cambridge University Press.
2. John Adair, Decision Making and Problem Solving, Kogan Page.

Reference Books:

1. Daniel Kahneman, Thinking, Fast and Slow published by Farrar, Straus and Giroux.
2. Rolf Dobelli, The Art of Thinking Clearly, Sceptre.
3. John S. Hammond, Ralph L. Keeney, Howard Raiffa, Smart Choices, published by Harvard Business School Press.
4. Ken Watanabe, Problem Solving 101, Portfolio.

E Resources:

1. NPTEL – Critical Thinking & Decision Making Courses
2. Coursera – Critical Thinking and Decision-Making Modules
3. Harvard Business Review – Decision Making Articles
4. MIT Open Course Ware – Decision Analysis

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH216OE2.1	2	3	2	–	–	–	–	–	–	–	–	3	2	1
4SH216OE2.2	–	3	3	–	–	–	–	–	–	–	–	1	3	1
4SH216OE2.3	–	3	2	–	–	–	–	–	–	–	–	3	-	1
4SH216OE2.4	–	3	3	–	–	2	3	–	–	–	–	1	2	1
4SH216OE2.5	–	2	2	–	2	–	–	–	–	–	–	3	3	1
4SH216OE2.6	–	2	2	–	–	2	–	2	2	–	2	3	2	1
4SH216OE2 CO	1	3	3	-	1	1	1	1	1	-	1	2	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4ET217PC1**	Course Category:	**PCC**
Course Name	**Analog & Digital Electronics Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	-- --
Total Credit Hours	**30 Hrs**				
SEE Marks	**25**	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 4ET217PC1Analog & Digital Electronics Lab is a compulsory Program Core Course Lab for Second Year B. Tech. Electronics & Telecommunication Engineering.

Course Objectives:

The objective of this course is to perform practicals on Linear Integrated Circuits and Digital ICs to demonstrate their practical applications in domain of analog and digital electronics.

Course Outcomes:

After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
4ET217PC1.1	Demonstrate ability to perform experiments based on op-amp and linear ICs to understand their linear and nonlinear applications.	C-3, P-5
4ET217PC1.2	Demonstrate timerIC 555, Voltage regulator IC and PLL ICto analyze their performance in applications and illustrate combinational logic circuits using digital ICs.	C-3
4ET217PC1.3	Use digital ICs to construct sequential logic circuits.	C-6, P-7

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Demonstrate op-amp as inverting amplifier.
2. Demonstrate op-amp as non- inverting amplifier and voltage follower.
3. Verify op-amp as practical integrator..
4. Verify op-amp as practical differentiator.
5. Verify op-amp as Schmitt trigger.
6. Demonstrate IC 555 as Astable multivibrator.
7. Demonstrate IC 555 as Monostable multivibrator.
8. Verify the operation of 8:1 Multiplexer IC 74151.
9. Verify the operation of 1:8 De-multiplexer IC 74138.
10. Verify the operation of 4 bit Comparator IC 7485.
11. Design and implementation of 4 bit Binary to Grey code converter using

logic gates.

12. Verify the operation of 4 bit asynchronous counter.
13. Verify the operation of Universal shift register.

E Resources:

1. Virtual Lab: Digital Electronics:https://de-iitr.vlabs.ac.in

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4ET217PC1.1	3	1	-	2	-	-	-	3	2	-	-	3	1	-
4ET217PC1.2	3	1	1	-	-	-	-	-	-	-	-	2	1	-
4ET217PC1.3	3	1	-	1	-	-	-	3	3	-	-	3	1	-
4ET217PC1CO	3	1	-	1	-	-	-	2	2	-	-	3	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	4ET218PC1	Course Category:	PCC
Course Name	Network Analysis Lab				
Credits	01	Total L:T:P Hours	0:0:2	Total SL Hours	--
Total Credit Hours	30 Hrs		30 Hrs		
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	25	PA Marks	25	Total Marks	50

Course Description:

Subject Code 4ET218PC1 Network Analysis Lab is a compulsory Program Core Course for Second Year B. Tech Electronics & Telecommunication Engineering.

Course Objectives:

The objective of this course is to perform practicals on the concepts of circuit analysis techniques, input–output characteristics of electrical Two-Port networks and frequency response and dynamic behavior of RLC circuits using simulation tools.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ET218PC1.1	Apply fundamental circuit analysis techniques (Node, Mesh, Superposition, Thevenin, Norton, Maximum Power Transfer) to DC and AC electrical networks to verify results experimentally.	C-3, P-4 A-2
4ET218PC1.2	Experimentally determine Two-Port Network parameters (Z, Y, h, ABCD) to validate input–output characteristics of electrical networks.	C-4 P-4 A-3
4ET218PC1.3	Interpret frequency response and dynamic behavior of RLC circuits using simulation tools, to extract network parameters like impedance and voltage transfer ratio.	C-4, P-4, A-3

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Verification of Node & Mesh Analysis for electric circuit (DC).
2. Verification of Node & Mesh Analysis for electric circuit (AC).
3. Verification of Superposition theorem for a given network.
4. Verification of Thevenin's & Norton's theorem for a given network.
5. Verification of Maximum Power Transfer theorem for a given network.
6. Verification and Calculation of and verify open circuit (Z) Impedance& Short circuit (Y) Admittance parameters of a given Two Port network.

7. Verification and Calculation of Transmission (ABCD) & Hybrid (h) parameters of a given Two Port network.
8. Calculation of driving point Impedance & Voltage Transfer Ratio for a given network.
9. Frequency response of R-L-C series Circuit using simulation Tool.
10. Study of series R-L-C circuit behaviour using simulation Tool.

E Resources:

1. http://vlabs.iitkgp.ac.in/asnam/#, Analog Signals, Network and Measurement Laboratory

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4ET218PC1.1	3	3	-	-	3	-	-	-	2	-	2	3	3	-
4ET218PC1.2	3	3	-	-	3	-	-	-	2	-	2	3	3	-
4ET218PC1.3	3	3		3	3	-	-	-	2	-	2	3	3	3
4ET218PC1.CO	3	3	-	1	3	-	-	-	2	-	2	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	4ET219VS1		Course Category:	SEC
Course Name		Python Programming Lab				
Credits		02	Total L:T:P Hours	0:0:4 60 Hrs	Total SL Hours	--
Total Credit Hours		60 Hrs				
SEE Marks		--	SEE Time	--	CIA Marks	--
EE Marks		--	PA Marks	50	Total Marks	50

Course Description:

Subject Code 4ET219VS1 Python Programming Lab is a compulsory Engineering Course for Second Year B. Tech in Electronics & Telecommunication Engineering.

Course Objectives:

The objective of the course is to develop basic and practical programming skills using Python by applying fundamental constructs, data structures, and object-oriented concepts. It also enables students to work with computer vision libraries like OpenCV and perform database operations using MongoDB for real-time applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ET219VS1.1	To install and configure Python, OpenCV, and MongoDB software on Windows/Ubuntu systems which will enable them to develop basic applications integrating image processing with database operations.	C-3, P-4
4ET219VS1.2	To apply basic Python programming constructs, this will allow them to develop efficient and modular software applications.	C-3, P-5
4ET219VS1.3	To design and develop integrated applications using Python libraries such as OpenCV and MongoDB, which will help students to create image processing solutions with database management.	C-6, P-6

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. To study and install Python software on Windows/Ubuntu Operating System.
2. To study Python software command and Write a Python program:
    a. To display “Hello JDIET_ABR!!!”

b. To perform Arithmetic operation such as: Addition, Subtraction, Division
c. and Multiplication.

3. Write a program to implement conditional Statements in Python programming.
4. Write a program to implement Looping Statements in Python programming.
5. Write a Python program to demonstrate Dictionary, List and Tuple comprehension.
6. Write a Python program to demonstrate the use of function.
7. Write a Python program to demonstrate the use of class.
8. To study OpenCV for computer vision and install OpenCV python, NumPy, SciPy and Matplotlib libraries on Windows/Ubuntu Operating System.
9. Write an OpenCV Python program of loading and displaying a 'JDIET'
   a. college image on screen.
10. Write an OpenCV Python program to capture videos through webcam and
    a. perform desired operations on that video
11. To study MongoDB database and installation of MongoDB for Python on
    a. Window Operating System.
12. Write a Python program to insert and update data in MongoDB database.

Text Books:

1. Mr. Rupesh Nasre, Python Programming, All India Council for Technical Education (AICTE) October, 2022.

Reference Books:

1. Dr. Adrian Rosebrock, Practical Python and OpenCV: An Introductory, Example Driven Guide to Image Processing and Computer Vision, Publishing Ltd, 3rd Edition, 2016.
2. Joseph Howse, Prateek Joshi & Michael Beyeler, OpenCV: Computer Vision Projects with Python, Packet Publishing Ltd, 3rd Edition, 2016.

E Resources:

1. https://www.w3schools.com/python/python_mongodb_getstarted.asp
2. https://www.mongodb.com/resources/languages/pymongo-tutorial
3. https://nptel.ac.in/courses/106106182

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4ET219VS1.1	3	2	2	1	3	1	1	1	1	3	2	2	2	1
4ET219VS1.2	3	1	2	1	3	1	1	2	2	2	1	2	3	1
4ET219VS1.3	3	3	3	2	3	1	1	2	2	2	3	1	3	2
4ET219VS1CO	3	2	3	2	3	1	1	2	2	3	2	2	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**4SH220AE1**	Course Category:	**AEC**
Course Name	**Technical Writing**			
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours	**15 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 4SH220AE1 Technical Writing is common Ability Enhancement Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to enhance students' ability to write effective technical documents, professional correspondence, and research-oriented content with clarity, accuracy, and ethical standards.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH220AE1.1	Apply principles of technical writing in engineering documents.	C-3 P-2 A-2
4SH220AE1.2	Apply technical writing skills to prepare professional documents.	C-4 P-2 A-2
4SH220AE1.3	Create ethical, well-structured technical and research documents using IEEE referencing for professional and academic communication.	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Technical Writing:** Nature and importance of technical communication, characteristics of technical writing, audience analysis, technical vocabulary, grammar and style, clarity and conciseness, paragraph structure, coherence, technical descriptions, instructions and manuals.	7 Hrs
Unit 2	**Professional and Research Writing:** Technical reports and documentation, structure of reports, abstracts and summaries, research papers, project proposals, resumes and cover letters, business emails, documentation ethics, plagiarism, referencing styles (IEEE), editing and proofreading.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Analysis of Technical Communication to Identify the nature, purpose of given technical documents and evaluate their effectiveness.
2. Editing technical text for clarity and brevity
3. Technical description of an engineering device/system
4. Writing step-by-step technical instructions
5. Preparation of structured technical reports
6. Resume and cover letter drafting
7. Technical report writing based on laboratory work, case study, or project work
8. Abstract and executive summary writing for technical documents
9. Referencing and citation using IEEE format
10. Editing, proofreading, and plagiarism check of technical documents

Text Books:

1. Rizvi A. M. & Patnaik P., Effective Technical Communication, McGraw Hill Education (India), New Delhi (Second Edition).
2. Verma S., Technical Communication for Engineers, Vikas Publishing House Pvt. Ltd., New Delhi (First Edition).
3. Misra P. & Tyagi K., Advanced Technical Communication, PHI Learning Pvt. Ltd., New Delhi (Second Edition).

Reference Books:

1. Chauhan G. S., Kashiramka S. & Thimmesha L., Technical Communication, Cengage Learning India Pvt. Ltd., New Delhi (First Edition).
2. Alred G. J., Brusaw C. T. & Oliu B., Handbook of Technical Communication, Oxford University Press, New Delhi (Second Edition).
3. IEEE Editorial Style Manual, IEEE Standards Association, IEEE, USA (Latest Edition).
4. Joseph G. & Joseph B., Grammar and Usage for Technical Communication, Cambridge University Press India, Delhi (First Edition).

E Resources :

1. NPTEL–SWAYAM, IIT Roorkee,Technical Communication for Engineers.
2. https://owl.purdue.edu
3. https://ieeeauthorcenter.ieee.org

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH220AE1.1	-	-	-	-	-	-	-	-		3	-	3	3	2
4SH220AE1.2	-	-	-	-	-	-	-	-	3	3	-	2	1	2
4SH220AE1.3	-	-	-	-	-	-	-	3		3	3	2	2	2
4SH220AE1 CO	-	-	-	-	-	-	-	1	1	3	1	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	4SH221EM1	Course Category:	EEM
Course Name	**Fundamentals of Book Keeping and Accounting**				
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours	**15 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 4SH221EM1 Fundamentals of Book Keeping and Accounting is an Ability Enhancement Course for Second Year B.Tech students that introduce basic accounting principles, bookkeeping processes, and financial statements for business applications.

Course Objectives:

The objective of the course is to develop students' skills in recording and analyzing financial transactions and to enable effective use of accounting information for decision-making.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH221EM1.1	Apply basic principles of bookkeeping and accounting for recording and maintaining financial transactions accurately.	C-3 P-2 A-2
4SH221EM1.2	Analyze financial statements such as income statement, balance sheet, and cash flow statement for supporting financial understanding and business decision-making.	C-4 P-2 A-2
4SH221EM1.3	Apply accounting tools and techniques for evaluating financial performance and improving business efficiency.	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundation of Bookkeeping and Accounting** Definition, objectives, and importance of accounting, Difference between accounting and bookkeeping, accounting equation, double entry system, Debit vs credit, accrual vs cash accounting, Terminology- depreciation, armotisation, CapEx vs OpEx, Source of Document (invoice, receipt, Purchase Order), Work Flow (Journal, posting to the ledger), Preparing trial balance, Software Integration- A brief overview of ERP (SAP/ oracle and tools like a tally/ quick book).	8 Hrs

Unit 2	**Financial Statements & Decision Making** Income Statement, Balance Sheet, Cash flow Statement. Ratio Analysis (Current Ratio, Debt to equity, ROI), Cost Accounting (Fixed vs Variable, Break-even), Taxation Basics (Corporate IT)	7 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Categories a list of items (Laptop, Office Rent Deposit, Cash, Bank Loan, Software Licenses) into Assets, Liabilities, or Equity.
2. Use the Double-Entry System to record buying raw materials, paying technician wages, and receiving a client advance.
3. Identify discrepancies like uncashed cheques, bank charges, or direct deposits from clients.
4. Compare the Straight-Line Method vs. the Written Down Value (WDV) method (as per Indian Income Tax rules).
5. Distinguish between Direct Costs (raw materials, factory power) and Indirect Costs (office salary, marketing).
6. Analyze the Annual Report of an Indian tech giant (e.g., L&T or Tata Motors).
7. Calculate the Current Ratio (liquidity), Debt-to-Equity (solvency), and Return on Investment (ROI).
8. Input Fixed Costs (Rent, Machinery) and Variable Costs (Material per unit) into a spreadsheet to find the Break-Even Point.
9. Value the remaining stock after several purchases and sales using the First-In, First-Out (FIFO) method.
10. Enter 5 basic transactions into a trial version of Tally Prime or a cloud-based tool like Zoho Books.

Text Books:

1. S.N. Maheshwari S.K. Maheshwari& S.K. Maheshwari., Financial Accounting, Vikas Publishing House (Eleventh Edition)
2. N. Ramachandran, Ramkumar Kakani., Financial Accounting for Management, McGraw Hill Education (Sixth Edition)

Reference Books:

1. R. L. Gupta & U. K. Gupta., Financial Accounting, Sultan Chand & Sons, (Ninth revised Edition)
2. Dr. Santanu Chakrabarty & Dr. Nilanjan Singha Roy., Accounting & Finance for engineering, Lawpoint Publications (Second Edition)
3. Bhushan Kumar Goyal., Accounting for Everyone, Taxmann Publications Pvt. Ltd (First Edition)

E-Resources:

1. SWAYAM, Financial Accounting / Business Accounting
2. National Digital Library of India, https://ndl.iitkgp.ac.in
3. Tally Education, https://tallyeducation.com

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH221EM1.1	2	2	-	-	-	-	-	-	-	-	-			
4SH221EM1.2	3	3	-	-	-	-	-	-	-	3	-			
4SH221EM1.3	2	3	-	-	3	-	-	-	-	3	-			

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CE222VE1**		Course Category: **VEC**		
Course Name	**Environmental Science**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 4CE222VE1 Environmental Science is a common Value Education course for Second Year B. Tech Electronics & Telecommunication Engineering.

Course Objectives:

The objective of this course is to develop understanding of environmental systems, natural resource management, ecological balance, and sustainable development practices to promote awareness and responsibility toward environmental protection and societal well-being.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE222VE1.1	Analyze renewable and non-renewable natural resources and associated problems to promote sustainable utilization for future generations.	C-4
4CE222VE1.2	Analyze food chains, webs, and ecological pyramids to evaluate ecological interactions and succession processes.	C-4
4CE222VE1.3	Examine shift from unsustainable to sustainable development to promote responsible resource planning for society.	C-3

Course Contents:

Unit 1	Renewable and non-renewable resources Environmental Science, Definition, scope and importance, Need for public awareness, Renewable and non-renewable resources, Natural resources and associated problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life styles.	10 hrs

Unit 2	**Ecosystem:** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem.	10 hrs
Unit 3	**Social Issues & Environment:** From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions, Environment Protection Act. Air (Prevention and Control of Pollution) Act., Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, public awareness.	10 hrs

Text Books:

1. Suresh K. Dhameja, Environmental Studies, Katson Books
2. Benny Joseph, Environmental Studies, McGraw Hill Education

Reference Books:

1. Gilbert M. Masters & Wendell Ela, Introduction to Environmental Engineering and Science, Pearson Education
2. William Cunningham & Mary Cunningham, Environmental Science, McGraw Hill

E Recourses:

1. https://www.vlab.co.in/broad-area-civil-engineering

Mapping of COs with Pos& PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE222VE1.1	3	2	-	-	-	2	2	-	-	-	-	-	-	-
4CE222VE1.2	3	2	-	-	-	3	2	-	-	-	-	-	1	-
4CE222VE1.3	3	2	-	-	-	3	3	-	-	-	-	-	1	-
4CE222VE1.CO	3	2	-	-	-	3	3	-	-	-	-	-	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4ET223DH1**	Course Category:	**DH**
Course Name	**Introduction to Machine Learning**				
Credits	**04**	Total L:T:P Hours	4:0:0 **60 Hrs**	Total SL Hours	**60 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 4ET223DH1 Introduction to Machine Learning is a Double Minor/Honours Course offered by the Department of Electronics & Telecommunication Engineering for Second Year B.Tech. students of all disciplines.

Course Objectives:
The objective of this course is to provide students with the fundamentals of Machine Learning, basic learning algorithms, data handling techniques and engineering applications without requiring advanced mathematics or programming.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ET223DH1.1	Explain the concepts and importance of Machine Learning.	C-2
4ET223DH1.2	Classify different Machine Learning techniques.	C-2
4ET223DH1.3	Apply basic Machine Learning methods for simple problems.	C-3
4ET223DH1.4	Explain commonly used Machine Learning algorithms.	C-2
4ET223DH1.5	Identify Machine Learning applications in engineering.	C-3
4ET223DH1.6	Discuss ethical issues and future trends in Machine Learning.	C-2

Course Contents:

Unit 1	**Introduction to Machine Learning:** Introduction to Machine Learning , AI vs ML, Need of Machine Learning, Applications, Data and Features ML Process.	10
Unit 2	**Types of Machine Learning:** Supervised Learning, Unsupervised Learning, Reinforcement Learning, Training and Testing Data, Model Evaluation Concepts	10
Unit 3	**sic Machine Learning Algorithms:** assification, Regression, Clustering, Decision Tree, K-Means Clustering, Simple Examples	10
Unit 4	**Machine Learning in Engineering:** ML in Agriculture, ML in Healthcare, ML in Electronics, ML in Communication Systems, ML in Smart Cities, Industrial	10

	Applications	
Unit 5	**Machine Learning Tools:** Introduction to Python, Google Colab, Scikit-Learn (Overview), TensorFlow (Overview), Data Visualization, Simple Demonstrations	10
Unit 6	**Future Trends:** Deep Learning, Neural Networks (Introduction), Generative AI, AI Chatbots, Ethics, Privacy, Career Opportunities	10

Text Books:

1. R. Rajesh, Machine Learning, McGraw Hill Education India.
2. S. Sridhar & M. Vijayalakshmi, Machine Learning, Oxford University Press.
3. E. Balagurusamy, Artificial Intelligence, McGraw Hill Education.

References:

1. N. P. Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press India.
2. Aurélien Géron, Hands-On Machine Learning, O'Reilly.
3. Tom M. Mitchell, Machine Learning, McGraw Hill.

E Resources :

1. NPTEL – Machine Learning
2. SWAYAM – Machine Learning
3. Google Colab Tutorials
4. Kaggle Learn

Mapping of COs with POs and PSOs

COs	POs											PSOs		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4ET223DH1.1	3	2	-	-	2	-	-	-	2	-	2	3	2	-
4ET223DH1.2	3	3	2	2	2	-	-	-	2	-	2	3	2	2
4ET223DH1.3	3	3	3	2	3	-	-	-	2	-	3	3	3	2
4ET223DH1.4	3	2	2	2	2	-	-	-	2	-	2	3	2	2
4ET223DH1.5	3	3	3	2	3	1	-	-	3	-	3	3	3	2
4ET223DH1.6	2	2	-	2	2	2	2	2	3	2	3	3	2	2
4ET223DH1CO	3	3	2	2	2	1	1	1	2	1	3	3	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**4ET223DH2**	Course Category:	**DH**
Course Name	**VLSI Design Fundamentals**			
Credits	**03**	Total L:T:P Hours	4:0:0 **60 Hrs**	Total SL Hours **60 Hrs**
Total Credit Hours	**120 Hrs**			
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks **40**
EE Marks	**--**	PA Marks	**--**	Total Marks **100**

Course Description:

Subject Code 4ET223DH2 VLSI Design is a Double Minor/ Honours Course offered by the department of Electronics & Telecommunication Engineering for Second Year B. Tech., of all discipline.

Course Objectives:

The objective of the course is to build foundational knowledge of VLSI and semiconductor processes, and to apply these concepts in integrated circuit and VLSI design.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ET223DH2.1	Explain MOS structures, MOS capacitors, and MOSFET threshold concepts to understand operation of MOSFETs.	C-2
4ET223DH2.2	Explain MOSFET I–V characteristics, small-signal models, and short-channel effects to analyse the MOSFET behaviour.	C-2
4ET223DH2.3	Design and evaluate CMOS inverters and logic circuits to determine the performance metrics.	C-3
4ET223DH2.4	Understand basic IC fabrication steps (oxidation, lithography, doping, metallization) to demonstrate process flow.	C-2
4ET223DH2.5	Apply λ-based rules and standard cell methodologies to develop CMOS layouts.	C-3
4ET223DH2.6	Evaluate MOS transistor delay models and sources of power dissipation to apply optimization techniques for efficient VLSI design	C-3

Course Contents:

Unit 1	**MOS Capacitor & MOSFET Fundamentals:** MOS structure; MOS capacitor operation (accumulation/depletion/inversion); C–V characteristics; surface potential; threshold voltage; body effect; short-channel effects (DIBL, mobility degradation); intro to FinFET and GAAFET.	10 Hrs
Unit 2	**MOSFET Modeling & Characteristics:** Linear & saturation I–V models; channel length modulation; MOSFET capacitances; mobility reduction; subthreshold behavior; small-signal model; mismatch and variability.	8 Hrs
Unit 3	**CMOS Inverter & Logic Design:** CMOS inverter structure; VTC; noise margins; delay parameters; power dissipation; CMOS NAND/NOR; transmission gates; sequential circuits (latch, FF); PVT variation impacts.	10 Hrs
Unit 4	**VLSI Fabrication Technology:** CMOS fabrication; well engineering; LOCOS & STI; oxidation (Deal–Grove); lithography (DUV/EUV); RIE; ion implantation; metallization; BEOL; CMP; reliability (NBTI, HCI, TDDB, EM)	10 Hrs
Unit 5	**Layout & Design Rules:** Stick diagrams; Euler path; λ-based design rules; inverter layout; NAND/NOR layout; parasitic extraction; standard cell design; memory cell layout; DRC/LVS introduction.	10 Hrs
Unit 6	**Delay, Power & Timing Optimization:** RC delay model; Elmore delay; interconnect delay; logical effort; path effort calculations; buffer sizing; low-power techniques (clock gating, power gating); multi-Vth; IR drop; clock tree basics	12 Hrs

Text Books:

1. Neil H.E. Weste, David Harris, CMOS VLSI Design: A Circuits and Systems Perspective (4th Edition), Pearson Education
2. Ben G. Streetman, Sanjay Kumar Banerjee , Solid State Electronic Devices (7th Edition), PHI Learning
3. R.K. Verma, Ashish Chaudhury, Solid State Electronics Ram Prasad Publications
4. K. Lal Kishore, V.S.V. Prabhakar, VLSI DesignI.K.International Publishing House.

Reference Books:

1. Simon M. Sze, VLSI Technology McGraw Hill Education India
2. Morris Mano, Digital Logic and Computer Design Pearson Education

E Resources :

1. NPTEL Online Courses, Digital VLSI Design video lectures
2. VLSI Resources Portal Tutorials on fabrication, MOSFETs, CMOS circuits, vlsiresources.com
3. Cadence & Synopsys Online Training Resources

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4ET223DH2.1	3	2	–	2	2	–	–	–	–	–	2	3	2	–
4ET223DH2.2	3	3	2	2	3	–	–	–	–	–	3	3	3	1
4ET223DH2.3	3	3	3	3	3	1	–	–	–	–	3	3	3	2
4ET223DH2.4	3	2	2	2	2	2	2	–	–	2	3	3	2	3
4ET223DH2.5	3	3	3	2	3	1	1	–	–	2	3	3	3	2
4ET223DH2.6	3	3	3	3	3	1	2	–	–	3	3	3	3	3
4ET223DH2.CO	3	3	2	3	3	1	1	-	-	1	3	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**5ET224EC1**	Course Category:	**EC**
Course Name	**Microprocessors/Microcontrollers based Product Design**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:

Subject Code 5ET224EC1 Microprocessors/Microcontrollers based Product Design is an Exit Course-1 (L5) for award of UG Certificate in Electronics & Telecommunication Engineering.

Course Objectives:

The objective of the course is to builds foundational skills in 8086 microprocessor and STM32 microcontrollers and develops Embedded C competency for interfacing sensors and peripherals, enabling students to design basic embedded electronic products.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5ET224EC1.1	Understand the 8086 microprocessor architecture and its addressing modes, instruction set, and assembler directives which make them able to write modular assembly language programs.	C2
5ET224EC1.2	Understand the architecture, features, and memory organization of STM32 ARM Cortex microcontrollers, which helps them to develop embedded applications through GPIO interfacing and peripheral programming in Embedded C	C2, P7
5ET224EC1.3	Interface and program various peripherals such as displays, motors, relays, ADCs, and DACs using STM32 microcontroller to develop basic embedded product prototypes.	P7

Course Contents:

Unit 1	**Introduction to Microprocessor:** Introduction to 8086–Microprocessor architecture, Addressing modes, Instruction set and assembler directives, Assembly language programming, Modular Programming, Linking and Relocation, Stacks, Procedures, Macros, Interrupts and interrupt service routines, Byte and String Manipulation.	10 Hrs

Unit 2	**Introduction to STM32 Microcontrollers & Programming in Embedded C:** Differences between Microprocessors and Microcontrollers. Introduction and features of STM32 ARM cortex family. STM32 Architecture and GPIO Registers, Memory organization/map. Setting up the Tool Chain for programming Development board of STM32, IO Interfacing and GPIO Programming.	10 Hrs
Unit 3	**Interfacing and Programming using Embedded C with STM32 Microcontrollers:** LED, Seven Segment Display, LCD display, Keyboard, Stepper Motor, DC motor, Relays, ADC & DAC.	10 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. To study DEBUG command and install Emulator for 8086 Microprocessor.
2. To write an assembly program to display the string 'JDIET, YTL' on screen.
3. To write an assembly program to scan and display the characters 'ABR_75'.
4. To study and set up the Tool Chain for programming and development board of STM32.
5. To implement embedded C program to toggle led.
6. UART Serial Communication: Send and Receive data with STM32 UART.
7. To implement embedded C program to display alphanumerical characters on seven segment display.
8. To interface a relay with a STM32 to control high-voltage appliances.
9. To implement embedded C program to display 'Hello ABR' on LCD display.
10. To demonstrate interfacing of STM32 with 4x4 matrix keypad and LCD".
11. To interface a stepper motor with STM32 and verify its operation using different excitation sequences (full-step and half-step).
12. Implement embedded C program with STM32 that make use of the real-time clock (RTC).

Text Books:

1. A.K. Ray and K.M. Bhurchandi, Advanced Microprocessors and Peripherals, TMH, 3rd Edition, 2012.
2. Muhammad Ali Mazidi, Shujen Chen and Eshragh Ghaemi, STM32 Arm Programming for Embedded Systems Using C Language with STM32 Nucleo, Microdigitaled, 2018.
3. Majid Pakdel, Advanced Programming with STM32 Microcontrollers, Elektor Verlag, 2020.
4. Ariel Lutenberg, Pablo Gomez and Eric Pernia, A Beginner's Guide to Designing Embedded System Applications on Arm Cortex-M Microcontrollers, Arm Education Media, UK, Copyright © 2022 Arm Limited.

Reference Books:

1. Douglas V Hall, Microprocessors and Interfacing, Programming and Hardware, Tata McGraw-Hill, 2012.
2. Warren Gay, Beginning STM32: Developing with Free RTOS, Libopencm3 and GCC, 2020.
3. Barry B. Brey, The Intel Microprocessor: Architecture, Programming and Interfacing, 6e, Pearson Education, PHI, 2003.
4. Carmine Noviello, Mastering STM32, Lean Publishing, 2018.

E Resources :

1. https://www.st.com/content/st_com/en/support/learning/stm32-education.html

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
5ET224EC1.1	3	1	1	1	2	1	1	1	3	1	2	3	2	1
5ET224EC1.2	3	1	2	1	3	1	1	2	2	2	3	1	2	1
5ET224EC1.3	2	1	1	2	3	2	1	1	3	2	2	2	1	2
5ET224EC1CO	3	1	2	2	3	2	1	2	3	2	3	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**5ET225EC1**	Course Category:	**EC**
Course Name	**Signal Processing with MATLAB**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:

Subject Code 5ET225EC1 Signal Processing with MATLAB is an Exit course (L-5) for award of UG Certificate in Electronics & Telecommunication Engineering.

Course Objectives:

The objective of the course is to provide fundamental knowledge of discrete-time signal processing and MATLAB-based analysis. It focuses on designing FIR/IIR filters, performing multi-rate DSP operations, and applying DSP concepts to real-world systems.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5ET225EC1.1	To analyze and perform operations on discrete-time signals, including convolution, correlation, and transformations, using MATLAB, which will enable them to interpret signal behaviour and processing results.	C-4, P-3, A-2
5ET225EC1.2	To design, realize, and evaluate FIR and IIR digital filters using appropriate structures and MATLAB tools, which will help them to assess filter performance.	C-5, P-4, A-3
5ET225EC1.3	To apply concepts of multi-rate DSP, sampling rate conversion, and DSP processor architecture to practical signal processing applications such as speech, RADAR, and SONAR, which will allow them to implement and analyze real-world signal processing systems.	C-3, P-3, A-2

Course Contents:

Unit 1	**Introduction to Discrete Time Signals[DTS]:** Discrete Time Signal, Signals δ(n) and u(n) its representations (Graphical, Functional, Tabular and Sequence), Basic Signal Operations, Sampling of Signal, Linear Convolution and	10 Hrs

	Circular Convolution, Auto and Cross Correlation.	
Unit 2	**Finite (FIR) and Infinite Impulse Response (IIR) filters:** Difference between FIR and IIR system, Realization of basic structure of FIR system:Direct form and Cascade, Realization of basic structure IIR system: Direct form-I, Direct Form-II, Cascade & Parallel.	10 Hrs
Unit 3	**Multirate Digital Signal Processing:** Sampling, Sampling rate conversion, multi-rate filter bank. Overview and application of DSP processor TMS320C54XX.Applications of DSP (Only Block Diagram): Speech Signal.	10 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. To study MATLAB commands.
2. Write a MATLAB program to generate standard discrete time signals and plot them.
3. Write a MATLAB program to implement shifting of discrete time signal.
4. Write a MATLAB program to implement folding of discrete time signal.
5. Write a MATLAB program to evaluate the linear convolution between two sequences.
6. Write a MATLAB program to perform auto correlation and cross correlation of the given discrete time sequence.
7. Write a MATLAB program to find N-point DFT using a Fast Fourier transform (FFT) algorithm.
8. Write a MATLAB program to evaluate the impulse response of the system.
9. Write a MATLAB program to verify the Decimation & Interpolation of given sequence.
10. Write a MATLAB program to implement Sampling Rate Conversion.
11. Using MATLAB determine the partial fraction expansion & Pole Zero plot of following transfer function.
12. Design of FIR filters of Low pass and high pass filter using MATLAB commands.

Text Books:

1. Nagoorkani, Digital Signal Processing, Tata McGraw Hill Education, Second Edition 2017.
2. S. Salivahanan and A. Vallavaraj, Digital Signal Processing, Tata McGraw-Hill Education,2001.

Reference Books:

1. Oppenheim & Schafer, Discrete time Processing , PHI.
2. Proakis & Manolakis D.G., Digital Signal Processing, PHI.
3. Mitra S. K., Digital Signal Processing, TMH.
4. Roman Kuc, Digital Signal Processing, MGH.

5. Ifeacher E.C., Jervis B.W., Digital Signal Processing, Addison Wesley.
6. P. P. Vaidyanathan, DSP and Multi-rate Systems, PHI.

E Resources :

1. https://www.mathworks.com/learn/training/signal-processing-with-matlab.html
2. https://www.udemy.com/course/digital-signal-processing-with-matlab-applications/

Mapping of COs with POs

CO	PO											PSO		
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5ET225EC1CO	3	2	3	3	3	2	1	2	2	2	2	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

ANNEXURE –I

Syllabus of III and IV Semester Courses for Four-Year Multidisciplinary Undergraduate B.Tech. Degree Programme in Mechanical Engineering

(In view of NEP-2020)

For students admitted in academic session 2025-26 and onwards



03/09/2026

SHRI JAWAHARLAL DARDA EDUCATION SOCIETY'S
JAWAHARLAL DARDA
INSTITUTE OF ENGINEERING AND TECHNOLOGY, YAVATMAL
AN AUTONOMOUS INSTITUTE
Affiliated to Sant Gadge Baba Amravati University, Approved by AICTE, New Delhi and DTE Maharashtra
93VP+PWF: P6, MIDC Area, Lohara, Yavatmal - 445 001, Maharashtra (www.jdiet.ac.in)

1.Vision

The Mechanical Engineering Department aims to be recognized center for exceptional education and research leading to competent engineers to furnish the ever-changing industrial demands and societal needs.

2. Mission

1. Educate, Prepare and mentor the students to build their abilities and enhance their professional skill to make them competitive.
2. Provide adequate recourses and facilities conducive to quality learning
   environment.
3. Develop alliances with industry as well as government establishments to prepare students for careers and inculcate the attitude of entrepreneurship.
4. Perform mechanical engineering-based research and other scholarly activities.

3. Programme Education Objectives

PEO 1: To provide a solid foundation and core competency in manufacturing, thermal fluids and design of mechanical systems and practice lifelong learning to strengthen their knowledge and skills.
PEO 2: To develop analytical and reasoning abilities, creativity, effective communication and team work skills amongst the students.
PEO 3: To imbibe high ethical and professional standards within the students so that they render valuable services to their peers, employers and society as a whole.

4. SDG of United Nation

1. **No Poverty** – End poverty in all its forms everywhere.
2. **Zero Hunger** – End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
3. **Good Health and Well-being** – Ensure healthy lives and promote well- being for all at all ages.
4. **Quality Education** – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
5. **Gender Equality** – Achieve gender equality and empower all women and girls.
6. **Clean Water and Sanitation** – Ensure availability and sustainable management of water and sanitation for all.
7. **Affordable and Clean Energy** – Ensure access to affordable, reliable, sustainable, and modern energy for all.
8. **Decent Work and Economic Growth** – Promote sustained, inclusive, and sustainable economic growth, full and

productive employment, and decent work for all.

9. **Industry, Innovation, and Infrastructure** – Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
10. **Reduced Inequalities** – Reduce inequality within and among countries.
11. **Sustainable Cities and Communities** – Make cities and human settlements inclusive, safe, resilient, and sustainable.
12. **Responsible Consumption and Production** – Ensure sustainable consumption and production patterns.
13. **Climate Action** – Take urgent action to combat climate change and its impacts.
14. **Life Below Water** – Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.
15. **Life on Land** – Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.
16. **Peace, Justice, and Strong Institutions** – Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.
17. **Partnerships for the Goals** – Strengthen the means of implementation and revitalize the global partnership for sustainable development.

5. WK: Washington Accord Knowledge Profile-Attributes for engineering program

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modeling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Outcomes (NBA, Jan 2025)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/ develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

7. Programme Specific Indicators

Thermal Power Industry

1. Analyze thermodynamic cycles to optimize energy conversion in power plant operations.
2. Evaluate performance of boilers and turbines using tools like MATLAB and ANSYS-Fluent.
3. Design thermal systems to ensure energy efficiency and environmental compliance.
4. Simulate combustion processes to enhance fuel efficiency and reduce emissions.
5. Apply knowledge of fluid mechanics to design efficient piping and pumping systems.
6. Assess heat exchanger performance using HTRI or Aspen HYSYS software.
7. Interpret P&ID diagrams for installation, troubleshooting and control system integration.
8. Estimate plant load factor and thermal efficiency for economic viability assessment.

9. Integrate renewable sources in thermal systems for sustainable energy generation.
10. Interpret ASME codes and safety standards in boiler and pressure vessel design.
11. Optimize plant layout using AutoCAD or SolidWorks for efficient space and utility use.
12. Apply project planning tools like MS Project or Primavera for thermal plant construction.
13. Monitor and analyze thermal losses using IR thermography tools.
14. Develop standard operating procedures for thermal plant operations and safety audits.

Manufacturing & Production Industry

15. Design manufacturing processes using CAD/CAM tools.
16. Implement lean manufacturing principles for waste reduction and cost efficiency.
17. Analyze material properties for suitable selection in industrial manufacturing applications.
18. Simulate production line efficiency using Arena or Plant Simulation software.
19. Evaluate machining parameters to achieve optimum surface finish and dimensional accuracy.
20. Apply GD&T principles for accurate engineering drawing interpretation and quality control.
21. Utilize ERP systems like SAP or Oracle for inventory and production planning.
22. Design jigs and fixtures using SolidWorks or AutoDesk Inventor for productivity improvement.
23. Develop quality control procedures using SPC, Six Sigma, and Minitab tools.
24. Perform time and motion study to reduce cycle time and enhance throughput.
25. Conduct FMEA to identify and mitigate potential manufacturing process failures.
26. Manage supply chain effectively through digital tools like SAP SCM or Tally ERP.
27. Implement automation using PLC, SCADA, or Robotics in CNC-based production lines.
28. Evaluate product cost estimation and pricing strategy for competitiveness.
29. Apply ISO 9001 standards to maintain quality and consistency in production systems.

Automotive Industry

30. Analyze vehicle dynamics for design of suspension and steering systems.
31. Design automotive components using CATIA or SolidWorks for strength and performance.

32. Evaluate thermal management systems for IC engines using CFD tools.
33. Analyze emissions and apply solutions complying with Bharat Stage norms or Euro standards.
34. Design electric vehicle drive trains and battery management systems using MATLAB/Simulink.
35. Apply diagnostic tools like OBD-II for real-time automotive fault detection.
36. Assess brake system performance through simulation and experimental validation.
37. Use CAN and LIN protocols to implement automotive electronics and network communication.
38. Apply Kaizen and 5S for continuous improvement in automotive production plants.
39. Validate designs with testing and simulation tools like AVL Cruise and Adams Car.
40. Implement lightweight materials and sustainable practices in automotive part manufacturing.
41. Evaluate ergonomics and aesthetic design in vehicle interiors and exteriors.
42. Monitor and improve fuel efficiency using IC engine analysis software.
43.Demonstrate understanding of vehicle homologation, testing procedures, and regulatory standards.

Design & Simulation Industry

44. Create 3D models of mechanical components using tools like SolidWorks, CATIA, or Creo software.
45. Simulate stress and deformation using FEA tools like ANSYS or Abaqus.
46. Optimize mechanical designs for weight, strength, and cost using Topology Optimization.
47. Perform thermal analysis of mechanical systems using ANSYS Fluent or COMSOL.
48. Develop manufacturing-ready drawings using GD&T standards in CAD tools.
49. Apply CFD tools to simulate fluid flow in mechanical and HVAC systems.
50. Create assemblies and kinematic simulations using CAD-integrated modules.
51. Validate designs using physical prototyping and reverse engineering tools.
52. Incorporate design standards and safety codes such as ASME or ISO.
53. Generate BoM and material selection reports using CAD-integrated tools.
54. Use cloud-based platforms like Autodesk Fusion 360 for collaborative design.
55. Automate design tasks using parametric modeling and scripting.
56. Conduct design reviews using augmented/virtual reality platforms.

57. Enhance presentation of design concepts with rendering and animation tools.

Industrial Automation & Mechatronics

58. Design automation systems using PLC, SCADA, and HMI for industrial processes.
59. Apply sensor and actuator integration for feedback control systems in automation.
60. Develop ladder logic programs.
61. Analyze robotic kinematics and program tasks.
62. Design mechatronic systems combining mechanical, electrical, and control components.
63. Implement Industry 4.0 concepts with IoT and real-time monitoring.
64. Utilize machine vision systems for quality inspection in manufacturing.
65. Analyze motion control systems using servo motors and stepper drives.
66. Design pneumatic and hydraulic circuits using FluidSIM or Automation Studio.
67. Monitor and maintain automated systems using predictive maintenance tools.
68. Apply cyber security principles to protect industrial control systems.
69. Optimize energy usage through automation and smart systems.
70. Ensure compliance with safety regulations in design and operation of automated systems.

Aerospace Industry

71. Apply principles of fluid mechanics to improve aircraft aerodynamic efficiency and fuel economy.
72. Analyze stress and deformation in aerospace components using ANSYS or similar FEA software.
73. Develop and simulate propulsion systems ensuring optimal performance and emission control.
74. Implement quality control practices for aircraft manufacturing in accordance with international standards.
75. Perform fatigue analysis and lifecycle assessment of aircraft materials using specialized software.
76. Apply project management techniques for timely aerospace project delivery and resource optimization.
77. Conduct CFD analysis for aircraft components using software like Fluent or OpenFOAM.
78. Use 3D printing for rapid prototyping of aerospace parts ensuring accuracy and strength.
79. Evaluate aircraft performance data to enhance operational efficiency and safety standards.
80. Interpret global aerospace regulations and apply safety protocols in aircraft operations.
81. Troubleshoot maintenance issues using digital twin and predictive analysis tools.

82. Demonstrate sustainable practices in aerospace engineering minimizing emissions and material waste.

Renewable Energy Industry

83. Design and analyze solar PV systems using software like PVsyst for optimal energy output.
84. Model and simulate wind energy systems for efficiency using MATLAB/SIMULINK.
85. Develop hybrid energy systems integrating solar, wind, and battery storage technologies.
86. Assess renewable energy project feasibility considering environmental, social and economic factors.
87. Analyze energy conversion efficiencies for thermal and hydroelectric renewable systems.
88. Apply electrical and mechanical interface knowledge in renewable power systems.
89. Design bioenergy systems using agricultural waste and simulate performance output.
90. Apply IoT-based monitoring in renewable energy systems for real-time data and control.
91. Understand and interpret renewable energy policies and safety standards for compliance.
92. Analyze grid integration challenges and suggest power quality enhancement strategies.
93. Optimize renewable system operations using digital tools and AI-based forecasting.
94. Evaluate carbon credits and sustainability impact of renewable energy systems.
95. Implement economic analysis techniques to evaluate life cycle cost of renewable projects.

HVAC & Refrigeration Industry

96. Design HVAC systems ensuring thermal comfort and energy efficiency using HAP or Carrier software.
97. Select and size refrigeration components using Duct Sizer and psychrometric charts.
98. Apply thermodynamic principles for efficient cooling cycle analysis and optimization.
99. Develop and simulate duct systems using AutoCAD MEP or Revit MEP.
100. Conduct heat load estimation and ventilation design based on building parameters.
101. Install and commission HVAC-R equipment ensuring operational safety and efficiency.
102. Perform maintenance and fault diagnosis in HVAC systems ensuring minimal downtime.
103. Integrate renewable sources such as solar with conventional HVAC systems for energy savings.

104. Evaluate indoor air quality and recommend control strategies for healthy living environment.
105. Interpret HVAC system layouts, specifications and tender documents for project execution.
106. Comply with ASHRAE standards in HVAC system design and maintenance procedures.
107. Optimize HVAC system operations using digital BMS tools and data analytics.

Generic Competencies (Mechanical Engineering)

A. Problem-Solving Skills

108. **Analytical Thinking**: Ability to analyze complex problems, break them down into smaller components, and find effective solutions.
109. **Critical Thinking**: Ability to evaluate multiple solutions to a problem and choose the best course of action based on available data, safety, and cost-efficiency.

B. Communication Skills

110. **Oral Communication**: Ability to communicate complex technical information clearly to a variety of audiences, including clients, stakeholders, contractors, and team members.
111. **Written Communication**: Proficiency in drafting reports, proposals, technical specifications, and documentation that are clear, concise, and accurate.
112. **Interpersonal Communication**: Ability to collaborate effectively with multidisciplinary teams, clients, and project stakeholders.

C. Project Management

113. **Time Management**: Efficiently managing time and prioritizing tasks to meet deadlines in a dynamic project environment.
114. **Resource Management**: Ability to plan, allocate, and manage resources such as labour, materials, and equipment to ensure project efficiency.
115. **Budgeting and Cost Control**: Skills in estimating project costs, monitoring budgets, and ensuring projects are completed within financial constraints.
116. **Risk Management**: Ability to identify, assess, and mitigate risks during the planning and execution of engineering projects.

D. Teamwork and Leadership

117. **Team Collaboration**: Working effectively as part of a team, contributing to the success of the project through collaboration, open communication, and respect for others' expertise.
118. **Leadership Skills**: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
119. **Conflict Resolution**: Ability to resolve conflicts between team members, clients, or contractors, ensuring that project objectives are still achieved.

E. Attention to Detail

120. **Accuracy**: Ensuring all engineering calculations, designs, and project plans are accurate and align with building codes, regulations, and standards.
121. **Quality Assurance**: Ensuring that the materials and processes used in construction adhere to high standards of quality and safety.

F. Ethical and Professional Integrity

122. **Ethical Decision Making**: Adhering to a strict code of ethics, ensuring public safety, environmental protection, and transparency in all dealings.
123. **Accountability**: Taking responsibility for the success or failure of a project, being proactive in addressing issues, and delivering results.

G. Adaptability and Flexibility

124. **Openness to Change**: Being able to adapt to new technologies, tools, and methods, as well as evolving project requirements or environmental conditions.
125. **Learning and Development**: Actively seeking opportunities for professional growth, staying current with industry trends, and acquiring new skills to remain competitive.

H. Technical Competency

126. **Understanding of Engineering Principles**: A strong foundation in the core principles of mechanical engineering, including thermodynamics, fluid mechanics, heat transfer, solid mechanics, materials science, manufacturing processes, and machine design.
127. **Technology Proficiency**: Proficiency in using mechanical engineering software, such as AutoCAD, SolidWorks, CATIA, ANSYS, MATLAB, and CNC simulation tools, to design, model, simulate, and optimize mechanical systems and processes.
128. **Data Analysis**: Ability to analyze experimental, simulation, and operational data from mechanical systems to evaluate performance, diagnose issues, and make informed engineering decisions.

I. Creativity and Innovation

129. **Creative Problem Solving**: Thinking outside the box and coming up with novel solutions to engineering challenges.
130. **Innovative Design**: Contributing new ideas for designs and processes that can improve efficiency, reduce costs, or make better use of resources.

J. Cultural and Environmental Awareness

131. **Sustainability Awareness**: Knowledge of sustainable construction methods, green building practices, and the importance of reducing the environmental impact of engineering projects.
132. **Cultural Sensitivity**: Understanding and respecting cultural differences when working in diverse teams or international projects.
133. **Environmental Impact Understanding**: Considering the environmental consequences of engineering decisions and striving to minimize negative impacts through design and construction

methods.

K. Decision-Making Skills

134. **Data-Driven Decisions**: Using available data, facts, and technical analysis to make informed decisions about the design, execution, and management of projects.
135. **Prioritizing Decisions**: Knowing which decisions need immediate attention and which can be deferred, especially in a high-pressure environment.

L. Regulatory and Legal Knowledge

136. **Familiarity with Building Codes and Standards**: Understanding and ensuring compliance with local, national, and international building codes, safety regulations, and legal standards.
137. **Health and Safety**: Knowledge of safety regulations and best practices for ensuring the health and safety of workers, the public, and the environment throughout the project lifecycle.

M. Client-Focused Mindset

138. **Client Management**: Building and maintaining strong relationships with clients, understanding their needs, and ensuring their expectations are met throughout the project.
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8. Scheme of Mechanical Engineering Department

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Mechanical Engineering Degree Programme

Semester - I (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - I	BSC	1SH101BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Physics	BSC	1SH102BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Programming for Problem Solving	ESC	1CS103ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Mechanics	ESC	1CE104ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Applied Physics Lab	BSC	1SH105BS1	0	0	2	0	2	1					25	25	50	25	50	
6	Programming for Problem Solving Lab	ESC	1CS106ES1	0	0	2	0	2	1					25	25	50	25	50	
7	Engineering Mechanics Lab	ESC	1CE107ES1	0	0	2	0	2	1					25	25	50	25	50	
8	Workshop	ESC	1ME108ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Computer Aided Drafting with CATIA	VSC	1ME109VS1	1	0	2	1	4	2						50	50	25	50	
10	Communication Skills	AEC	1SH110AE1	1	0	2	1	4	2					25	25	50	25	50	
11	Sports & Yoga	CC	1SH111CC1	0	0	4	0	4	2						50	50	25	50	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Mechanical Engineering Degree Programme

Semester - II (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - II	BSC	2SH112BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Chemistry	BSC	2SH113BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Basic Electrical Engineering	ESC	2EE114ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Graphics	ESC	2ME115ES1	2	0	0	2	4	2	60	40	100	40					100	4 Hrs.
5	Elements of Mechanical Engineering	PCC	2ME116PC1	1	0	2	1	4	2						50	50	25	50	
6	Indian heritage in Mechanical Engineering	IKS	2ME117IK1	1	0	2	1	4	2						50	50	25	50	
7	Applied Chemistry - Lab	BSC	2SH118BS1	0	0	2	0	2	1					25	25	50	25	50	
8	Basic Electrical Engineering - Lab	ESC	2EE119ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Engineering Graphics/CAD Lab	ESC	2ME120ES1	0	0	2	0	2	1					25	25	50	25	50	
10	Universal Human Values	SEC	2SH121VS1	1	0	2	1	4	2						50	50	25	50	
11	Digital Wellness	CC	2SH122CC1	1	0	2	1	4	2						50	50	25	50	
Total				**15**	**0**	**14**	**15**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 15x15 = 225 Hrs]

Exit Option (Level 4.5) for Undergraduate Certificate in Odd Semester of next Academic Year as approved by BOS																			
12	Welding Technology / Joining Processes	EC	3ME123EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Metal Forming Processes	EC	3ME124EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	3ME125EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	3ME126OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Mechanical Engineering Degree Programme

Semester - III (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Thermal Engineering -I	PCC	3ME201PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Fluid Mechanics	PCC	3ME202PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Strength of Material	PCC	3ME203PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - I	MDM	3_204MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - I	OE	3_205OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Thermal Engineering- I - Lab	PCC	3ME206PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Fluid Mechanics - Lab	PCC	3ME207PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Strength of Material - Lab	PCC	3ME208PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Entrepreneurship in Mechanical Engineering	EEM	3ME209EM1	2	0	0	2	4	2						50	50	25	50	
10	Constitutional Values and Fundamental Duties	VEC	3SH210VE1	2	0	0	2	4	2						50	50	25	50	
11	Field Project	FP	3ME400FP1	0	0	4	0	4	2					25	25	50	25	50	
12	Disaster Management and Preparedness	NC	3AL001NC1	2	0	0	0	2	-										
Total				**19**	**0**	**10**	**17**	**46**	**22**			**450**				**300**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 17x15 = 255 Hrs]

Optional Course for Double Minor / Honours Degree																			
13	Double Minor / Honours Course - I	DH	3__211DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Mechanical Engineering Degree Programme
Semester - IV (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Manufacturing Processes	PCC	4ME212PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Material Science & Nano Technology	PCC	4ME213PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Hydraulic and Pneumatic Systems	PCC	4ME214PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - II	MDM	4_215MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - II	OE	4_216OE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Material Science & Nano Technology - Lab	PCC	4ME217PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Hydraulic and Pneumatic Systems - Lab	PCC	4ME218PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Manufacturing Processes - Lab	VSC	4ME219VS1	0	0	4	0	4	2						50	50	25	50	
9	Technical Writing	AEC	4SH220AE1	1	0	2	1	4	2						50	50	25	50	
10	Fundamentals of Book Keeping and Accounting	EEM	4SH221EM1	1	0	2	1	4	2						50	50	25	50	
11	Environmental Science	VEC	4CE222VE1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
Total				**16**	**0**	**12**	**16**	**44**	**22**			**500**				**250**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 28x15 = 420 Hrs] + [Learner-engaged time 16x15 = 240 Hrs]

Optional Course for Double Minor / Honours Degree																			
12	Double Minor / Honours Course - II	DH	4__223DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5) for Undergraduate Diploma in Odd Semester of next Academic Year as approved by BOS																			
13	Lathe Machine	EC	5ME224EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
14	Casting Process	EC	5ME225EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
15	Internship / Apprenticeship in Industry	EI	5ME226EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
16	Two MOOC/NPTEL Courses	EC	5ME227OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Mechanical Engineering Degree Programme

Semester - V (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Theory of Machines	PCC	5ME228PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Metrology and Quality Control	PCC	5ME229PC1	3	1	0	4	8	4	60	40	100	40					100	3 Hrs.
3	Thermal Engineering-II	PCC	5ME230PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - I	PEC	5ME231PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - III	MDM	5_232MD_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Open Elective - III	OE	5_233OE_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Theory of Machines - Lab	PCC	5ME234PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Thermal Engineering II- Lab	PCC	5ME235PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - I - Lab	PEC	5ME236PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Multidisciplinary Minor - III - Lab	MDM	5_237MD_	0	0	2	0	2	1					25	25	50	25	50	
Total				**17**	**1**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]

Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - III	DH	5__238DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Mechanical Engineering Degree Programme

Semester - VI (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Heat Transfer	PCC	6ME239PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Design of Machine Elements	PCC	6ME240PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Production Estimation and Management	PCC	6ME241PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - II	PEC	6ME242PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Programme Elective Course - III	PEC	6ME243PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Multidisciplinary Minor - IV	MDM	6_244MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Heat Transfer - Lab	PCC	6ME245PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Design of Machine Elements - Lab	PCC	6ME246PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - II - Lab	PEC	6ME247PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Personal Skills (GD & PI)	SEC	6SH248VS1	1	0	2	1	4	2						50	50	25	50	
Total				**18**	**0**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]

Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - IV	DH	6__249DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5.5) for B. Voc in Odd Semester of next Academic Year as approved by BOS																			
12	CNC Lathe	EC	7ME250EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Milling Machine	EC	7ME251EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	7ME252EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	7ME253OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Mechanical Engineering Degree Programme

Semester - VII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Refrigeration and Air Conditioning	PCC	7ME301PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Artificial Intelligence & Robotics	PCC	7ME302PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Programme Elective Course - IV	PEC	7ME303PE_	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - V	PEC	7ME304PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - V	MDM	7_305MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
6	Refrigeration and Air Conditioning - Lab	PCC	7ME306PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Programme Elective Course - IV-Lab	PEC	7ME307PE_	0	0	2	0	2	1					25	25	50	25	50	
8	Research Methodology	RM	7ME401RM1	2	0	4	2	8	4	30	20	50	20		50	50	25	100	2 Hrs.
9	Project	PR	7ME402PR1	0	0	8	0	8	4					50	100	150	75	150	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**500**				**300**		**800**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Optional Course for Double Minor / Honours Degree																			
10	Double Minor / Honours Course - V	DH	7__308DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
Optional Course for Honours with Research Degree																			
12	Research Project	RP	7ME403RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Mechanical Engineering Degree Programme
Semester - VIII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Automobile Engineering & EV Technology (Online)	PCC	8ME309PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Programme Elective Course - VI (Online)*	PEC	8ME310PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Multidisciplinary Minor - VI (Online)	MDM	8_311MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
4	On Job Training (Internship/Apprenticeship)	OJT	8ME404IN1	0	0	24	0	24	12					100	100	200	100	200	
Total				**8**	**0**	**24**	**8**	**40**	**20**			**250**				**200**		**450**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 32x15 = 480 Hrs] + [Learner-engaged time 8x15 = 120 Hrs]																			
Optional Course for Honours with Research Degree																			
5	Research Project	RP	8ME405RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

9. List of Programme Elective Courses

Students will have an option to choose the PEC offered by their respective Major Discipline offered during semester V to VIII

Programme Elective Courses offered by Mechanical Engineering

Sr. No.	Semester	Programme Elective Course/Subjects Name	Course Code
1	V	Computer-Aided Design and Manufacturing (PEC-I)	5ME231PE1
2		Computer-Aided Design and Manufacturing – Lab (PEC- Lab I)	5ME236PE1
		OR	
3		Power Plant Engineering (PEC-I)	5ME231PE2
4		Power Plant Engineering – Lab (PEC- Lab I)	5ME236PE2
5	VI	Internal Combustion Engine (PEC- II)	6ME242PE1
6		Internal Combustion Engine -Lab (PEC-Lab II)	6ME246PE1
		OR	
7		Measurement System (PEC-II)	6ME242PE2
8		Measurement System- Lab (PEC- Lab II)	6ME246PE2
9		Mechanical Innovations & Entrepreneurship (PEC- III)	6ME243PE1
		OR	
10		Additive Manufacturing (PEC- III)	6ME243PE2
11	VII	Automation Engineering (PEC- IV)	7ME303PE1
12		Automation Engineering - Lab (PEC-Lab IV)	7ME307PE1
		OR	
13		Non- Conventional Energy Sources (PEC-IV)	7ME303PE2
14		Non- Conventional Energy Sources – Lab (PEC-Lab IV)	7ME307PE1
15		Production & Operation Management (PEC-V)	7ME304PE1
		OR	
16		Die, Mould & Tool Engineering (PEC-V)	7ME304PE2
17	VIII	Mechatronics (Online)* (PEC-VI)	8ME310PE1
		OR	
18		Finite Element Analysis (Online)* (PEC-VI)	8ME310PE2

10. Syllabus for Semester III & IV

Level: **5**	Course Code: **3ME201PC1**		Course Category: **PCC**		
Course Name	**Thermal Engineering -I**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3ME201PC1 Thermal Engineering -I is a compulsory Program Core Course for Second Year B.Tech. Mechanical Engineering Program.

Course Objectives:
This course develops a strong understanding of thermodynamic principles and laws to analyze energy systems, interpret thermodynamic properties, and evaluate major power cycles for real life engineering applications.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ME201PC1.1	Explain the basic concepts, laws, and properties related to thermodynamic systems and processes, with the purpose of building a strong foundational understanding of thermodynamics.	C-2
3ME201PC1.2	Interpret various forms of energy and apply the First Law of Thermodynamics to closed and open systems, in order to understand energy interactions and conservation principles in practical applications.	C-2
3ME201PC1.3	Describe steam properties and analyze steam formation processes using steam tables and diagrams, for the purpose of enabling accurate evaluation of steam-based thermodynamic systems.	C-2
3ME201PC1.4	Apply the First Law of Thermodynamics to steady-flow devices such as turbines, compressors, and nozzles, to develop the ability to analyze and solve real-world engineering problems.	C-3

3ME201PC1.5	Evaluate the performance of heat engines, refrigerators, and heat pumps using the Second Law of Thermodynamics, with the purpose of assessing efficiency and identifying performance improvements.	C-4
3ME201PC1.6	Analyze air standard and vapor cycles using thermodynamic principles and diagrams, for the purpose of selecting and optimizing cycles for engineering applications.	C-4

Course Contents:

Unit 1	**Fundamentals:** Introduction to basic concepts of thermodynamics, Macroscopic and microscopic approaches, properties of system, state, processes and cycle, thermodynamic equilibrium, types of thermodynamic systems, Temperatures and Zeroth law of thermodynamics, Quasi-static process, Gas Laws and Ideal gas equation of states, gas constant and universal gas constant.	7 Hrs
Unit 2	**Energy, Energy Transfer and Energy Analysis:** Energy and various forms of energy, Internal Energy, Heat and energy transfer by Heat, Mechanism of Heat Transfer; Work, Electrical Work and forms of Mechanical Work; First Law of Thermodynamics and Energy Balance, Mechanisms of energy transfer to and from a system, Flow Energy, Energy conversion efficiencies, Implications of energy conversion on environment.	7 Hrs
Unit 3	**Properties of Steam**: Formation of Steam, Triple Point and Critical Point, Sensible Heat, Latent Heat, Superheat and Total Heat of Steam. Wet Steam, Dryness Fraction, Internal energy of steam, External work of Evaporation, Specific Volume, Enthalpy, Internal Energy and Entropy of Steam. T-S Diagram and Steam Table and their use. Difference between Vapour and Gas, Dryness Fraction &Measurement of by Separating, Throttling, and Combine Calorimeter	7 Hrs
Unit 4	**First Law applied to flow processes:** Steady state, steady flow process, equation for work done in steady flow process and its representation on P-V diagram, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, turbine and compressor pumps, heat exchangers, Throttle valve etc. work done and Heat transfer during steady flow processes.	8 Hrs

Unit 5	**Second Law of thermodynamics:** Limitations of First law, Thermal energy reservoir, heat engines refrigerator and heat pumps, COP and tonne of refrigeration, COP for heat pump and refrigerator, Kelvin-Plank and Clausius statements, their equivalence, reversible and irreversible processes, Carnot cycle, Carnot theorem	8 Hrs
Unit 6	**Air Standard Cycles:** Otto, Diesel, Brayton, Sterling and joule cycles etc., their efficiencies, comparison of auto, diesel and dual cycles. Vapour Cycles: Rankine Cycle. Comparison of Rankine and Carnot cycle, representation on P-V, T-S and H-S diagram.	8 Hrs

Text Books:

1. Yunus Çengel and Michael, Boles,Thermodynamics: An Engineering Approach, Tata McGraw Hill.
2. P. K. Nag,Basic and Applied Thermodynamics, Tata McGraw Hill Education.
3. R.Yadav, Fundamentals of Engineering Thermodynamics, Central Publishing House (CPH), Allahabad.
4. V. Ganeshan, Thermodynamics Basics and Applied, Tata McGraw Hill Education.
5. Mahesh M. Rathore, Thermal Engineering, Tata McGraw Hill Education.

Reference Books:

1. ReynerJoel, Basic Engineering Thermodynamics, Pearson Education
2. C.P.Arora, Thermodynamics, Tata McGraw Hill Education.
3. G. J.Vanwylen, Fundamentals of ClassicalThermodynamics, Wiley (John Wiley & Sons).
4. P. Chattopadhyay, Engineering Thermodynamics, Oxford University Press.
5. Gordon Rogers, Yon Mayhew, Pearson, Engineering Thermodynamics, Pearson Education.

E-Resources:

1. https://ncert.nic.in/textbook/pdf/keph204.pdf
2. https://www.sfu.ca/~mbahrami/ENSC%20388/Notes/First%20Law%20of%20Thermodynamics_Closed%20Systems.pdf
3. https://www.sfu.ca/~mbahrami/ENSC%20388/Notes/Intro%20and%20Basic%20Concepts.pdf
4. https://coursecontent.indusuni.ac.in/wp-content/uploads/sites/8/2021/11/3.1.-PROPERTIES-OF-STEAM.pdf
5. http://www.rshanthini.com/tmp/ThermoBook/ThermoChap10.pdf
6. https://www.sfu.ca/~mbahrami/ENSC%20388/Notes/Second%20Law%20of%20Thermodynamics.pdf
7. https://www.sathyabama.ac.in/sites/default/files/course-material/2020-10/UNIT-1.PDF

Mapping of CO with PO& PSO

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3ME201PC1.1	3	2	-	-	1	-	-	-	-	-	1	3	1	1
3ME201PC1.2	3	3	-	2	2	-	-	-	-	-	1	3	1	1
3ME201PC1.3	3	2	-	-	2	-	-	-	-	-	1	3	1	1
3ME201PC1.4	2	3	2	3	3	-	-	-	-	-	1	3	2	1
3ME201PC1.5	2	3	2	2	2	2	-	-	-	-	2	3	2	1
3ME201PC1.6	2	3	2	2	3	2	-	-	-	-	2	3	2	1
3ME201PC1	3	3	1	2	2	1	-	-	-	-	1	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3ME202PC1**		Course Category: **PCC**		
Course Name	**Fluid Mechanics**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3ME202PC1Fluid Mechanicsis a compulsory Program Core Course for Second Year B.Tech. Mechanical Engineering Program.

Course Objectives:
To impart fundamental knowledge of fluid properties and behaviour in various flow conditions, including hydrostatics, buoyancy, stability, boundary layer concepts, and the application of mass, momentum, and energy equations to analyze flow systems and associated losses.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ME202PC1.1	To enable students to understand the basic physical properties of fluids and apply principles of fluid statics and kinematics to describe fluid behavior at rest and in motion.	C-3
3ME202PC1.2	To develop the ability to evaluate buoyant forces, stability, and equilibrium conditions of bodies immersed in fluids for engineering applications.	C-5
3ME202PC1.3	To equip students with the analytical skills required to study fluid motion by applying kinematic and dynamic principles to real flow situations.	C-3
3ME202PC1.4	To enable students to calculate head losses and analyze energy dissipation in pipe flow systems for efficient design and operation.	C-3
3ME202PC1.5	To help students understand the effects of viscosity on fluid motion and analyze laminar and turbulent flow behavior in practical systems.	C-4
3ME202PC1.6	To develop competence in evaluating forces due to jet impingement and applying momentum principles in hydraulic and mechanical systems.	C-5

Course Contents:

Unit 1	**Basic properties of fluid:** Density, Specific weight, Specific Volume, Specific gravity, Viscosity of fluid, Surface Tension, Capillarity, vapour pressure & cavitation. pressure & its measurement: Pascal's law, Hydrostatic law of pressure & pressure variation in fluid, measurement of pressure by Manometers.	5 Hrs
Unit 2	**Buoyancy & floatation:** Concept of buoyancy, Centre of buoyancy. Stability of floating body, Metacentre& metacentric height. Condition of equilibrium of floating & sub-merged body. Hydrostatic pressure force on plane surfaces. Measurement of total pressure & Centre of pressure	5 Hrs
Unit 3	**Kinematics of fluid flow:** Methods of describing fluid motion, Types of flow, rate of flow, streamline, potential line, flow net, velocity & acceleration, continuity equation in three-dimensional flow. Dynamics of fluid flow: Euler's equation of motion, Bernoulli's equation measurement of fluid flow with venturimeter.	5 Hrs
Unit 4	**Flow through pipes:** Losses in pipe, major losses, Darcy‘s Weisbach equation, minor losses due to sudden enlargement, contraction, entry, exit & pipe fitting. Flow through series & parallel pipes, concept of water hammer in pipes	5 Hrs
Unit 5	**Motion of viscous fluid:** Introduction to Laminar & Turbulent flow, Concept of Boundary layer & its type, Boundary layer separation, Reynolds number & its significance. Drag & Lift force on object	5 Hrs
Unit 6	**Impact of Jet:** Force exerted by fluid jet on plane, curved, stationary & moving vanes. Velocity diagrams, work done & efficiency.	5 Hrs

Text Books:

1.R. K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, New Delhi, India
2. R. K. Rajput, Engineering fluid Mechanics, S. Chand & Company Pvt. Ltd., New Delhi, India.

Reference Books:

1. S. Ramamrutham, Hydraulic, Fluid Mechanics &Fluid Machines, Dhanpat Rai Publishing Company, New Delhi, India
2. Modi & Sheth, Fluid Mechanics & Machinery, Standard Book House, New Delhi, India
3. CRSP. Ojha, Fluid mechanics & Machinery, R. Berndtsson,Oxford University Press (OUP India)
4. Strecter, Fluid Mechanics, Mcgraw Hill Education,McGraw-Hill Education (India / International Editions)

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ce85/preview?utm
2. https://www.nptelprep.in/courses/105103192/materials?utm
3. https://onlinecourses.nptel.ac.in/noc25_me41/preview?utm
4. https://www.nptelprep.in/courses/105103192?utm
5. https://www.vssut.ac.in/lecture_notes/lecture1427495313.pdf?utm

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ME202PC1.1	3	2	-	-	-	-	-	-	-	-	-	3	1	-
3ME202PC1.2	3	2	1	1	-	-	-	-	-	-	-	3	2	-
3ME202PC1.3	3	2	1	1	-	-	-	-	-	-	-	3	2	1
3ME202PC1.4	3	3	2	2	1	-	-	-	-	-	-	3	2	1
3ME202PC1.5	3	2	1	1	-	-	-	-	-	-	-	3	1	1
3ME202PC1.6	3	3	2	2	3	2	-	-	-	-	1	3	2	1
3ME202PC1	3	3	1	1	1	2	-	-	-	-	1	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3ME203PC1**		Course Category: **PCC**		
Course Name	**Strength of Materials**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45Hrs**	Total SL Hours	**45Hrs**
Total Credit Hours	**90Hrs**				
SEE Marks	**60**	SEE Time	**3Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3ME203PC1 Strength of Materials is a compulsory Program CoreCourse for Second Year B.Tech Mechanical Engineering.

Course Objectives:
The objective of this course is to develop the ability in students to understand the mechanical behaviour of materials and to analyze stresses, strains, internal forces, bending, torsion, principal stresses, and deflection in structural and machine components, so that they can design safe and efficient engineering systems.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ME203PC1.1	Explain stresses, strains, and material properties to understand the mechanical behavior of materials under different loading conditions.	C2
3ME203PC1.2	Construct shear force and bending moment diagrams for evaluating internal force distribution in beams.	C3
3ME203PC1.3	Apply bending theory to compute stresses and assess strength of beam cross-sections.	C3
3ME203PC1.4	Analyze torsion, springs, and impact loading to assess stress behavior in shafts and energy-absorbing elements.	C4
3ME203PC1.5	Determine principal stresses and strains for examining biaxial stress conditions in thin pressure vessels.	C4
3ME203PC1.6	Calculate slope and deflection of beams to evaluate deformation and serviceability under various boundary conditions.	C3

Course Contents:

Unit 1	**Stresses and Strain:** Mechanical Properties of Materials, Concept of direct, bending and shear stresses and strains, Stress-strain relations, Bi-axial and Tri-axial loading, Elastic constants, Poission's ratio and their relationship, Stress-strain diagrams and their characteristics for mild steel, Factor of safety and its significance. Stresses and strains in compound bars in uni-axial tension and compression, Thermal stresses in simple restrained bars and compound bars of two metals.	10 Hrs
Unit 2	**Shear Force and Bending Moment:** Types of Beams and concept of Shear force and Bending moment. Axial force, shear force & bending moment diagrams for - Simply supported Beams, Overhanging Beams and Cantilever Beams subjected to Point load, uniformly distributed load. Relation between shear force, bending moment and loading intensity.	07 Hrs
Unit 3	**Theory of simple bending**: section modulus, moment of resistance. **Bending and Shear Stresses:** Bending stresses in solid, hollow and built-up section. Shear stress distribution on beams with Rectangular and Circular cross sections.	07 Hrs
Unit 4	**Torsion:** Theory of torsion & assumptions, derivation of torsion equation. Polar modulus, Stresses in solid & hollow circular shaft. Power transmitted by solid and hollow shaft and their equivalence. **Spring:** Basic Terminology of Spring, Closed coiled helical spring with axial load. Strain energy under uni-axial tension and compression. Gradually, Suddenly and Impact loads and instantaneous stresses and strain.	07 Hrs
Unit 5	**Thin cylinders and thin spherical shells:** Thin cylinders and thin spherical shells subjected to internal pressures. **Biaxial stress system**: principal stresses, principal planes. Mohr's circle of stresses, principal strains, principal planes.	07 Hrs
Unit 6	**Slope and Deflection:** Slope and Deflection for Simply supported and Cantilever Beams - subjected to Point loads and uniformly distributed load by Macaulay's method. End Conditions.	07 Hrs

Text Books:

1. R. K. Bansal, A Textbook of Strength of Materials, Laxmi Publications
2. S. Ramamrutham, Strength of Materials (SI Units) ,DhanpatRai Publications
3. R. K. Rajput, Strength of Materials, S. Chand Publications
4. S. S. Bhavikatti, Strength of Materials, Vikas Publishing House
5. R. S. Khurmi, Strength of Materials, S. Chand Publications

Reference Books:

1. S. P. Timoshenko, Strength of Materials, Vol. I, CBS Publishers / Van Nostrand
2. S. P. Timoshenko, Strength of Materials, Vol. II – CBS Publishers / Van Nostrand
3. Dr. B. C. Punmia, Strength of Materials, Laxmi Publications
4. L. N. Srinath, Advanced Mechanics of Solids, McGraw Hill Education
5. S. M. A. Kazimi, Solid Mechanics, Tata McGraw Hill

E-Resources:

1. Strength of Materials by Prof. S.K. Bhattacharyya, IIT Kharagpur (https://nptel.ac.in/courses/105105108)
2. Strength of Materials (Open Textbook) https://engineeringmechanicsoer.github.io/StrengthBook/?utm_source=chatgpt.com

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ME203PC1.1	3	2	1	1	-	-	1	1	-	1	-	3	2	-
3ME203PC1.2	3	3	3	2	1	-	1	1	-	1	-	2	3	-
3ME203PC1.3	3	3	3	3	1	-	1	1	-	1	-	2	3	-
3ME203PC1.4	3	3	2	3	1	-	1	1	-	1	-	3	2	1
3ME203PC1.5	3	3	2	2	1	-	1	1	-	1	-	3	2	-
3ME203PC1.6	3	2	2	2	1	1	3	2	1	2	1	2	2	1
3ME203PC1	3	3	2	2	1	1	1	1	1	1	1	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3ME204MD1**		Course Category: **MDM**		
Course Name	**Foundation of Mechanical Engineering**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:
Subject Code 3ME204MD1Foundation of Mechanical Engineering is a compulsory Multidisciplinary Minor Course offered by the department of Mechanical Engineering for other Second Year B. Tech., major disciplines.

Course Objectives:
The objective of the course is to introduce fundamental concepts of mechanical engineering, and to impart knowledge of energy, materials, manufacturing, and thermal-fluid sciences.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ME204MD1.1	Apply the basic principles of thermodynamics and energy conversion to evaluate engineering systems and processes.	C-3
3ME204MD1.2	Identify materials and manufacturing processes relevant to engineering to select appropriate engineering materials and manufacturing processes based on functional requirements, performance, and economic considerations.	C-2
3ME204MD1.3	Apply fundamental concepts of fluid mechanics and heat transfer to analyze and design practical engineering systems.	C-3

Course Contents:

Unit 1	**Fundamentals of Mechanical Engineering & Thermodynamics:** Scope and importance of Mechanical Engineering in industries. **Introduction to mechanical systems:** Machine elements, mechanisms and power transmission. **Basics of Thermodynamics:** Systems, properties, state, process, cycle. Zeroth law, First law of thermodynamics, applications to closed and open systems. Concepts of internal energy, enthalpy, work and heat interactions. Heat engines, refrigerators, and heat pumps – performance parameters (efficiency, COP).	10 Hrs
Unit 2	**Materials and Manufacturing:** Classification of engineering materials: metals, polymers, ceramics, composites. Properties: mechanical, thermal, electrical, corrosion resistance. **Manufacturing Processes:** Casting, forming, welding, and machining (basic principles). Additive manufacturing – introduction to 3D printing.	9 Hrs
Unit 3	**Fluid Mechanics, Heat Transfer & Applications:** Properties of fluids: density, viscosity, compressibility, surface tension. Fluid statics: pressure, Pascal's law, manometers, buoyancy. Fluid kinematics: continuity equation, Bernoulli's principle and applications. **Introduction to Heat Transfer:** Modes – conduction, convection, radiation. Fourier's law, Newton's law of cooling, Stefan–Boltzmann law (basic form). Applications: pumps, turbines, boilers, heat exchangers.	11 Hrs

Text Books:

1. R. K. Purohit, Foundation of Mechanical Engineering, 4th Edition, Scientific Publishers.
2. Dr. D. S. Kumar, Fundamentals of Mechanical Engineering, S.K. Kataria & Sons.
3. R. K. Rajput, Fundamentals of Mechanical Engineering, Laxmi Publications Pvt Ltd.

Reference Books:

1. P.K. Nag, Engineering Thermodynamics, McGraw-Hill Education.
2. R. K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications.
3. A. Ghosh & A.K. Mallik, Manufacturing Science, Affiliated East-West Press.
4. V. Raghavan, Engineering Materials & Metallurgy, PHI Learning.

E-Resources:

1. https://alison.com/course/mechanical-engineering-principles-and-design-conceptsAlison.
2. https://opencourser.com/course/f9crix/basics-of-mechanical-engineeringopencourser.com.
3. https://www.classcentral.com/course/swayam-basics-of-mechanical-engineering-1-292635Class Central.
4. https://ocw.mit.edu/courses/2-72-elements-of-mechanical-design-spring-2009/pages/lecture-notes/

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3ME204MD1.1	3	2	-	-	-	-	-	-	-	-	-	3	-	-
3ME204MD1.2	2	2	-	-	-	1	-	-	-	-	-	-	3	-
3ME204MD1.3	3	3	-	-	-	-	-	-	-	-	2	-	-	-
3ME204MD1	3	2	-	-	-	1	-	-	-	-	1	1	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3SH205OE1**	Course Category:	**OE**
Course Name	**Soft Skills & Profile Building**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3SH205OE1 Soft Skills & Profile Building is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:
The objective of this course is to focus on developing advanced communication skills, leadership qualities and professional etiquette among engineering graduates.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE1.1	Apply advanced interpersonal, analytical, and persuasive communication techniques in professional contexts for effective professional interactions.	C-3
3SH205OE1.2	Demonstrate professional workplace etiquette, business communication, and group discussion skills to enhance employability.	C-3 A-3
3SH205OE1.3	Analyze leadership styles, emotional intelligence, and team dynamics for effective collaboration.	C-4 A-3
3SH205OE1.4	Design a structured and realistic career plan aligned with industry expectations and personal goals for professional growth.	C-6
3SH205OE1.5	Create ATS-friendly résumés, professional portfolios, and digital profiles for personal branding.	C-6 P-4
3SH205OE1.6	Perform effectively in interviews, workplace simulations, and job-search processes with professional confidence for enhanced employability.	C-3 P-3 A-3

Course Contents:

Unit 1	**Advanced Communication Dynamics:** Advanced interpersonal communication strategies; speech articulation; structuring thoughts and fluency techniques; analytical and critical communication; storytelling techniques for impactful presentations; persuasive communication models.	7 Hrs
Unit 2	**Global Workplace Etiquettes, Email Writing & GD–PI Perspective:** Professional greetings and workplace conduct; giving and receiving feedback; handling criticism and adaptability issues; professional values such as punctuality and attire; types of handshakes and significance; effective business email writing; types of Group Discussions, purpose of GDs; mock GDs (video-based); interview strategies and techniques.	8 Hrs
Unit 3	**Leadership, Team Dynamics & Corporate Skills:** Personality types using 9/9 matrix; leadership styles; emotional intelligence and leadership relationship; conflict resolution and negotiation techniques; team-building skills (Johari Window perspective); cross-cultural communication; creativity and design thinking; structured problem-solving and decision-making**.**	7 Hrs
Unit 4	**Strategizing Career Planning:** SMART goal setting; mapping skills to career paths; understanding industry expectations; emerging futuristic soft and hard skills (domain-wise); personalized career roadmap; certification planning (technical and non-technical); networking skills and participation in professional communities	7 Hrs
Unit 5	**Profile Building, Portfolio & Personal Branding:** ATS-friendly résumé preparation and common mistakes; video résumé creation and self-marketing pitch; LinkedIn profile optimization and networking strategies; developing online portfolios using platforms such as GitHub, Behance, Google Sites, and Toastmasters	8 Hrs
Unit 6	**Employment Readiness & Industry Integration:** Workplace simulation activities (mock emails, meetings, discussions); mock personal interviews; understanding sector-specific industry dynamics; unconventional career opportunities after engineering; job-hunting strategies and popular job platforms	8 Hrs

Text Books:

1. Alex K., Soft Skills, S. Chand Publishing
2. Meenakshi Raman & Prakash Singh, Business Communication, Oxford University Press

Reference Books:

1. Stephen R. Covey,The 7 Habits of Highly Effective People, Free Press Publication
2. Daniel Goleman, Emotional Intelligence, published by Bantam Books.
3. Shiv Khera, You Can Win, published by Bloomsbury Publishing
4. Richard N. Bolles, What Color Is Your Parachute? Published by Ten Speed Press, Crown Publishing Group

E Resources:

1. NPTEL: Soft Skills and Personality Development
2. LinkedIn Learning – Communication & Career Development Courses
3. Harvard Business Review – Communication & Leadership Articles
4. Coursera /edX – Career Development & Employability Skills Modules

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE1.1	2	3	2	–	–	–	–	2	3	–	–	1	2	1
3SH205OE1.2	–	2	–	–	–	2	3	3	3	–	–	1	2	2
3SH205OE1.3	–	3	2	–	–	2	2	3	–	–	–	1	2	2
3SH205OE1.4	–	3	3	–	–	2	–	–	–	2	3	–	3	–
3SH205OE1.5	–	2	3	–	3	–	–	–	2	–	2	–	3	1
3SH205OE1.6	–	2	2	–	2	2	–	2	3	–	2	1	2	2
3SH205OE1CO	1	3	2	-	1	2	1	2	2	1	1	1	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	3SH205OE2	Course Category:	OE
Course Name	**Team Building & Management**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3SH205OE2 Team Building & Management is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:
The Objective of the course is to develop teamwork capabilities, leadership and managerial skills, collaborative problem-solving abilities, conflict management techniques, and effective decision-making skills required in professional and organizational settings.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE2.1	Explain the principles and importance of effective team building in organizations to foster collaborative work culture.	C-2
3SH205OE2.2	Apply team dynamics and collaboration strategies to achieve common goals.	C-3 A-3
3SH205OE2.3	Analyze leadership styles and managerial roles for effective team performance.	C-4
3SH205OE2.4	Demonstrate conflict resolution, negotiation, and interpersonal management skills for effective team performance.	C-3 A-3
3SH205OE2.5	Apply motivation and performance management techniques in team-based environments for achieving organizational goals.	C-3
3SH205OE2.6	Perform effectively as a team member or leader in simulated managerial scenarios to develop leadership competencies	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Team Building:** Concept of teams; types of teams; stages of team development; characteristics of effective teams; roles and responsibilities of team members; barriers to effective teamwork; team norms and values.	7Hrs
Unit 2	**Team Dynamics & Interpersonal Relationships:** Group behavior and dynamics; interpersonal communication in teams; trust and collaboration; listening as a team skill; diversity and inclusion in teams; cross-cultural team management	8Hrs
Unit 3	**Leadership in Teams:** Leadership concepts; leadership styles; emotional intelligence and leadership; situational leadership; influence and power in teams; leadership ethics and responsibilities.	7 Hrs
Unit 4	**Conflict Management & Negotiation:** Sources and types of conflict; conflict resolution techniques; negotiation strategies; managing difficult team members; stress management; maintaining team harmony	7 Hrs
Unit 5	**Motivation, Performance & Team Effectiveness:** Motivation theories; team motivation techniques; goal setting and performance measurement; feedback and appraisal systems; decision-making in teams; problem-solving techniques.	8 Hrs
Unit 6	**Managerial Skills & Team-Based Applications:** Managerial roles and functions; planning, organizing, and controlling teams; delegation and coordination; workplace simulations (team meetings, role plays); case studies on team management; team performance evaluation.	8 Hrs

Text Books:

1. Stephen P. Robbins, Organizational Behavior, Pearson Education
2. L.M. Prasad, Management Principles and Practices, published by Sultan Chand & Sons

Reference Books:

1. Patrick Lencioni, The Five Dysfunctions of a Team, published by Jossey-Bass
2. Peter G. Northouse, Leadership, published by SAGE Publications
3. Daniel Goleman, Emotional Intelligence, published by Bantam Books

E Resources:

1. NPTEL – Organizational Behavior & Management Courses
2. LinkedIn Learning – Team Leadership & Management Modules
3. Harvard Business Review – Teamwork & Leadership Articles
4. Coursera / edX – Team Management and Leadership Courses

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3SH205OE2.1	2	–	–	–	–	–	–	–	–	–	–	1	2	2
3SH205OE2.2	–	2	2	–	–	–	–	3	2	–	–	1	2	3
3SH205OE2.3	–	3	3	–	–	–	–	2	–	–	–	–	2	3
3SH205OE2.4	–	2	2	–	–	2	3	3	–	–	–	–	2	3
3SH205OE2.5	–	2	2	–	–	–	–	2	–	2	–	–	2	3
3SH205OE2.6	–	2	2	–	–	2	–	3	2	–	2	1	2	3
3SH205OE2 CO	1	2	2	-	-	1	1	2	1	1	1	1	2	3

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3ME206PC1**		Course Category: **PCC**		
Course Name	**Thermal Engineering -ILab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3ME206PC1Thermal Engineering -I Lab is a compulsory Program Core Course for Second Year B.Tech. Mechanical Engineering Program.

Course Objectives:
The objective of this course is to offers hands-on experiments in thermodynamic systems, steam properties, gas laws, refrigeration, and engines to build skills in measurement, data analysis and performance evaluation.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ME206PC1.1	Perform and analyze experiments related to basic thermodynamic systems, processes, and gas laws to develop practical understanding and strengthen fundamental concepts of thermodynamics.	C-3, P-3
3ME206PC1.2	Conduct experiments on refrigeration, steam processes, and apply thermodynamic principles to real-life equipment to understand their working and evaluate performance in practical scenarios.	C-3, P-3
3ME206PC1.3	Compare and evaluate performance parameters of SI and CI engines through experimentation and data analysis to interpret engine behavior and enhance data-driven decision-making skills.	C-3, P-2, A-4

List of Practical's:
Minimum eight practical's from the list mentioned below.

1. Study of Thermodynamic System and Processes
2. Study of Zeroth Law and Temperature Measurement Devices
3. Verification of Gas Laws (Boyle's and Charles' Law)
4. Calculation of Gas Constant (R) for Air
5. Study of Steam Formation and Phase Change
6. Measurement of Dryness Fraction using Separating Calorimeter
7. COP Measurement of Refrigeration Test Rig
8. Basic Study of Engine Parameters

9. Study of SI Engine (Petrol Engine)
10. Study of CI Engine (Diesel Engine)

E-Resources:

1. https://introphyslab.sites.northeastern.edu/ideal-gas-law-and-absolute-temperature-virtual-lab/?utm_source
2. https://ht-amrt.vlabs.ac.in/?utm_source
3. https://learncheme.com/simulations/thermodynamics/thermo1/?utm_source
4. https://vmtiitg.vlabs.ac.in/Separating_and_Throttling_Calorimeter(procedure).html

Mapping of CO with POand PSO

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3ME206PC1.1	3	2	–	2	2	–	–	1	1	–	1	3	-	-
3ME206PC1.2	3	2	1	2	2	1	–	1	1	1	1	3	-	-
3ME206PC1.3	2	3	2	3	2	2	–	2	2	1	2	3	-	2
3ME206PC1	3	2	1	2	2	1	-	1	1	1	1	3	-	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial

Level: **5**	Course Code: **3ME207PC1**		Course Category: **PCC**		
Course Name	**Fluid Mechanics - Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3ME207PC1 Fluid Mechanics - Lab is a compulsory Program Core Course for Second Year B.Tech. Mechanical Engineering Program.

Course Objectives:
The objective of this course is to develop a clear understanding of the fundamental principles of fluid mechanics and to demonstrate the practical application of Bernoulli's equation. The course also aims to provide hands-on learning of the impact of jets on plane, inclined, and curved surfaces.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ME207PC1.1	To enable students to comprehend the fundamental physical properties of fluids and apply principles of fluid statics and fluid kinematics to analyze fluid behavior under static and dynamic conditions encountered in engineering applications.	C-4, P-3
3ME207PC1.2	To develop students' ability to apply Bernoulli's equation and Reynolds number concepts for analyzing energy conservation in fluid flow and for classifying flow regimes (laminar or turbulent) in practical fluid flow systems.	C-3, P-3
3ME207PC1.3	To equip students with analytical skills to estimate energy losses due to friction in pipe flows and to evaluate forces generated by jet impingement, enabling effective analysis and design of hydraulic and mechanical systems.	C-5, P-2 & A-4

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Study of manometer.
2. Determination of metacentric height.
3. Verification of Bernoulli's equation.
4. Determination of co-efficient discharge by Venturimeter.
5.Determination of co-efficient discharge by Orificemeter
6. Calculation of Reynolds number for Laminar & Turbulent flow.
7. Determination of co-efficient of friction (Major losses in Pipes) through pipe.
8. Determination of Minor losses in pipe.
9. Determination of Impact of Jet on Plane/Inclined/Curved surfaces.
10. Study of Boundary Layer over a Flat Plate

E-Resources:

1.https://fm-nitk.vlabs.ac.in/Target%20Audience.html?utm
2. https://me.iitp.ac.in/Virtual-Fluid-Laboratory/?utm
3.https://eerc03-iiith.vlabs.ac.in/?utm
4.https://www.nptelprep.in/courses/112106311/videos?utm

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ME207PC1.1	3	3	2	2	1	-	1	2	2	-	2	3	1	-
3ME207PC1.2	3	3	2	2	1	-	1	2	2	-	2	3	2	1
3ME207PC1.3	3	3	3	3	2	1	1	2	2	-	2	3	2	1
3ME207PC1CO	3	3	2	2	1	1	1	2	2	-	2	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3ME208PC1**		Course Category: **PCC**		
Course Name	**Strength of Material - Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3ME208PC1 Strength of Material - Lab is a compulsory Program Core Course for Second Year B.Tech Mechanical Engineering.

Course Objectives:
The objective of this course is to understand the fundamental mechanical properties of materials and their behavior under different types of loading, and to apply these concepts for analyzing stresses, strains, deflection, and failure in structural and machine components.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ME208PC1	Explain mechanical properties of materials to understand material behavior through laboratory testing.	C2
3ME208PC2	Conduct standard material tests to determine strength and elastic properties experimentally.	C4, P3
3ME208PC3	Interpret experimental results to correlate theory with practice while following professional lab practices.	A5, C5

List of Practicals:
Minimum Eight practicals from the list mentioned below.

1. To study the mechanical properties of engineering materials.
2. To conduct a tension test on metallic specimens for determining yield strength and modulus of elasticity.
3. To perform a compression test on materials to evaluate compressive strength.
4. To determine shear strength of metals.
5. To assess impact strength of metals using Izod/Charpy test.
6. To measure hardness of metals using standard hardness testing methods.
7. To analyze torsional behavior of metallic shafts by torsion testing.
8. To determine deflection of beams under applied loads.
9. To evaluate modulus of rupture for brittle material strength assessment.
10. To examine load–deflection characteristics of springs for stiffness evaluation.

E-Resources:

1. Strength of Materials – Prof. S. K. Bhattacharyya, IIT Kharagpur https://nptel.ac.in/courses/105105108
2. Virtual Lab: https://www.vlab.co.in

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3ME208PC1.1	3	2	1	1	1	-	-	-	1	1	-	2	2	-
3ME208PC1.2	3	3	2	3	2	-	-	-	2	2	1	2	3	2
3ME208PC1.3	2	2	1	2	2	2	1	3	3	3	2	1	2	2
3ME208PC1	3	2	1	2	2	1	1	1	2	2	1	2	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3ME209EM1**		Course Category: **EEM**		
Course Name	**Entrepreneurship in Mechanical Engineering**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 3ME209EM1Entrepreneurship in Mechanical Engineering is a compulsory course for Second Year B. Tech in Mechanical Engineering program.

Course Objectives:
The objective of the course is to introduce the concept of entrepreneurship in the context of mechanical engineering and develop the ability to identify, plan, and manage engineering-based ventures.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ME209EM1.1	Discuss entrepreneurial fundamentals and innovation process in Mechanical Engineering to develop creativity.	C-2
3ME209EM1.2	Apply business planning with engineering management skills to understand marketing strategies for engineering products.	C-3
3ME209EM1.3	Analyze financial, legal, environmental, and technological trends shaping Mechanical entrepreneurship to do Cost estimation, pricing, and break-even analysis.	C-4

Course Contents:

Unit 1	**Introduction to Entrepreneurship & Innovation:** Concept and definition of entrepreneurship. Role of entrepreneurs in economic and industrial development. Characteristics and types of entrepreneurs. Creativity, innovation, and idea generation in mechanical engineering. Feasibility analysis and opportunity identification. Case studies of successful mechanical start-ups and innovations.	10 Hrs

Unit 2	**Business Planning & Management in Engineering Ventures:** Steps in starting a new enterprise. Project identification and selection process. Preparation of project report/business plan. Feasibility analysis (technical, financial, market). Basics of management: planning, organizing, staffing, directing, and controlling. Leadership, team building, and marketing strategies for engineering products. Intellectual Property Rights (patents, trademarks, designs).	11 Hrs
Unit 3	**Financial, Legal & Support Systems for Entrepreneurs:** Sources of finance: government, venture capital, angel investors, crowdfunding. Cost estimation, pricing, and break-even analysis. Legal requirements for establishing an enterprise. Government schemes and institutional support (MSME, DIC, Startup India, etc.). Environmental and ethical issues in entrepreneurship. Emerging trends: Industry 4.0, sustainable and green entrepreneurship.	9 Hrs

Text Books:

1. S.S. Khanka, Entrepreneurship Development, S. Chand & Co.
2. Robert D. Hisrich, Michael P. Peters, and Dean A. Shepherd, Entrepreneurship, McGrawHill.
3. Vasant Desai, Entrepreneurship Development and Project Management, Himalaya Publishing House.

Reference Books:

1. Peter F. Drucker, Innovation and Entrepreneurship, The Classic Drucker Collection.
2. Vasant Desai, Small Scale Industries and Entrepreneurship, Himalaya Publishing House.

E-Resources:

NPTEL/SWAYAM:

1. https://shorturl.at/nptel-entre
2. https://shorturl.at/swayam-entre

E-Book:

3. https://shorturl.at/ignou-entre
4. https://shorturl.at/epathshala

Central Government Website:

5. https://shorturl.at/startupindia
6. https://shorturl.at/aimindia

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ME209EM1.1	3	-	-	-	-	3	3	-	-	-	2	-	2	-
3ME209EM1.2	3	-	-	-	-	3	3	-	-	-	2	-	-	-
3ME209EM1.3	3	-	-	-	-	3	3	-	-	-	2	-	-	-
3ME209EM1	3	-	-	-	-	3	3	-	-	-	2	-	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3SH210VE1**	Course Category:	**VEC**
Course Name	**Constitutional Values and Fundamental Duties**			
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks		PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 3SH210VE1 Constitutional Values and Fundamental Duties is a compulsory Values enhancement Course for Second Year B. Tech.

Course Objectives:
The objective of the course is to introduce the Indian Constitution, its historical background, fundamental values, rights, and duties.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH210VE1.1	Explain the historical background, making, and significance of the Indian Constitution to Understand the Constitution, Preamble, and core values.	C2
3SH210VE1.2	Interpret Fundamental Rights and Duties (Articles 12–35, 51A) to evaluate their implications through case studies in professional and civic life.	C3
3SH210VE1.3	Apply constitutional principles to engineering ethics, sustainability concerns (Articles 48A, 51A(g)), and demonstrate social commitment, innovation, and inclusive growth as nation builders.	C3

Course Contents:

Unit 1	**Introduction to the Constitution and Fundamental Values**: Overview of the Indian Constitution – Historical background and making of the Constitution; Meaning of Constitution; Preamble – Meaning and significance. Core Constitutional Values – Justice (Social, Economic, Political); Liberty (thought, expression, belief, faith, worship); Equality (status and opportunity); Fraternity (dignity and unity of the nation). Relevance of constitutional values for professionals and citizens.	10 Hrs

Unit 2	**Fundamental Rights and Duties**: Fundamental Rights (Articles 12–35) – Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies. Fundamental Duties (Article 51-A) – Importance and implications; Role of youth and professionals in upholding duties. Case studies highlighting real-life significance of rights and duties.	10 Hrs
Unit 3	**Application of Constitutional Values in Engineering and Public Life**: Ethical Responsibilities and Constitutional Alignment – Engineering ethics and public interest; Environment and sustainability as constitutional concern (Articles 48A, 51A(g)); Engineers as nation builders – Social commitment, innovation, and inclusive growth.	10 Hrs

Text Books:

1. Basu D. D., Introduction to the Constitution of India, LexisNexis Publication, New Delhi (Twenty-Third Edition).
2. Jain M. P., Constitution of India, LexisNexis Publication, New Delhi (Eighth Edition).
3. Laxmikanth M., Indian Polity, McGraw Hill Education, New Delhi (Sixth Edition).
4. Austin Granville, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, New Delhi.
5. Shukla V. N., Constitution of India, Eastern Book Company, Lucknow (Twelfth Edition).
6. Government of India, Constitution of India (Bare Act), Government of India Publication, New Delhi.

Reference Books:

1. Subhash Kashyap, Our Constitution, National Book Trust, New Delhi.
2. Durga Das Basu, Shorter Constitution of India, LexisNexis Publication.
3. P. M. Bakshi, The Constitution of India, Universal Law Publishing.
4. J. N. Pandey, Constitutional Law of India, Central Law Agency.
5. Seervai H. M., Constitutional Law of India, N. M. Tripathi Pvt. Ltd. (Vols. I–III).
6. B. Shiva Rao, The Framing of India's Constitution: A Study, Indian Institute of Public Administration.
7. D. C. Wadhwa, Political Science and Constitutional Law, Eastern Book Company.
8. Madhav Khosla, The Indian Constitution: Oxford India Short Introductions, Oxford University Press.

E Resources:

1. NPTEL course on Constitutional Studies, Prof. Sudhir Krishnaswamy, National Law School of India University
2. Constitutional Values and Fundamental Duties (University of Delhi – aligned with NEP 2020, available via NPTEL/DU open learning) https://kmc.du.ac.in/kmcouter/collnews/download/40727448169063791359.pdf/LinkedContents/pdf/All/All

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH210VE1.1	3	2	-	1	-	-	-	-	-	-	-	1	2	1
3SH210VE1.2	-	3	2	2	-	2	3	3	-	-	-	1	2	1
3SH210VE1.3	-	-	3	3	-	2	3	2	-	2	-	1	2	2
3SH210VE1CO	1	2	2	2	-	2	2	2	-	1	-	1	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3ME400FP1**	Course Category:	**FP**
Course Name	**Field Project**				
Credits	**02**	Total L:T:P Hours	0:0:4 **60 Hrs**	Total SL Hours	**--**
Total Credit Hours	**60 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3ME400FP1Field Projectis a compulsory Experiential Learning Course for Second Year B. Tech Mechanical Engineering

Course Objectives:
The objective of this course is to provide students real-world exposure to industrial, community, or field environments relevant to mechanical engineering. Also to develop problem-solving, teamwork, and communication skills through hands-on project work.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ME400FP1.1	Conduct field visits, collect relevant data, and analyze engineering problems to identify and define real-world problems related to mechanical or allied systems.	C-4, P-3
3ME400FP1.2	Develop feasible technical solutions or improvement strategies for identified problems andPrepare a project report with proper documentation, analysis, and presentation.	C-5, C-6, P-4
3ME400FP1.3	Demonstrate teamwork, professional ethics, and communication during project execution.	A-3

Course Contents:

Module	Description	Hours
Module 1	Orientation & Sensitization	4
Module 2	Field Visit & Problem Identification	24
Module 3	Problem–Solution Design & Implementation	20
Module 4	Documentation, Presentation & Reflection	12

Note:

1. Students must collaborate within their assigned practical batches. Each batch should be further divided into subgroups, with five students per subgroup, in accordance with the prescribed guidelines.
2. **Projects (Must select from the guidelines provided)**

1. Study of manufacturing processes in a local industry
2. Maintenance practices and condition monitoring
3. Energy audit and efficiency improvement in machines
4. Design and fabrication of simple mechanical systems (e.g., pedal pump, hydraulic jack, or solar dryer)
5. Reverse engineering and 3D modeling of mechanical parts
6. Lean manufacturing or productivity improvement study

3. Suggested Mechanical Project Themes

1. Development of low-cost agricultural implements
2. Water conservation or irrigation system design
3. Waste management or recycling system for local area
4. Design of ergonomic devices for physically challenged persons
5. Energy conservation awareness campaigns or devices
6. Renewable energy-based mechanical applications.

4. Documentation /Project Report Format:

The Documentation /Project Report shall contain the following sections:

1. Title Page
2. Certificate & Declaration
3. Abstract
4. Introduction (Community + Mechanical relevance)
5. Objectives
6. Literature Survey
7. Methodology (Survey + Technical)
8. Problem Identification
9. Proposed E&TC Solution
10. Implementation / Simulation
11. Results & Analysis
12. Community Feedback & Social Impact
13. Conclusion & Future Scope
14. References
15. Appendices (Photos, questionnaires, certification letter issued by the Gram Panchayat office)

Course Plan:

Lecture No.	Module Title	Topic	Hours
1	**Module1: Orientation & Sensitization**	NEP 2020: Community Engagement & Role of Engineers, Ethics, Social Responsibility & SDGs for Civil Engineers, Overview of Rural & Urban Communication Infrastructure, Identification of Community Institutions (GP, School, Self Help Group (SHG), Health Centre), Field Safety, Team Formation, Area & Theme Allocation, Reorganization	4
2	**Module 2: Field Visits & Problem Identification**	Pre-Visit Study, Permissions &Planning	24
3		Conduct field visits and survey to understand the working process of each elements.	
4		Field Data Collection & Technical Observation	
5		Problem Identification or scope for improvement	
6	**Module3: Engineering Problem–Solution Design & Implementation-**	Literature review & relevant data collection	20
7		Analysis of Collected Field Data and Identification of Problems	
8		Preparation alternative feasible solutions	
9		Design and Develop solution, its cost estimation	
10		Experimentation & analysis of solution	
11		Evaluation of Feasibility and Expected Community Benefits	
12		Implementation of solution	
13	**Module4: Documentation, Presentation & Reflection**	Data Analysis & Graphical Representation, Writing Methodology & Analysis Sections, Results, Discussion & Conclusion	12
14		Project Report Structure & Guidelines, Report Finalization, Presentation Preparation	
15		Evaluation and Viva	

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE400FP1.1	3	3	2	3	2	1	1	2	2	2	3	2	2	-
3CE400FP1.2	3	2	3	3	3	1	2	1	2	3	3	1	2	-
3CE400FP1.3	1	1	2	1	1	3	3	3	3	3	3	2	2	2
3CE400FP1CO	3	2	3	3	3	2	2	2	3	3	3	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3AL001NC1**		Course Category: **NC**		
Course Name	**Disaster Management and Preparedness**				
Credits	--	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	--
Total Credit Hours	--				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	--	Total Marks	--

Course Description:
Subject Code 3CE001NC1 Disaster Management and Preparedness is a Compulsory Non-Credit course for Second Year B. Tech all disciplines.

Course Objectives:
The objective of this course is to provide students with a comprehensive understanding of disasters, their types, impacts, the complete disaster management cycle, and the roles of various agencies in Disaster Risk Reduction.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE001NC1.1	Identify the concepts of disaster, hazard, vulnerability and risk, and classify disasters to understand the basic nature, causes and profiles of disasters in India.	C-2
3CE001NC1.2	Analyze the disaster management cycle for risk assessment, mitigation, preparedness, response, recovery, and international disaster management frameworks.	C-4
3CE001NC1.3	Apply disaster management practices, including stakeholder roles, national policies, engineers' responsibilities, and preparedness measures for effective disaster risk reduction.	C-3

Course Contents:

Unit 1	**Introduction to Disaster Management:** Concepts and definitions – disaster, hazard, vulnerability, risk, severity, frequency, exposure, capacity, and impact; classification of disasters- Natural disasters: earthquakes, tsunami, landslides, mining, Hydro-Meteorological Disasters: floods, draught, cyclones, coastal erosion. Biological Disaster: epidemics, pest attacks, forest fire, Manmade disasters: Industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, vulnerability profile of India, ecological fragility; principles of disaster prevention and mitigation	10 hrs

Unit 2	**Disaster Management Cycle and Framework:** Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development. Awareness During Disaster – Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation. Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action Phases of disaster management; vulnerability and capacity assessment, post-disaster environmental response	12 hrs
Unit 3	**Disaster Management practices:** Roles and responsibilities of government, community, local bodies, NGOs, and other stakeholders, National Policy on Disaster Management Act 2005 Mega Disasters of India and Lessons Learnt, Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster.	8 hrs

Textbooks:

1. Sharma, S. C. (2022). Disaster Management, Khanna Publication.
2. Subramanian, R. (2024). Disaster Management. Vikas Publication.

Reference Books:

1. Gaur, R. C. (2018). Environmental Engineering and Disaster Management. New Age International.
2. Pradeep Sahni, 2024, Disaster Risk Reduction in South Asia, Prentice Hall.
3. Mondal, D. (2022). Disaster Management. New Delhi: CBS Publishers & Distributors
4. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
5. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
6. Natural Disaster Management Policy ,2009,GOI
7. H.N. Shrivastava& G.D. Gupta, Management of Natural Disasters in developing Countries, Daya Publishers , Delhi
8. S.L. Goyal, Encyclopedia of disaster Management, Vol I,II& III Disaster Managemnt Policy and administration, Deep & Deep, New Delhi,2006
9. Coppola D P, Introduction to International Disaster Management, Elsevier Science (B/H), London, 2007
10. Disaster Mitigation in Asia & Pacific, Asian Development Bank

Course Assignments

Internal Assessment at Institute level will be based on following assignments:

1) Study of Recent Disasters (at local, state and national level)
2) Preparation of Disaster Risk Management Plan of and Area or Sector
3) A Case study on Disaster Management

E Recourses:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed61/preview

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE001NC1.1	3	2	-	-	-	3	2	-	-	-	3	-	-	-
3CE001NC1.2	3	3	-	-	-	3	3	-	-	-	3	2	2	-
3CE001NC1.3	3	3	-	-	-	3	3	-	-	3	3	1	2	2
3CE001NC1.CO	3	3	-	-	-	3	3	-	-	1	3	1	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: 3ME211DH1		Course Category: **DH**		
Course Name	**Principles of Robotics**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3ME211DH1Principles of Robotics is a for Double Minor / Double Minor / Course offered as Honours by department of Mechanical Engineering for Second Year B.Tech., for all Discipline.

Course Objectives:
The objective of the course is to introduce the fundamental concepts, terminology, and classifications of robots and robotic systems to develop an understanding of the kinematic and dynamic modeling of robotic manipulators.

CO	Course Outcome	Domain Level
3ME211DH1.1	Explain the fundamentals, classification, and historical evolution of robotics along with various robot configurations and their performance parameters	C-2
3ME211DH1.2	Identify and describe the structural elements of robots, including links, joints, end-effectors, actuators, and drive mechanisms used for different applications.	C-2
3ME211DH1.3	Demonstrate understanding of various types of sensors, feedback devices, and signal conditioning techniques used for robot perception and control.	C-3
3ME211DH1.4	Illustrate basic concepts of robot motion, degrees of freedom, workspace, trajectory planning, and simple motion control strategies for how to plan and control trajectories for precise and efficient task execution.	C-3
3ME211DH1.5	Develop simple robot programs for basic industrial tasks such as pick-and-place, assembly, and welding using standard programming approaches and simulation tools.To gain practical skills in programming robots for common industrial tasks	C-4

3ME211DH1.6	Analyze different industrial and service applications of robotics and discuss emerging trends such as AI, IoT, collaborative robots, and ethical issues in robotic automation.	C-5

Course Contents:

Unit 1	**Introduction to Robotics:** Definition and scope of robotics, History and evolution of robots, Basic components of a robot – structure, actuators, sensors, controller, power supply, Types of robots and their configurations (Cartesian, cylindrical, SCARA, articulated), Robot specifications and performance parameters, Areas of application – manufacturing, service, agriculture, medical, and defense	8 Hrs
Unit 2	**Robot Structure and Components:** Links and joints – revolute, prismatic, and other types, End effectors – grippers, tools, and their selection, Common materials used for robot construction, Drives and power transmission systems – belt, gear, and chain drives, Overview of actuators and basic working principles – electric, pneumatic, and hydraulic systems	8 Hrs
Unit 3	**Sensors and Feedback Devices:** Role of sensors in robotics, Internal sensors: position, speed, and current sensors, External sensors: proximity, force, temperature, and vision sensors, Simple signal conditioning and data acquisition, Feedback systems and introduction to closed-loop control	7 Hrs
Unit 4	**Basics of Robot Motion and Control:** Concept of degrees of freedom, Robot motion terminology: workspace, path, and trajectory, Simple joint and Cartesian motion, Introduction to kinematics (concept only, without derivation) Basic motion control strategies – open-loop and closed-loop, Introduction to path control and trajectory planning (conceptual overview)	7 Hrs
Unit 5	**Robot Programming and Simulation:** Introduction to robot programming – online and offline methods, Simple programming examples for pick-and-place, assembly, and welding tasks, Overview of standard robot programming languages	7 Hrs

Unit 6	**Robotics Applications and Future Trends:** Industrial applications – material handling, welding, assembly, and inspection, Robots in healthcare, defense, agriculture, and domestic service, Introduction to collaborative robots (cobots), Mobile robots and autonomous vehicles – basic concepts, Emerging trends: AI in robotics, Industry 4.0, IoT and robotic automation, Ethical and social issues in robotics	8 Hrs

Text Books:

1. S. K. Saha, Introduction to Robotics, Tata McGraw-Hill.
2. Mikell P. Groover, Industrial Robotics: Technology, Programming, and Applications, McGraw-Hill.
3. John J. Craig, Introduction to Robotics: Mechanics and Control, Pearson Education.

Reference Books:

1. Mikell P. Groover, Industrial Robotics: Technology, Programming, and Applications, McGraw-Hill.
2. Robert J. Schilling, Fundamentals of Robotics: Analysis and Control, PHI.
3. Peter Corke, Robotics, Vision and Control, Springer.

E-Resources:

6. https://github.com/correll/Introduction-to-Autonomous-Robots
7. https://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-2005

Course Outcomes:

After completing the course students will be able to:

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ME211DH1.1	3	2	1	-	-	-	-	-	-	-	1	1	-	-
3ME211DH1.2	3	2	2	1	1	-	-	-	-	-	1	1	1	-
3ME211DH1.3	2	2	2	2	3	-	-	-	-	-	1	-	1	1
3ME211DH1.4	2	3	2	3	-	-	-	-	-	-	1	-	1	-
3ME211DH1.5	2	3	3	2	3	-	2	2	2	2	1	-	1	-
3ME211DH1.6	2	2	2	-	3	3	2	3	2	2	1	-	1	-
3ME211DH1	3	3	2	2	3	3	2	3	2	2	1	1	1	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: 3ME211DH2		Course Category: **DH**		
Course Name	**Energy Resource, Environment and Economics**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3ME211DH2EnergyResource, Environment and Economics is a for Double Minor / Double Minor / Course offered as Honours by department of Mechanical Engineering for Second Year B.Tech., for all Discipline.

Course Objectives:
The objective of the course is to understand various conventional and renewable energy resources, their technologies, and patterns of energy utilization and apply economic principles to evaluate energy systems, including cost analysis, feasibility, and energy policy considerations.

CO	Course Outcome	Domain Level
3ME211DH2.1	Explain the classification of energy resources, energy systems, energy demand–supply dynamics, and energy planning concepts.	C-2
3ME211DH2.2	Describe the working principles, advantages, limitations, and challenges of conventional energy systems such as thermal, hydro, and nuclear power plants.	C-2
3ME211DH2.3	Analyze renewable and emerging energy technologies for sustainable energy applications.	C-4
3ME211DH2.4	Evaluate environmental impacts of energy systems using sustainability concepts and life-cycle assessment (LCA).	C-5
3ME211DH2.5	Apply engineering economic principles to perform cost analysis, life-cycle costing, and economic comparison of energy projects.	C-3
3ME211DH2.6	Assess energy policies, management strategies, and future energy transitions for sustainable development.	C-5

Course Contents:

Unit 1	**Introduction to Energy Systems and Resources:** Classification of energy resources: Conventional & non-conventional Global and national energy scenario & consumption patterns. Primary, secondary, commercial, and non-commercial energy. Energy units, conversions, and energy chains. Basics of energy demand–supply and sector-wise distribution. Energy planning and integrated resource planning.	8 Hrs
Unit 2	**Conventional Energy Resources:** Coal, petroleum, and natural gas: origin, extraction, utilization. Thermal power plants: working principles, efficiency, emissions. Hydropower: site selection, types, advantages and limitations. Nuclear energy: fission, fusion, reactors, safety, waste disposal. Issues with fossil fuels: depletion, pollution, energy security.	8 Hrs
Unit 3	**Renewable and Emerging Energy Resources:** Solar energy: photovoltaic and thermal systems, applications. Wind energy: site selection, turbine basics, performance. Biomass and biofuels: conversion technologies and applications. Geothermal, tidal, wave and ocean thermal energy. Hydrogen economy and fuel cells – potential and challenges. Hybrid and integrated renewable systems.	7 Hrs
Unit 4	**Energy, Environment, and Sustainability:** Environmental impacts of energy production and consumption. Air, water, and soil pollution from energy systems. Climate change, greenhouse gases, and global warming. Life-cycle assessment (LCA) of energy systems. Sustainable energy development and low-carbon technologies. Environmental regulations, policies, and international agreements (e.g., COP, Kyoto, Paris).	7 Hrs
Unit 5	**Energy Economics and Costing:** Basics of engineering economics applied to energy systems. Time value of money, cost–benefit analysis, payback period. Life-cycle cost (LCC) and levelized cost of energy (LCOE). Fuel cost, operation & maintenance cost estimation. Externalities and social cost of energy. Economic comparison of conventional vs renewable projects.	7 Hrs
Unit 6	**Energy Planning, Policy, and Future Trends:** National and international energy policies and strategies. Energy pricing, subsidies, taxation, and incentives. Energy audits and management for industries and buildings. Demand-side management (DSM) and integrated energy planning. Smart grids, distributed generation, and prosumer models. Future energy transitions and sustainable development goals (SDGs).	8 Hrs

Text Books:

1. Subhes C. Bhattacharyya, Energy Economics: Concepts, Issues, Markets and Governance, Springer London.
2. Tom Tietenberg & Lynne Lewis, Environmental and Natural Resource Economics, 12th Edition, Routledge, 2024.
3. Peter M. Schwarz, Energy Economics, 2nd Edition, Routledge (Taylor & Francis Group), published 2022/2023.

Reference Books:

1. Narendra N. Dalei & Anshuman Gupta, Economics and Policy of Energy and Environmental Sustainability, 1st Edition, Springer Singapore, 2022.
2. Jonathan M. Harris & Brian Roach, Environmental and Natural Resource Economics, 6th Edition, Routledge, 2026.
3. Tom Tietenberg & Lynne Lewis, Natural Resource Economics, 2nd Edition, Routledge, 2025.

E-Resources:

1. https://archive.nptel.ac.in/courses/109/101/109101171/.
2. https://www.nptelprep.in/courses/109101171/materials

Course Outcomes:

After completing the course students will be able to:

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3ME211DH2.1	3	2	-	-	-	1	2	-	-	-	1	1	-	-
3ME211DH2.2	3	2	1	-	-	1	2	-	-	-	1	1	1	-
3ME211DH2.3	3	3	2	-	2	2	3	-	-	-	1	-	1	-
3ME211DH2.4	2	2	1	-	2	2	3	-	-	-	1	-	1	-
3ME211DH2.5	2	2	2	-	-	1	2	2	-	3	1	-	1	-
3ME211DH2.6	2	2	1	-	-	2	2	3	-	2	1	-	1	-
3ME211DH2	2	2	1	-	1	2	2	1	-	1	1	1	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4ME212PC1**		Course Category: **PCC**		
Course Name	**Manufacturing Processes**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 4ME212PC1Manufacturing Processesis a Program Core Course offered to Second Year B.Tech Mechanical Engineering Program.

Course Objectives:
The objective of the course is to introduce fundamental manufacturing concepts and to impart knowledge of materials and various manufacturing processes.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ME212PC1.1	Describe the principles and operations of casting processes, including pattern making, moulding, melting furnaces, and defect analysis for understanding the principles and operational steps of casting.	C-2
4ME212PC1.2	Explain the principles, operations, and applications of various welding and joining processes along with their defects and inspection methodsfor understanding the principles, operations, applications, of various welding and joining processes.	C-2
4ME212PC1.3	Understand the principles and applications of hot and cold working processes and various metal forming operations for understanding various metal forming operations used in manufacturing.	C-2
4ME212PC1.4	Identify the mechanics of metal cutting, tool geometry, and lathe operations involved in various machining processes for understanding mechanics of metal cutting & tool geometry.	C-2
4ME212PC1.5	Discuss the construction, working, and applications of drilling, milling, grinding, and finishing processes used in manufacturing for understanding the construction and working principles of different machines.	C-2

4ME212PC1.6	Understand the principles, processes, and applications of additive manufacturing technologies such as FDM, SLA, and SLS for understanding the principles and applications of additive manufacturing.	C-2

Course Contents:

Unit 1	**Introduction to Casting processes:** Introduction to pattern making, types of patterns, pattern materials, pattern allowances, core print, core box, moulding sands & their properties, types of moulding, gating system. Melting furnaces, cupola, electric arc furnace, induction furnace. Casting processes & their principle of operation, permanent mould casting, die casting, centrifugal casting, investment casting. Casting defects.	7 Hrs
Unit 2	**Joining processes:** Mechanical joining processes, Mechanical fastening, riveting, soldering, brazing. Different types of welding processes, principle and working: Weldability, Arc welding, Submerged arc welding, Resistance welding Forge welding, Plasma arc, Heat generation of resistance welding processes such as spot welding, projection welding, butt welding. Gas welding principle and working: Oxy-acetylene welding, Tungsten Inert Gas (TIG) & Metal Inert Gas (MIG) welding. Special Welding Processes: Friction welding, Ultrasonic welding, Electron Beam, Laser Beam welding, Thermit welding and welding defects.	8 Hrs
Unit 3	**Mechanical Working of Metals:** Principle of hot and cold working process and its types, Extrusion, piercing, pipe and tube production, manufacture of seamless pipe. Shearing operations, tube drawing, wire drawing, spinning, embossing and coining, squeezing and bending operations, rotary swaging, forging and drawing, rolling and types of rolling mills.	7 Hrs
Unit 4	**Theory of metal cutting:** Mechanics of metal cutting, chip formation process, tool material, classification of tools, Single point cutting tool geometry, tool life, tool failure, Construction and working principle and accessories of lathe machine, lathe operations like- turning, facing, thread cutting, knurling, taper turning and its methods. Introduction to CNC lathe machine.	7 Hrs

Unit 5	**Milling, Drilling & Grinding:** Milling machines: types of milling, types of milling cutters, types of indexing. Introduction to CNC milling machine. Construction & working of drilling machine, types of drilling machine. Introduction to boring, broaching and reaming operations. Grinding operation and wheel selection. Honing, lapping, super finishing, buffing & burnishing processes.	9 Hrs
Unit 6	**Additive Manufacturing:** Introduction to Additive Manufacturing: Concept of Rapid Prototyping, Definition and concept of Additive Manufacturing (AM), Comparison between additive, subtractive, and formative manufacturing, Advantages, limitations, and applications of AM. Classification and Overview of AM Processes, Additive Manufacturing Process Steps. Principle, working, materials used, advantages, and limitations of Fused Deposition Modeling (FDM), Stereolithography (SLA), Selective Laser Sintering (SLS).	7 Hrs

Textbooks:

1. Chapman W. A., Workshop Technology, Vol. II, III and I, Edward Arnold Pub. Ltd. London.
2. Hajra Chaudhary S. K., Elements of workshop technology Vol. I & II, Media Prom & pub, Mumbai.
3. P. N. Rao, Manufacturing technology Vol. II McGraw Hill 1998

Reference books:

1. Workshop Technology, O.P Khanna, Dhanpatrai& sons.
2. Workshop Technology Vol. II, B. S. Raghuvanshi.

E-Resources:

1. https://link.springer.com/book/10.1007/978-3-030-21066-3
2. https://www.sciencedirect.com/book/9780080523958/manufacturing-engineers-reference-book?utm_source=chatgpt.com
3. https://openlibrary.org/subjects/manufacturing_processes?utm_source=chatgpt.com
4. https://welib.org/md5/83c3bfdbf1e9a60ce30a7c8f8cdca36e?utm_source=chatgpt.com
5. https://www.kopykitab.com/Manufacturing-Processes-Second-Edition-Vol-I-by-PUBLIC-DOMAIN?utm_source=chatgpt.com

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4ME212PC1.1	3	2	2	1	2	-	-	-	1	1	-	2	1	-
4ME212PC1.2	3	2	2	2	1	-	-	-	-	1	-	2	2	-
4ME212PC1.3	3	2	2	1	1	-	-	-	1	1	-	2	1	-
4ME212PC1.4	3	2	2	1	1	-	-	-	1	-	-	2	1	-
4ME212PC1.5	3	2	2	1	1	-	-	-	1	1	-	2	1	-
4ME212PC1.6	3	2	3	2	3	-	1	-	1	1	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4ME213PC1**		Course Category: **PCC**		
Course Name	**Material Science and Nano Technology**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 4ME213PC1Material Science and Nano Technology is a compulsory Program Core Course for Second Year B.Tech. Mechanical Engineering Program.

Course Objectives:
The objective of this course is to provide students with a comprehensive understanding of the structure, properties, and behavior of various engineering materials, and to introduce the fundamental concepts of nano-materials and nano-technology.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ME213PC1.1	Explain the basic principles of process, physical, and mechanical metallurgy, and relate the structure and composition of metals and alloys to understand their properties using phase relationships and the lever rule.	**C2**
4ME213PC1.2	Interpret binary phase diagrams and the iron–carbon equilibrium diagram, identify critical temperatures and invariant reactions, and explain the advantages and applications of composite materials for effective material selection.	**C4**
4ME213PC1.3	Explain the purpose of alloying, classify alloy steels, and assess the effect of alloying elements on steel properties and to understand their engineering applications	**C2**
4ME213PC1.4	Compare the constitution, properties, and applications of cast irons and common non-ferrous alloys such as brass, bronze, and aluminium alloys for appropriate material selection.	**C2**

4ME213PC1.5	Explain metal-working processes including hot and cold working, work hardening, strain ageing, recovery, recrystallization, and grain growth, and assess their impact on microstructure and mechanical properties.	**C3**
4ME213PC1.6	Describe the applications of powder metallurgy and explain the fundamentals, properties, applications, and environmental and health aspects of nanotechnology and nanomaterials.	**C2**

Course Contents:

Unit 1	**Introduction to Metallurgy:** Introduction to metallurgy: Basic concept of process metallurgy, physical metallurgy, and mechanical metallurgy, Classification of materials & their application, Structure of metals and alloys, formation of Alloys, Solid solutions, types and their formation, Lever rule for phase mixtures.	5 Hrs
Unit 2	**Study of Binary Phase Diagrams, Iron–Carbon System and Introduction to Composite Materials:** Study of binary equilibrium diagram and invariant reactions, Construction and study of Iron-carbon Equilibrium Diagram, Critical temperatures, Introduction to composite materials, advantages and applications.	5 Hrs
Unit 3	**Alloy Steels:** Purpose of alloying, Classification of alloy steels, classification of alloying elements, Alloying elements and their effect on properties of steels, properties and applications of OHNS steels, Hadfield's Manganese steels, High speed steels,Ferritic, Austenitic and Martensitic stainless steels.	5 Hrs
Unit 4	**Cast iron and Non-Ferrous Metals& Alloys:** Constitution and properties of White, Gray, Nodular and Malleable cast irons; and their applications. Non-ferrous metals and alloys: Properties, Composition and applications of Cartridge Brass, Admiralty Brass, Muntz Metal, Phosphor Bronze, Aluminium Bronze, Aluminium Alloy -Duralumin. Season Cracking.	5 Hrs
Unit 5	**Mechanical working of Metals and Powder Metallurgy:** Hot and cold working, Relative advantages and disadvantages, Work hardening, Strain Ageing; Recovery, Recrystallization and grain growth. **Powder Metallurgy:** Concept, Advantages, limitations and applications of Powder Metallurgy.	5 Hrs

Unit 6	**Introduction to Nanotechnology:** Definition, scope, and importance of nanotechnology. Environmental and health issues in nanotechnology. Introduction, Properties, Applications of Nano materials. Future Perspectives of Nanomaterials.	5 Hrs

Text Books:

1. Sidney H Avner, Introduction to physical metallurgy, TATA Mc-Graw hill
2. R.K.Rajput, Engineering materials & metallurgy, S Chand Publication.
3. V.D. Kodgire, Material Science & Metallurgy, Everest Publication House.
4. C. N. R. Rao, Achim Müller, A. K. Cheetham, The Chemistry of Nanomaterials: Synthesis, Properties and Applications, Publisher: Wiley-VCH
5. T. Pradeep, *A Textbook of Nanoscience and Nanotechnology*, McGraw Hill.

Reference Books:

1. G. E. Dieter, Mechanical Metallurgy, G. E. Dieter, Mc- Graw Hill International, London 3rd Edn. 1999
2. Clarke and Varney, Physical metallurgy for engineers, Second Edn.,1987.
3. A.K Sinha, Power metallurgy, Dhanpat Rai & Sons.
4. Y Lakhtin, Engineering physical Metallurgy, Mir Publications. Second Ed. 1999
5. C. Daniel Yesudian,Materials Science and Metallurgy.Scitech Publication (India) Pvt. Ltd.
6. Dinesh C. Agrawal, Introduction to Nanomaterials, Oxford University Press

E-Resources:

1. http://www.digimat.in/nptel/courses/video/113104068/L26.htmlto L60.html
2. http://kcl.digimat.in/nptel/courses/video/112104195/lec12.pdf
3. https://www.coursera.org/specializations/materials-science-for-technological-application
4. http://kcl.digimat.in/nptel/courses/video/112107145/lec1.pdf
5. https://www.coursera.org/learn/introduction-to-materials-science
6. https://www.coursera.org/learn/nanotechnology

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4ME213PC1.1	3	2	1	-	-	-	-	-	-	1	-	1	2	1
4ME213PC1.2	3	3	2	1	-	-	-	-	-	1	-	1	3	1
4ME213PC1.3	3	2	2	-	-	-	-	-	-	1	-	1	3	1
4ME213PC1.4	3	2	2	-	-	-	-	-	-	1	-	1	3	1
4ME213PC1.5	3	3	3	2	1	-	-	-	-	-	-	1	3	1
4ME213PC1.6	3	2	1	-	-	2	-	-	-	-	-	1	2	3
4ME213PC1	3	2	2	2	2	1	-	-	-	1	-	1	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4ME214PC1**		Course Category: **PCC**		
Course Name	**Hydraulic and Pneumatic Systems**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code4ME214PC1Hydraulic and Pneumatic Systems is a compulsory Program Core Course for Second Year B.Tech. Mechanical Engineering Program.

Course Objectives:
The objective of this course is to provide fundamental knowledge of hydroelectric power plants and hydraulic machines—including turbines and pumps—along with an understanding of their working principles, performance characteristics, and the behaviour of compressible fluid flow.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ME214PC1.1	To enable students to understand the working principles, classification, and basic operation of prime movers and hydraulic turbines used for energy conversion in mechanical systems.	C-2
4ME214PC1.2	To develop students' ability to analyze, design, and evaluate the performance characteristics of hydraulic turbines for efficient power generation and engineering applications.	C-4
4ME214PC1.3	To help students understand the operating principles, classification, and applications of water lifting devices used in hydraulic and irrigation systems.	C-2
4ME214PC1.4	To equip students with the capability to analyze, select, and apply centrifugal and reciprocating pumps for suitable industrial, municipal, and mechanical engineering applications.	C-4
4ME214PC1.5	To enable students to understand and apply basic principles of compressible fluid flow, including flow through nozzles and pipes, relevant to pneumatic and gas flow systems.	C-3

4ME214PC1.6	To develop students' ability to integrate hydraulics and pneumatics concepts in problem-solving, design, and mini-projects addressing real-world mechanical engineering challenges.	C-6

Course Contents:

Unit 1	**Hydraulic Turbines**: Basic classification of Turbines, Theory of impulse and reaction turbines, Pelton wheel Turbinetheir construction, classification, analysis, characteristics.	5 Hrs
Unit 2	**Reaction Turbines**: Theory of Francis and Kaplan turbines, their construction, classification, analysis, characteristics and governing, draft tube .	5 Hrs
Unit 3	**Axial flow pump**: Basic theory, construction, & operation. **Other water lifting devices**: (a) Air lift pump. (b) Jet Pump. (c) Hydraulic Ram. **Computational Fluid Dynamics (CFD):** Introduction to CFD: Necessity, limitations, philosophy behind CFD, applications	5 Hrs
Unit 4	**Pumps**: Centrifugal pumps Basic Theory, classification, construction, operation, characteristics, multistage, NPSH and cavitations in pumps, Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels. Comparison of centrifugal and reciprocating pumps, performance characteristics	5 Hrs
Unit 5	**Hydraulics**: Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic coupling, hydraulic torque converter.	5 Hrs
Unit 6	**Introduction to Pneumatics**: Definition of pneumatics, Comparison of pneumatic, hydraulic, and electric systems. Air Treatment Units-Air filtration, Air dryers, Air lubrication, Air Regulation, FRL unit symbol and working.	5 Hrs

Text Books:

1. CSP Ojha, R. Berndtsson, Fluid mechanics and machinery, Oxford University.
2. R.K.Bansal, Fluid mechanics and fluid machines, Laxmi publications.

Reference Books:

1. Jagdish Lal, Hydraulic machines, Metropolitan Book Co. Pvt. Ltd
2. Dr. Modi & Seth, Hydraulics and Fluid Mechanics, Standard house book.
3 Sen gupta, Computational fluid dynamics, Pearson Publishers.
4 Sameer sheikh, Iliyas Khan, Treaties on Hydraulics, Pneumatics, R.K. Publication.

E-Resources:

1. https://www.nptelprep.in/courses/112106300?utm
2. https://link.springer.com/book/10.1007/978-981-19-0855-2?utm
3. https://hydraulicsonline.com/technical-knowledge-hub/ebooks/?utm
4. https://onlinecourses.nptel.ac.in/noc25_me58/preview?utm
5. https://swayam.gov.in/nc_details/NPTEL?utm

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4ME214PC1.1	3	2	1	-	-	1	-	-	-	-	-	1	-	-
4ME214PC1.2	3	3	3	2	2	1	-	-	-	-	-	3	3	-
4ME214PC1.3	2	2	1	-	1	1	-	-	-	-	-	1	-	-
4ME214PC1.4	3	3	2	1	2	1	-	-	-	-	-	2	3	-
4ME214PC1.5	3	3	2	2	1	-	-	-	-	-	-	2	-	-
4ME214PC1.6	3	2	3	2	3	1	-	-	-	-	-	3	3	3
4ME214PC1	3	3	2	1	2	1	-	-	-	-	-	2	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4ME215MD1**		Course Category: **MDM**		
Course Name	**Green Power Technologies**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30Hrs**	Total SL Hours	**30Hrs**
Total Credit Hours	**60Hrs**				
SEE Marks	**30**	SEE Time	**3Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:
Subject Code 4ME215MD1 Green Power Technologies is a Multidisciplinary Minor offered by Second Year B.Tech Mechanical Engineering program.

Course Objectives:
The objective of this course is to develop understanding of renewable and green energy systems, evaluate performance of different energy conversion technologies, and apply sustainable engineering principles for real-world applications and carbon-neutral solutions.
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Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ME215MD1.1	Explain green and renewable energy technologies to understand working principles of solar, wind, and biomass systems.	C2
4ME215MD1.2	Evaluate renewable and emerging energy technologies to assess performance, efficiency, and environmental impact.	C4
4ME215MD1.3	Apply energy storage and sustainability concepts to design efficient and eco-friendly power solutions.	C3

Course Contents:

Unit 1	**Introduction to Green and Renewable Energy Technologies:** Concept of green power; global and Indian energy scenarios; classification and significance of renewable energy sources. Solar thermal and photovoltaic energy; collectors, characteristics, applications. Basics of wind energy and turbine performance.	10 Hrs
Unit 2	**Bioenergy, Waste-to-Energy, and Emerging Technologies:** Biomass, biogas, biodiesel production. Waste-to-energy methods: pyrolysis, gasification, incineration. Basics of geothermal, hydrogen energy, fuel cells, and ocean energy.	10 Hrs

Unit 3	**Energy Storage, Smart Grids, and Sustainable Power Systems:** Batteries, thermal storage, pumped hydro. Smart grids, demand-side management, microgrids, EV integration. Environmental and economic assessment of renewable energy.	10 Hrs

Text Books:

7. Chetan Singh Solanki, Solar Photovoltaics: Fundamentals, Technologies and Applications, PHI Learning.
8. S. P. Sukhatme, Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw Hill
9. B. H. Khan, Non-Conventional Energy Resources, Tata McGraw Hill

Reference Books:

1. Godfrey Boyle, Renewable Energy: Power for a Sustainable Future, Oxford University Press
2. S. N. Bhadra, D. Kastha, S. Banerjee, Wind Electric Systems, Oxford University Press
3. G. D. Rai, Non-Conventional Energy Sources, Khanna Publishers
4. Duffie&Beckman, Solar Engineering of Thermal Processes, Wiley
5. Ibrahim Dincer, Green Energy and Technology, Springer

E-Resources:

1. Renewable Energy Engineering: Solar, Wind and Biomass Energy Systems NPTEL, IIT: https://nptel.ac.in/courses/103103206?utm_source=chatgpt.com
2. IEI- International Energy Agency: https://www.iea.org
3. Ministry of New and Renewable Energy: https://mnre.gov.in

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4ME215MD1.1	3	2	2	1	-	-	2	1	-	1	-	3	2	1
4ME215MD1.2	3	3	3	2	1	1	2	1	-	1	-	3	2	2
4ME215MD1.3	3	3	3	3	2	2	3	2	1	2	1	2	3	3
4ME215MD1	3	3	3	2	1	1	2	1	1	1	1	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:		**4SH216OE1**	Course Category:	**OE**
Course Name	**Quantitative and Logical Reasoning**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 4SH216OE1Quantitative and Logical Reasoning is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:
The Objective of the Course is to develop quantitative aptitude, logical reasoning, problem-solving efficiency, and decision-making skills for placements, competitive exams, and real-life applications

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE1.1	Apply arithmetic and numerical techniques to solve quantitative problems accurately.	C-3
4SH216OE1.2	Solve algebraic and equation-based problems using simplification and approximation methods to improve problem-solving efficiency.	C-3
4SH216OE1.3	Analyze logical reasoning problems using structured and critical thinking approaches to improve decision-making skills.	C-4
4SH216OE1.4	Interpret and analyze data using graphical and tabular methods for decision making for strategic planning.	C-4
4SH216OE1.5	Solve complex logical puzzles and advanced reasoning problems efficiently for competitive examination success.	C-3
4SH216OE1.6	Demonstrate effective aptitude test strategies integrating quantitative and logical reasoning skills for career advancement opportunities.	C-3

Course Contents:

Unit 1	**Number System & Arithmetic Foundations:** Number system fundamentals; LCM and HCF applications; divisibility rules; percentage calculations; ratio and proportion; averages; profit and loss; simple and compound interest; speed mathematics and shortcut techniques.	7Hrs
Unit 2	**Algebra, Equations & Simplification Techniques:** Linear and quadratic equations; algebraic expressions;	7 Hrs

	simplification and approximation; indices and surds; inequalities; time and work; pipes and cisterns; time, speed and distance; mixtures and alligation.	
Unit 3	**Logical Reasoning: Analytical & Critical Thinking:** Coding–decoding; blood relations; direction sense; series and pattern recognition; analogies; ranking and ordering; syllogisms; statement and assumption; statement and conclusion; cause–effect reasoning.	7 Hrs
Unit 4	**Data Interpretation & Analytical Aptitude:** Tables; pie charts; line graphs; bar graphs; caselets; data sufficiency; DI shortcut techniques; approximation in data interpretation; comparative and predictive data analysis.	8Hrs
Unit 5	**Advanced Logical Reasoning & Puzzle Solving:**Seating arrangements (linear, circular, and complex); floor-based puzzles; scheduling puzzles; selection-based puzzles; Venn diagrams; logical grouping; critical reasoning frameworks	8 Hrs
Unit 6	**Placement Aptitude Mastery & Test Strategies:** Integrated quantitative and logical reasoning practice; decision-making and elimination strategies; speed improvement techniques; mock placement aptitude patterns (TCS, Infosys, Wipro, Accenture, Capgemini); common error analysis; test-taking strategies; aptitude and reasoning simulations.	8 Hrs

Text Books:

1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing
2. Arun Sharma, Logical Reasoning and Data Interpretation, McGraw Hill

Reference Books:

1Arun Sharma, How to Prepare for Quantitative Aptitude,published by McGraw Hill Education.
2. R.S. Aggarwal, A Modern Approach to Logical Reasoning, published by S. Chand Publishing
3. M.K. Pandey, Analytical Reasoning, published by BSC Publishing Co. Pvt. Ltd.
4. Rajesh Verma, Fast Track Objective Arithmetic, published by Arihant Publications

E Resources:

1. NPTEL – Quantitative Aptitude & Logical Reasoning Courses
2. IndiaBIX – Quantitative and Logical Reasoning Practice
3. CareerRide – Aptitude Preparation Modules
4. PrepInsta / HackerEarth – Placement Aptitude Practice Platforms

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4SH216OE1.1	3	3	2	–	–	–	–	–	–	–	–	1	2	1
4SH216OE1.2	3	3	2	–	–	–	–	–	–	–	–	1	2	1
4SH216OE1.3	–	3	3	–	–	–	–	–	–	–	–	1	2	2
4SH216OE1.4	–	3	2	–	–	–	–	–	–	–	–	1	3	2
4SH216OE1.5	–	3	3	–	–	–	–	–	–	–	–	2	2	2
4SH216OE1.6	–	3	2	–	–	–	–	–	–	2	3	1	2	2
4SH216OE1 CO	1	3	3	–	–	–	–	–	–	1	1	1	2	2

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level:	**5**	Course Code:	**4SH216OE2**	Course Category:	**OE**
Course Name	**Critical Thinking & Decision Making**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 4SH216OE2 Critical Thinking & Decision Making is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:
The objective of this course is to develop critical thinking and decision-making competencies by strengthening analytical reasoning and structured problem-solving skills applicable to professional and real-world situations.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE2.1	Apply critical thinking frameworks to analyze problems systematically.	C-3
4SH216OE2.2	Evaluate information, assumptions, and arguments for logical consistency and validity.	C-5
4SH216OE2.3	Analyze complex situations and identify feasible alternatives for decision making.	C-4
4SH216OE2.4	Design rational and ethical decision-making strategies under uncertainty to ensure sustainable organizational outcomes.	C-6 A-3
4SH216OE2.5	Apply quantitative and qualitative tools to support decision-making processes.	C-3
4SH216OE2.6	Demonstrate effective decision making in simulated professional and team-based scenarios to resolve workplace challenges effectively	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundations of Critical Thinking:** Concept of critical thinking; elements of reasoning; logical vs illogical thinking; assumptions and inferences; inductive and deductive reasoning; common cognitive biases; barriers to critical thinking.	7Hrs
Unit 2	**Analytical Reasoning & Problem Framing:** Problem identification and structuring; root cause analysis;	7 Hrs

	issue trees; questioning techniques; systems thinking; analytical reasoning models.	
Unit 3	**Decision Making Models & Techniques:** Rational decision-making model; intuitive decision making; bounded rationality; decision trees; cost–benefit analysis; risk and uncertainty; heuristics.	7 Hrs
Unit 4	**Data-Driven & Ethical Decision Making:** Use of data in decision making; qualitative vs. quantitative data; basic decision matrices; ethical frameworks; professional ethics; social and environmental considerations in decisions.	8Hrs
Unit 5	**Creativity, Innovation & Strategic Thinking:** Creative thinking techniques; lateral thinking; design thinking approach; scenario planning; strategic decision making; innovation in problem solving.	8 Hrs
Unit 6	**Applied Decision Making & Case Analysis:** Case studies from industry and management; individual and group decision simulations; conflict resolution through decision frameworks; decision-making under pressure; reflection and feedback	8 Hrs

Text Books:

1.Alec Fisher, Critical Thinking, published by Cambridge University Press.

2. John Adair, Decision Making and Problem Solving, published by Kogan Page.

Reference Books:

1Daniel Kahneman, Thinking, Fast and Slow published by Farrar, Straus and Giroux.

2. Rolf Dobelli, The Art of Thinking Clearly,published by Sceptre.

3. John S. Hammond, Ralph L. Keeney, Howard Raiffa, Smart Choices, published by Harvard Business School Press.

4. Ken Watanabe, Problem Solving 101, published by Portfolio.

E Resources:

1. NPTEL – Critical Thinking &Decision Making Courses
2. Coursera – Critical Thinking and Decision-Making Modules
3. Harvard Business Review – Decision Making Articles
4. MIT OpenCourseWare – Decision Analysis

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH216OE2.1	2	3	2	–	–	–	–	–	–	–	–	1	2	2
4SH216OE2.2	–	3	3	–	–	–	–	–	–	–	–	1	2	2
4SH216OE2.3	–	3	2	–	–	–	–	–	–	–	–	1	2	2
4SH216OE2.4	–	3	3	–	–	2	3	–	–	–	–	-	3	2
4SH216OE2.5	–	2	2	–	2	–	–	–	–	–	–	2	3	2
4SH216OE2.6	–	2	2	–	–	2	–	2	2	–	2	1	2	2
4SH216OE2. CO	1	3	3	-	1	1	1	1	1	-	1	1	3	2

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4ME217PC1**		Course Category: **PCC**		
Course Name	**Material Science & Nano Technology – Lab**				
Credits	**01**	Total L:T:P etc. Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 4ME217PC1Material Science & Nano Technology - Lab is a compulsory Engineering Science Course for Second Year B. Tech. Mechanical Engineering.

Course Objectives:

To provide a practical understanding of the structure, properties, and behavior of engineering materials, and to develop skills in using metallurgical and material characterization equipment such as microscopes, while correlating theoretical material science concepts with experimental observations.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ME217PC1.1	Demonstrate proficiency in using metallurgical microscope, and differentiate the microstructures of steels, cast irons, and non-ferrous alloys to interpret their material behavior.	C-4, P-3, A-3
4ME217PC1.2	Interpret the iron–carbon equilibrium diagram, analyse the effects of mechanical working and microstructural phenomena like recovery, recrystallization, and grain growth in metals.	C3, P4, A3
4ME217PC1.3	Describe the fundamentals of nanotechnology and classify nanomaterials based on properties and applications as well as study of Nanomaterials, classification, properties, and applications	C-2, P-1, A-2

List of Practical's:
Minimum Eight practical's from the list mentioned below.
1. Study of metallurgical microscope.
2. Study of Iron carbon Equilibrium diagram &its invariant reactions.
3. Study of effect of alloying elements on the properties of steels.
4. Study of micro structures of plain carbon steels and alloy steels.

5. Study of micro structures of various cast irons.
6. Study of micro structures of non-ferrous metals (brasses, bronzes)
7. Investigation of Mechanical Working Processes and their effects on metal 8. Study of Recovery, Recrystallization, and Grain Growth in Metals.
9. Study of Nanotechnology, its applications and benefits.
10. Study of Nanomaterials, classification, properties and its applications.

E-Resources:

1. http://www.digimat.in/nptel/courses/video/113104068/L26.html
2. https://www.coursera.org/specializations/materials-science-for-technological-application
3. http://kcl.digimat.in/nptel/courses/video/112104219/L01.html
4. http://kcl.digimat.in/nptel/courses/video/112104219/L01.html
5. https://msvs-dei.vlabs.ac.in/QuenchingSimulation.php?
6. http://kcl.digimat.in/nptel/courses/video/112107145/L01.html

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4ME217PC1.1	3	2	1	3	3	1	1	1	2	2	2	2	3	1
4ME217PC1.2	3	3	2	3	2	2	2	1	2	2	2	3	3	1
4ME217PC1.3	2	2	2	-	-	-	-	-	-	-	-	1	2	3
4ME217PC1	3	2	2	2	2	1	1	1	2	2	2	2	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4ME218PC1**		Course Category: **PCC**		
Course Name	**Hydraulic and Pneumatic Systems- Lab**				
Credits	**01**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 4ME218PC1Hydraulic and Pneumatic Systems - Labis a compulsory Program Core Course for Second Year B.Tech. Mechanical Engineering Program.

Course Objectives:
The objective of this Course is to understand the fundamental concepts of hydraulic machines, apply them in practical engineering scenarios, and recognize the importance of specialized water-lifting devices.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ME218PC1.1	Demonstrate the basic concepts of prime movers and turbines to develop a strong understanding of energy conversion in mechanical systems.	C-3, P-3
4ME218PC1.2	Apply the knowledge of centrifugal and reciprocating pumps for selecting and implementing appropriate solutions in industrial and engineering applications.	C-3, P-3
4ME218PC1.3	Apply hydraulic and pneumatic principles to design and develop practical projects and problem-solving solutions in mechanical engineering contexts	C-3, P-2 & A-4

List of Practicals:
At least Eight Practicals from the below list.
1.Study of Pelton wheel
2.Study of Francis Turbine
3.Study of Kaplan Turbine
4.Study of centrifugal pump
5.Study of reciprocating pump
6.Study of axial flow pump
7.Study of multistage pump
8.Study of special pumps (air lift pump/ jet pump)
9.Trial on pneumatic system

10.Case study onComputational Fluid Dynamics (CFD)

E-Resources:

1. https://archive.nptel.ac.in/courses/112/106/112106300/?utm
2. https://www.g-wonlinetextbooks.com/fluid-power-lab-manual-2020/?utm
3. https://www.onlinetutorials.org/teaching-academics/introduction-of-hydraulics-and-pneumatics/?utm
4. https://docslib.org/doc/1908894/lecture-1-introduction-to-hydraulics-and-pneumatics?utm

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4ME218PC1.1	3	2	2	1	2	2	1	3	2	1	2	1	-	-
4ME218PC1.2	3	2	3	1	2	2	1	3	2	1	2	2	3	-
4ME218PC1.3	2	2	3	2	2	2	1	3	3	1	2	2	3	3
4ME218PC1	3	2	3	2	2	2	1	3	2	1	2	2	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4ME219VS1**		Course Category: **VSC**		
Course Name	**Manufacturing Processes - Lab**				
Credits	**02**	Total L:T:P etc. Hours	0:0:4 **60 Hrs**	Total SL Hours	**--**
Total Credit Hours	**60 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**--**	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 4ME219VS1 Manufacturing Processes Lab is a Vocational Skill Course. (VSC)offered to Second Year B.Tech Mechanical Engineering Program.

Course Objectives:
The objective of this course is to develop practical skills and understanding of various manufacturing processes including casting, welding, machining, and additive manufacturing.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ME219VS1.1	Demonstrate and perform the basic casting processes including pattern making and mould preparation, for understanding and practically apply the fundamentals of casting by creating patterns and preparing moulds.	C-3 P-4
4ME219VS1.2	Demonstrate and perform various welding operations such as arc, gas, and TIG welding with an understanding of their applications, for developing hands-on skills in arc, gas, and TIG welding and understand their appropriate applications in fabrication and joining processes.	C-3 P-4
4ME219VS1.3	Demonstrate and perform basic machine tools like lathe and milling machines and demonstrate modern manufacturing techniques such as 3D printing, for applying and understanding conventional machining operations on lathe and milling machines.	C-3 P-4

List of Practicals:

Minimum Ten Practicals from the list mentioned below.

11. Study of Various Casting Techniques.
12. Preparation of a single piece wooden pattern by teak wood.
13. Preparation of the mould cavity in the mould box using split pattern.
14. Study of different types of welding processes.
15. Preparation of a welding job by using arc welding and gas welding.
16. Preparation of a welding job by using TIG welding.
17. Demonstration of MIG welding machine.
18. Preparation of one job on Lathe Machine consisting of facing, turning, taper turning, knurling & threading operations.
19. Preparation of a spur gear on milling machine
20. Demonstration of Shaper machine.
21. Demonstration of verticalmilling machine.
22. Study and demonstration of 3D Printing.

E-Resources:

1. https://www.vlab.co.in/broad-area-mechanical-engineering
2. dei.vlabs.ac.in/exp/design-manufacture-wooden-pattern-given-casting
3. https://mp-dei.vlabs.ac.in/exp/study-observe-stages-casting-sand-casting-process
4. https://mm-coep.vlabs.ac.in/exp/welding-ndyag-laser
5. https://osme.co.in/wp-content/uploads/2023/09/FOUNDRY-ENGINEERING-LAB-MANUAL.pdf

6. **Mapping of COs with POs**

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4ME219VS1.1	3	2	1	-	1	-	-	-	-	-	2	2	1	2
4ME219VS1.2	3	2	-	-	1	1	-	-	2	1	2	2	2	2
4ME219VS1.3	3	2	2	1	3	-	-	-	2	1	2	3	2	1
4ME219VS1CO	3	2	1	-	2	-	-	-	1	1	2	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**4SH220AE1**	Course Category:	**AEC**
Course Name	**Technical Writing**			
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours	**15 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 4SH220AE1 Technical Writing is common Ability Enhancement Course for Second Year B. Tech.

Course Objectives:
The objective of the course is to enhance students' ability to write effective technical documents, professional correspondence, and research-oriented content with clarity, accuracy, and ethical standards.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH220AE1.1	Apply principles of technical writing in engineering documents.	C-3 P-2 A-2
4SH220AE1.2	Apply technical writing skills to prepare professional documents.	C-4 P-2 A-2
4SH220AE1.3	Create ethical, well-structured technical and research documents using IEEE referencing for professional and academic communication.	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Technical Writing:** Nature and importance of technical communication, characteristics of technical writing, audience analysis, technical vocabulary, grammar and style, clarity and conciseness, paragraph structure, coherence, technical descriptions, instructions and manuals.	7 Hrs
Unit 2	**Professional and Research Writing:** Technical reports and documentation, structure of reports, abstracts and summaries, research papers, project proposals, resumes and cover letters, business emails, documentation ethics, plagiarism, referencing styles (IEEE), editing and proofreading.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.
1.Analysis of Technical Communication to Identify the nature, purpose of given technical documents and evaluate their effectiveness.

2. Editing technical text for clarity and brevity
3. Technical description of an engineering device/system
4. Writing step-by-step technical instructions
5. Preparation of structured technical reports
6. Resume and cover letter drafting
7. Technical report writing based on laboratory work, case study, or project work
8. Abstract and executive summary writing for technical documents
9. Referencing and citation using IEEE format
10. Editing, proofreading, and plagiarism check of technical documents

Text Books:

1. Rizvi A. M. & Patnaik P., Effective Technical Communication, McGraw Hill Education (India), New Delhi (Second Edition).
2. Verma S., Technical Communication for Engineers, Vikas Publishing House Pvt. Ltd., New Delhi (First Edition).
3. Misra P. & Tyagi K., Advanced Technical Communication, PHI Learning Pvt. Ltd., New Delhi (Second Edition).

Reference Books:

1. Chauhan G. S., Kashiramka S. &Thimmesha L., Technical Communication, Cengage Learning India Pvt. Ltd., New Delhi (First Edition).
2. Alred G. J., Brusaw C. T. &Oliu B., Handbook of Technical Communication, Oxford University Press, New Delhi (Second Edition).
3. IEEE Editorial Style Manual, IEEE Standards Association, IEEE, USA (Latest Edition).
4. Joseph G. & Joseph B., Grammar and Usage for Technical Communication, Cambridge University Press India, Delhi (First Edition).

E Resources:

1. NPTEL–SWAYAM, IIT Roorkee,Technical Communication for Engineers.
2. https://owl.purdue.edu
3. https://ieeeauthorcenter.ieee.org

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH220AE1.1	-	-	-	-	-	-	-	-		3	-			
4SH220AE1.2	-	-	-	-	-	-	-	-	3	3	-			
4SH220AE1.3	-	-	-	-	-	-	-	3		3	3			
4SH220AE1 CO	-	-	-	-	-	-	-	1	1	3	1			

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code:	4SH221EM1	Course Category:	**EEM**
Course Name	**Fundamentals of Book Keeping and Accounting**			
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours **15 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	**--**	SEE Time	**--**	CIA Marks **--**
EE Marks	**--**	PA Marks	**50**	Total Marks **50**

Course Description:

Subject Code 4SH221EM1 Fundamentals of Book Keeping and Accounting is an Ability Enhancement Course for Second Year B. Tech students that introduce basic accounting principles, bookkeeping processes, and financial statements for business applications.

Course Objectives:

The objective of the course is to develop students' skills in recording and analyzing financial transactions and to enable effective use of accounting information for decision-making.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH221EM1.1	Apply basic principles of bookkeeping and accounting for recording and maintaining financial transactions accurately.	C-3 P-2 A-2
4SH221EM1.2	Analyze financial statements such as income statement, balance sheet, and cash flow statement for supporting financial understanding and business decision-making.	C-4 P-2 A-2
4SH221EM1.3	Apply accounting tools and techniques for evaluating financial performance and improving business efficiency.	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundation of Book keeping and Accounting** Definition, objectives, and importance of accounting, Difference between accounting and bookkeeping, accounting equation, double entry system, Debit vs credit, accrual vs cash accounting, Terminology- depreciation, armotisation, CapEx vs OpEx. Source of Document (invoice, receipt, Purchase Order), Work Flow (Journal, posting to the ledger), Preparing trial balance, Software Integration- A brief overview of ERP (SAP/ oracle and tools like a tally/ quick book).	8 Hrs

Unit 2	**Financial Statements & Decision Making** Income Statement, Balance Sheet, Cash flow Statement. Ratio Analysis (Current Ratio, Debt to equity, ROI), Cost Accounting (Fixed vs Variable, Break-even), Taxation Basics (Corporate IT)	7 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Categories a list of items (Laptop, Office Rent Deposit, Cash, Bank Loan, Software Licenses) into Assets, Liabilities, or Equity.
2. Use the Double-Entry System to record buying raw materials, paying technician wages, and receiving a client advance.
3. Identify discrepancies like uncashed cheques, bank charges, or direct deposits from clients.
4. Compare the Straight-Line Method vs. the Written Down Value (WDV) method (as per Indian Income Tax rules).
5. Distinguish between Direct Costs (raw materials, factory power) and Indirect Costs (office salary, marketing).
6. Analyze the Annual Report of an Indian tech giant (e.g., L&T or Tata Motors).
7. Calculate the Current Ratio (liquidity), Debt-to-Equity (solvency), and Return on Investment (ROI).
8. Input Fixed Costs (Rent, Machinery) and Variable Costs (Material per unit) into a spreadsheet to find the Break-Even Point.
9. Value the remaining stock after several purchases and sales using the First-In, First-Out (FIFO) method.
10. Enter 5 basic transactions into a trial version of Tally Prime or a cloud-based tool like Zoho Books.

Text Books:

1. S.N. Maheshwari S.K. Maheshwari & S.K. Maheshwari., Financial Accounting, Vikas Publishing House (Eleventh Edition)
2. N. Ramachandran, Ramkumar Kakani., Financial Accounting for Management, McGraw Hill Education (Sixth Edition)

Reference Books:

1. R. L. Gupta & U. K. Gupta., Financial Accounting, Sultan Chand & Sons, (Ninth revised Edition)
2. Dr. Santanu Chakrabarty & Dr. Nilanjan Singha Roy., Accounting & Finance for engineering, Lawpoint Publications (Second Edition)
3. Bhushan Kumar Goyal., Accounting for Everyone, Taxmann Publications Pvt. Ltd (First Edition)

E Resources:

1. SWAYAM, Financial Accounting / Business Accounting
2. National Digital Library of India, https://ndl.iitkgp.ac.in
3. Tally Education, https://tallyeducation.com

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH221EM1.1	2	2	-	-	-	-	-	-	-	-	-			
4SH221EM1.2	3	3	-	-	-	-	-	-	-	3	-			
4SH221EM1.3	2	3	-	-	3	-	-	-	-	3	-			

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4CE222VE1**		Course Category: **VEC**		
Course Name	**Environmental Science**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:
Subject Code 4CE222VE1 Environmental Science is a Value Education course for Second Year B. Tech Civil Engineering.

Course Objectives:
The objective of this course is to develop understanding of environmental systems, natural resource management, ecological balance, and sustainable development practices to promote awareness and responsibility toward environmental protection and societal well-being.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE222VE1.1	Analyze renewable and non-renewable natural resources and associated problems to promote sustainable utilization for future generations.	C-4
4CE222VE1.2	Analyze food chains, webs, and ecological pyramids to evaluate ecological interactions and succession processes.	C-4
4CE222VE1.3	Examine shift from unsustainable to sustainable development to promote responsible resource planning for society.	C-3

Course Contents:

Unit 1	**Renewable and non-renewable resources**: Environmental Science, Definition, scope and importance, Need for public awareness, Renewable and non-renewable resources, Natural resources and associated problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life styles.	10 hrs
Unit 2	**Ecosystem:** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: Forest	10 hrs

	ecosystem, Grassland ecosystem, Desert ecosystem.	
Unit 3	**Social Issues & Environment:** From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions, Environment Protection Act. Air (Prevention and Control of Pollution) Act., Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, public awareness.	10 hrs

Text Books:

1. Suresh K. Dhameja, Environmental Studies, Katson Books
2. Benny Joseph, Environmental Studies, McGraw Hill Education

Reference Books:

1. Gilbert M. Masters & Wendell Ela, Introduction to Environmental Engineering and Science, Pearson Education
2. William Cunningham & Mary Cunningham, Environmental Science, McGraw Hill

E Resources:

1. https://www.vlab.co.in/broad-area-civil-engineering

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE222VE1.1	3	2	-	-	-	2	2	-	-	-	-	-	-	-
4CE222VE1.2	3	2	-	-	-	3	2	-	-	-	-	-	1	-
4CE222VE1.3	3	2	-	-	-	3	3	-	-	-	-	-	1	-
4CE222VE1.CO	3	2	-	-	-	3	3	-	-	-	-	-	1	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: **5**	Course Code: **4ME223DH1**		Course Category: **DH**		
Course Name	**Robotics and Automation**				
Credits	**04**	Total L:T:P etc. Hours	4:0:0 **60 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 4ME223DH1 Robotics and Automation is a for Double Minor / Double Minor / Course offered as Honours by department of Mechanical Engineering for Second Year B.Tech., for all Discipline.

Course Objectives:
The objective of this course is to provide foundational knowledge of robotics and automation, including structure, actuation, sensing, and modern advancements such as AI, IoT, and autonomous systems.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ME223DH1.1	Explain the fundamentals, configurations, and components of robotics and automation systems. To understand the fundamentals, configurations, and components of robotics and automation systems	C-2
4ME223DH1.2	Describe the structure of robots including joints, links, end effectors, drive systems, and transmission mechanisms used in robotic actuation. To build a strong foundation for understanding how robotic and automation systems	C-2
4ME223DH1.3	Discuss the classification, working principles, and roles of internal/external sensors, signal conditioning, and basic feedback control systems used in robotics. To enable accurate sensing, monitoring, and control of robotic operations	C-2
4ME223DH1.4	Analyze kinematic relationships and motion control principles in robotic manipulators. To achieve precise positioning, motion planning, and control of robots.	C-4

4ME223DH1.5	Analyze degrees of freedom, workspace, kinematics, differential motion, and basic dynamics of robotic manipulators. To evaluate robot motion capability, performance, and dynamic behavior.	C-4
4ME223DH1.6	Evaluate current and emerging trends in robotics, automation, and Industry 4.0 technologies. To prepare for modern industrial applications and future advancements in intelligent automation.	C-5

Course Contents:

Unit 1	**Introduction to Robotics and Automation** Definition, scope, and evolution of robotics and automation Classification and anatomy of robots (Cartesian, cylindrical, SCARA, articulated, delta), Components of a robotic system: mechanical structure, actuators, sensors, controller, power supply, Performance parameters and specifications. Applications in manufacturing, service, medical, agriculture, and defense	5 Hrs
Unit 2	**Robot Structure, Drives, and Actuators**: Joints and links: types and configuration, End effectors – types of grippers and selection criteria, Drives: electrical, pneumatic, and hydraulic systems, Transmission systems: gears, belts, chains, lead screws.	5 Hrs
Unit 3	**Sensors and Control Systems:** Sensor classification and working principles: proximity, force, torque, temperature, vision, and tactile sensors, Internal sensors: position, velocity, acceleration, current, Signal conditioning and data acquisition. Open-loop and closed-loop control systems, Basic feedback control concepts used in robotics.	5 Hrs
Unit 4	**Kinematics and Dynamics of Robots**: Degrees of freedom, workspace, path, and trajectory, Forward and inverse kinematics, Differential motion and velocity relationships. Dynamics of robotic manipulators – basic concept.	5 Hrs
Unit 5	**Industrial Automation and Programming:** Introduction to automation systems and levels of automation, Programmable Logic Controllers (PLC): structure, I/O modules, ladder logic programming, Sensors and actuators in automation systems. Robot programming methods – online/offline programming, Simple programs for pick-and-place.	5 Hrs

Unit 6	**Emerging Trends and Applications:** Collaborative robots (Cobots) and mobile robots, Artificial Intelligence and Machine Learning in robotics. Integration of IoT, Cloud, and Industry 4.0 in automation. Human-robot interaction, ethics, and safety in robotics.	5 Hrs

Text Books:

1. S. K. Saha, Introduction to Robotics, McGraw Hillpublication.
2. Saeed B. Niku, Introduction to Robotics: Analysis, Control, Applications, Wiley publication.
3. Deb, S.R. – Robotics Technology and Flexible Automation, McGraw Hillpublication.

Reference Books:

1. Spong & Vidyasagar – Robot Dynamics and Control, Wiley publication.
2. Bolton, W. – Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, Pearson publication.
3. Alessandro De Luca et al., Springer Handbook of Robotics, Springer publication.

E-Resources:

1. https://tinyurl.com/mit-robotics-ocw
2. https://tinyurl.com/nptel-robotics-preview
3. https://tinyurl.com/elements-robotics-freebook

Mapping of COs with POs & PSOS

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4ME223DH1.1	3	-	-	-	-	-	-	-	1	-	-	1	-	-
4ME223DH1.2	3	1	-	-	-	-	-	-	1	1	-	1	1	-
4ME223DH1.3	3	-	-	-	1	-	-	-	1	1	-	-	1	1
4ME223DH1.4	3	2	2	1	2	-	-	-	1	1	-	-	1	-
4ME223DH1.5	3	2	2	1	2	-	-	-	-	-	1	-	1	-
4ME223DH1.6	2	1	2	1	2	-	-	-	1	-	1	-	1	-
4ME223DH1	3	2	2	1	2	-	-	-	1	1	1	1	1	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4ME223DH2**		Course Category: **DH**		
Course Name	**Fuels and Combustion**				
Credits	**04**	Total L:T:P etc. Hours	4:0:0 **60 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 4ME223DH2Fuels and Combustion is a for Double Minor / Double Minor / Course offered as Honours by department of Mechanical Engineering for Second Year B.Tech., for all Discipline.

Course Objectives:
The objective of this course is to analyze combustion processes using stoichiometry, thermochemistry, and efficiency calculations for practical engineering applications and to evaluate combustion equipment, emission control techniques, and energy optimization methods for safe, efficient, and environmentally responsible fuel utilization.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
4ME223DH2.1	Explain the classification, origin, and properties of solid, liquid, gaseous, and alternative fuels and their importance in energy systems.	C-2
4ME223DH2.2	Describe coal carbonization, petroleum refining, and production, handling, and safety measures for different fuels.	C-2
4ME223DH2.3	Analyze gaseous and alternative fuels, comparing energy content, storage, handling, and environmental impact.	C-4
4ME223DH2.4	Apply combustion stoichiometry and thermochemistry principles to calculate air–fuel ratio, adiabatic flame temperature, flue gas composition, and combustion efficiency.	C-3
4ME223DH2.5	Understand combustion equipment and furnace design, types of burners, and industrial applications including boilers, turbines, and IC engines.	C-2
4ME223DH2.6	Evaluate combustion emissions, control techniques, waste heat recovery, and strategies for efficient and environmentally sustainable fuel utilization.	C-5

Course Contents:

Unit 1	**Introduction to Fuels and Combustion:** Classification of fuels: Solid, liquid, and gaseous fuels. Origin and characteristics of fuels. Importance of fuels in energy systems and power generation. Fundamental definitions: calorific value, ignition temperature, flash & fire point. Combustion basics: definition, types (complete & incomplete), stages of combustion.	10 Hrs
Unit 2	**Solid and Liquid Fuels**: Solid fuels: Coal – types, properties, grading, analysis (proximate & ultimate). Carbonization and coke production. Liquid fuels: Petroleum refining, types of liquid fuels (diesel, kerosene, fuel oils). Properties and applications of liquid fuels. Fuel handling, storage, and safety measures.	10 Hrs
Unit 3	**Gaseous and Alternative Fuels:** Gaseous fuels: Producer gas, water gas, coal gas, natural gas, LPG, CNG. Manufacture, properties, and applications. Alternative fuels: Biofuels, hydrogen, alcohols, synthetic fuels. Comparative analysis: energy content, storage, handling, environmental impact.	10 Hrs
Unit 4	**Combustion Stoichiometry and Thermochemistry**: Stoichiometric air-fuel ratio, excess air, equivalence ratio. Mass and energy balance for combustion systems. Adiabatic flame temperature, flue gas analysis. Determination of combustion efficiency. Problems on combustion calculations.	10 Hrs
Unit 5	**Combustion Equipment and Furnaces:** Principles of burner and furnace design. Types of burners (pressure jet, rotary cup, gas burners). Solid fuel combustion systems: grate, fluidized bed combustion. Furnaces: design considerations, heat losses, efficiency. Industrial applications: boilers, gas turbines, IC engines.	10 Hrs
Unit 6	**Emissions, Control, and Energy Utilization:** Combustion emissions: CO, NO_x, SO_x, particulates. Environmental impact and emission standards. Combustion control techniques: flue gas recirculation, staged combustion. Waste heat recovery and energy optimization. Case studies in industrial combustion systems.	10 Hrs

Text Books:

1. Samir Sarkar, Fuel and Combustion, PHI Learning Pvt. Ltd.
2. Ganesan V., Fuels and Combustion, McGraw-Hill Education.
3. Gary L. Borman & Kenneth W. Ragland, Combustion Engineering, McGraw Hill publication.

Reference Books:

1. D.P. Mishra,Engineering Combustion, PHI Learning.
2. Stephen R. Turns, Introduction to Combustion: Concepts and Applications,

McGraw-Hill Education
3. Harald G. Weller, Alternative Fuels and Advanced Combustion Techniques, Springer.

E-Resources:

4. https://nptel.ac.in/courses/112/105/112105285/
5. https://nptel.ac.in/courses/108/106/108106130/
6. https://www.coursera.org/learn/combustion

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4ME223DH2.1	3	-	-	-	-	-	-	-	1	-	-	1	-	-
4ME223DH2.2	3	1	-	-	-	-	-	-	1	1	-	1	1	-
4ME223DH2.3	3	-	-	-	1	-	-	-	1	1	-	-	1	-
4ME223DH2.4	3	2	2	1	2	-	-	-	1	1	-	-	1	-
4ME223DH2.5	3	2	2	1	2	-	-	-	-	-	1	-	1	-
4ME223DH2.6	2	1	2	1	2	-	-	-	1	-	1	-	1	-
4ME223DH2	3	2	2	1	2	-	-	-	1	1	1	1	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **5ME224EC1**		Course Category: **EC**		
Course Name	**Lathe Machine**				
Credits	**4**	Total L:T:P etc. Hours	2:0:4 **90 Hrs**	Total SL Hours	**30Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:
Subject Code 5ME224EC1Hands on Training on Lathe Machine is an exit course(L-5) for second year B.Tech in Mechanical Engineering program.

Course Objectives:
To provide students with foundational knowledge and hands-on experience on Lathe Machine to develop skills in performing various machining operations

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
5ME224EC1.1	Interpret the fundamentals of Lathe machine to perform the jobs.	C-2
5ME224EC1.2	Perform basic Lathe operations to fabricate the jobs.	P-4
5ME224EC1.3	Analyze Common lathe problems, causes, and remedies to do maintenance of Lathe machine.	C-4

Course Contents:

Unit 1	**Introduction and Lathe Fundamentals:** Introduction to machine tools – classification and application. Purpose, working principle, and components of lathe machine. Types of lathes – engine, bench, turret, capstan, and CNC lathe. Lathe specifications and main parts: bed, headstock, tailstock, carriage, feed mechanism. Lathe accessories: chuck, faceplate, mandrel, centers, collets, and tool post. Cutting tool materials and geometry of single-point cutting tool. Safety precautions while operating lathe machines.	9 Hrs

Unit 2	**Lathe Operations and Machining Parameters:** Basic operations: facing, straight turning, step turning, taper turning, and parting-off. Advanced operations: thread cutting, knurling, drilling, boring, and grooving. Cutting parameters: cutting speed, feed, and depth of cut – calculation and selection. Surface finish and accuracy considerations. Tool setting and alignment procedure. Measurement and inspection of machined parts using precision instruments (vernier caliper, micrometer, etc.)	12 Hrs
Unit 3	**Maintenance, Troubleshooting, and CNC Concepts:** Common lathe problems, causes, and remedies. Lubrication and preventive maintenance of lathe machines. Cutting fluid types and applications. Introduction to CNC lathe – basic features and comparison with conventional lathe. Introduction to part programming (G-codes and M-codes). Safety, ergonomics, and environmental considerations in machining	9 Hrs

List of Practicals:

Minimum Ten practicals from the list mentioned below.

1. Study of lathe machine parts, specifications, and accessories.
2. Demonstration of lathe operations and safety procedures.
3. Tool grinding and setting of single-point cutting tool.
4. Facing operation on mild steel workpiece.
5. Straight turning and step turning operations.
6. Taper turning using compound rest and tailstock offset methods.
7. External Thread cutting on lathe.
8. Knurling and parting-off operations.
9. Drilling and boring operations using lathe.
10. Measurement and inspection of machined components using precision tools.
11. Study and demonstration of CNC lathe.
12. Study of various G & M codes and sample part program on CNC lathe.

Text Books:

1. B.S. Raghuwanshi, Workshop Technology Vol. II(Machine Tools)**,** Dhanpat Rai Publications.
2. S. K. Hajra Choudhury, Elements of Workshop Technology Vol. II(Machine Tools), Media Promoters and Publishers Pvt. Ltd.
3. P. N. Rao, Manufacturing Technology: Vol. II(Metal cutting and Machine tools), McGraw Hill.

Reference Books:

1. R.K. Jain, Production Technology, Khanna Publishers
2. S. Kalpakjian& S.R. Schmid, Manufacturing Processes for Engineering Materials, Pearson

E-Resources:

1. https://virtlabs.tech/metal-cutting/
2. https://www.teksure.in/virtual_CNC_lathe_simulator.php

Mapping of COs with POs and PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
5ME224EC1.1	3	-	-	-	-	-	2	-	-	-	2	-	-	-
5ME224EC1.2	3	-	-	-	3	-	2	-	-	-	2	-	2	2
5ME224EC1.3	3	3	2	-	2	-	2	-	-	-	2	-	-	-
5ME224EC1	3	1	1	-	2	-	2	-	-	-	2	-	1	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **5ME225EC1**		Course Category: **EC**		
Course Name	**Casting Process**				
Credits	**4**	Total L:T:P etc. Hours	2:0:4 **90 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:
Subject Code 5ME225EC1Hands on Training on Casting Process is an exit course (L-5) for second year B.Tech in Mechanical Engineering program.

Course Objectives:
The objective of this course is to provide fundamental knowledge of operations involved in metal casting and develop hands-on skills in producing simple cast components.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
5ME225EC1.1	Interpret the basic principles of metal casting process to build a strong foundation in the fundamentals of Foundry.	C-2
5ME225EC1.2	Demonstrate knowledge of moulding materials, Core making and melting processes to perform moulding and casting operations.	C-3, P-4
5ME225EC1.3	Identify and analyze casting defects to perform inspection of castings using various testing methods.	C-4

Course Contents:

Unit 1	**Introduction to Casting Process:** Overview of manufacturing processes and role of casting in industry. Basic principles of metal casting and solidification. Types of casting processes (sand casting, die casting, investment casting, etc.). Foundry layout and equipment. Pattern making: types of patterns, pattern allowances, materials used, and core boxes. Foundry tools and their uses. Safety precautions in foundry.	9 Hrs

Unit 2	**Moulding, Core Making, and Melting:** Moulding materials: types of sand, sand properties, and additives. Sand testing: grain fineness, permeability, strength tests. Types of moulds and cores. Moulding methods: hand moulding, machine moulding. Melting furnaces – Cupola, crucible, induction, and electric arc furnaces. Pouring techniques and gating system design (sprue, runner, riser).	12 Hrs
Unit 3	**Defects, Inspection, and Modern Casting Techniques:** Casting defects – causes, identification, and remedies. Inspection and testing of castings (visual, dimensional, and NDT methods). Fettling and finishing operations. Modern casting processes – centrifugal, investment, shell moulding, and continuous casting. Quality control and environmental aspects in foundry.	9 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. Study of foundry tools, equipment, and layout.
2. Study and demonstration of different types of patterns and pattern materials.
3. To make a single piece wooden pattern by teak wood.
4. Study and demonstration of different types of moulding sand.
5. Study of various testing methods for moulding sand.
6. Making a single-piece pattern mould.
7. Making a split-pattern mould with core setting.
8. Preparation of a core using core box and core baking.
9. Study of gating and riser systems and their design parameters.
10. Demonstration of metal melting and pouring into prepared moulds.
11. Shakeout, fettling, and inspection of a casting.
12. Identification and analysis of common casting defects in sample castings.

Text Books:

1. B. S. Raghuwanshi, Workshop Technology: Vol.-I(Manufacturing Processes)**,** Dhanpat Rai Publications.
2. S. K. Hajra Choudhury, Elements of Workshop Technology: Vol.-I (Manufacturing Processes), Media Promoters and Publishers Pvt. Ltd.
3. P. N. Rao, Manufacturing Technology: Vol.-I(Foundry, Forming and Welding), McGraw Hill.

Reference Books:

3. R.K. Jain, Production Technology, Khanna Publishers.
4. S. Kalpakjian& S.R. Schmid, Manufacturing Processes for Engineering Materials, Pearson.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc24_me84/preview
2. https://onlinecourses.nptel.ac.in/noc24_me16/preview

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
5ME225EC1.1	3	-	-	-	-	2	-	-	-	-	2	-	-	-
5ME225EC1.2	3	-	-	-	3	2	2	2	-	-	2	2	2	-
5ME225EC1.3	3	3	-	-	2	-	-	-	-	-	2	-	-	-
5ME225EC1	3	1	-	-	2	1	1	1	-	-	2	1	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

ANNEXURE –I

Syllabus of III and IV Semester Courses for Four-Year Multidisciplinary Undergraduate B.Tech. Degree Programme in Textile Engineering

(In view of NEP-2020)

For students admitted in academic session 2025-26 and onwards



03/09/2026

SHRI JAWAHARLAL DARDA EDUCATION SOCIETY'S
JAWAHARLAL DARDA
INSTITUTE OF ENGINEERING AND TECHNOLOGY, YAVATMAL
AN AUTONOMOUS INSTITUTE
Affiliated to Sant Gadge Baba Amravati University, Approved by AICTE, New Delhi and DTE Maharashtra
93VP+PWF: P6, MIDC Area, Lohara, Yavatmal - 445 001, Maharashtra (www.jdiet.ac.in)

1. Department Vision:

To achieve regional and national recognition for excellence in textile engineering education through quality teaching, research and industry collaboration, contributing to employment, entrepreneurship, societal and sustainable development.

2. Department Mission

1. To adopt contemporary teaching–learning methods for developing competent and skilled textile engineers.
2. To promote multidisciplinary approach, research and industry collaborations for enhancing employability and entrepreneurship.
3. To practice inclusive and ethical learning environment fostering lifelong learning and sustainability awareness.
4. To provide experiential and outreach activities benefiting industry and society.

3. Programme Education Objectives

PEO 1: Graduate will achieve professional excellence as competent engineers and entrepreneurs in textile and allied sectors through strong technical knowledge and problem solving skills.

PEO 2: Graduate will pursue higher education, research or continuous professional development for lifelong learning, innovation, and industry advancement.

PEO 3: Graduate will demonstrate ethical behaviour, leadership qualities and effective teamwork while contributing to industrial, entrepreneurial and societal development.

PEO 4: Graduate will adapt to evolving technologies, sustainability practices and global challenges in textile and allied sectors.

4. SDG of United Nation

1. **No Poverty:** End poverty in all its forms everywhere.
2. **Zero Hunger:** End hunger, achieve food security, improve nutrition, and promote sustainable agriculture.
3. **Good Health and Well-being:** Ensure healthy lives and promote well-being for all at all ages.
4. **Quality Education:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities.
5. **Gender Equality:** Achieve gender equality and empower all women and girls.
6. **Clean Water and Sanitation:** Ensure availability and sustainable management of water and sanitation for all.
7. **Affordable and Clean Energy:** Ensure access to affordable, reliable, sustainable, and modern energy.

8. **Decent Work and Economic Growth:** Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work.
9. **Industry, Innovation, and Infrastructure:** Build resilient infrastructure, promote sustainable industrialization, and foster innovation.
10. **Reduced Inequalities:** Reduce inequality within and among countries.
11. **Sustainable Cities and Communities:** Make cities and human settlements inclusive, safe, resilient, and sustainable.
12. **Responsible Consumption and Production:** Ensure sustainable consumption and production patterns.
13. **Climate Action:** Take urgent action to combat climate change and its impacts.
14. **Life Below Water:** Conserve and sustainably use oceans, seas, and marine resources.
15. **Life on Land:** Protect, restore, and promote sustainable use of terrestrial ecosystems, forests, and biodiversity.
16. **Peace, Justice, and Strong Institutions:** Promote peaceful and inclusive societies, provide access to justice, and build effective, accountable institutions.
17. **Partnerships for the Goals:** Strengthen the means of implementation and revitalize the global partnership for sustainable development.

5. WK: Washington Accord Knowledge Profile-Attributes for engineering program

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Outcomes (NBA, Jan 2025)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic

decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

7. Programme Specific Indicators

Manmade Fibre & Yarn Industry

1. Knowledge and Understanding of fibre and yarn processes.
2. Familiarity with fibre and yarn machineries operation and settings.
3. Knowledge of fibre types, yarn properties, and fabric behaviour in manmade fibre and yarn industry.
4. Knowledge and Use of textile testing equipment for fibre and yarn.
5. Knowledge of quality control and assurance protocols regarding fibre and yarn.
6. Understanding of academic/lab procedures and curriculum of fibre and yarn.
7. Fabric behaviour knowledge, design compatibility, sustainability factors for Fashion & Fabric Consultancy awareness.
8. Sampling process, costing basics, buyer communication, BOM/tech pack handling for Apparel Merchandising Skills.
9. Knowledge of Concepts of productivity (efficiency, utilization, waste reduction).
10. Knowledge of basic troubleshooting and preventive maintenance of spinning, weaving, knitting, and dyeing machines.
11. Knowledge of Basic dyeing, printing, finishing processes.
12. Knowledge of Chemical handling, effluent treatment, colourfastness testing.
13. Knowledge of Weave structures, knitting types, fabric density, defects identification for Fabric Construction and Analysis.
14. Knowledge of Natural, synthetic, blends, recycled and technical fibres.

Spinning Industry

15. Knowledge and Understanding of spinning processes.
16. Familiarity with spinning machineries operation and settings.
17. Knowledge of fibre types, yarn properties, and its behaviour for spinning.
18. Knowledge and Use of textile testing equipment for yarn
19. Knowledge of quality control and assurance protocols of spinning department.

Weaving Industry

20. Knowledge and Understanding of weaving processes.
21. Familiarity with weaving machinery operation and settings.
22. Knowledge of fibre types, yarn properties, and fabric behaviour for preparation of fabric.

23. Ability to maintain machine logs, quality records, and compliance documents for weaving department.
24. Coordination across departments like QA, production, design, sourcing for fabric.

Knitting Industry

25. Knowledge and Understanding of knitting processes.
26. Familiarity with knitting machinery operation and settings.
27. Knowledge of fibre types, yarn properties, and fabric behaviour for knitted fabric.
28. Knowledge and Use of textile testing equipment for knitted fabric.
29. Knowledge of quality control and assurance protocols for knitted fabric.
30. Ability to maintain machine logs, quality records and compliance documents in knitting department.
31. Coordination across departments like QA, production, design, sourcing for knitted fabric.

Nonwoven Industry

32. Knowledge and Understanding of non-woven processes.
33. Familiarity with non-woven fabric manufacturing machinery operation and settings.
34. Knowledge of fibre types, yarn properties, and fabric behaviour for making non-woven fabric.
35. Ability to maintain machine logs, quality records and compliance documents in non-woven production department.
36. Coordination across departments like QA, production, design, sourcing for non-woven fabric.

Textile Wet Processing Industry

37. Knowledge and Understanding of textile wet processes.
38. Familiarity with chemical processing machinery operation and settings.
39. Knowledge of fibre types, yarn properties and fabric behaviour for processed fabric.
40. Awareness of lean manufacturing and cost reduction strategies in chemical processing department.
41. Basic knowledge of Excel, ERP systems and production reports.

Technical Textiles Industry

42. Awareness of national/international standards (ISO, BIS, OEKO- TEX, GOTS) for technical textile product.
43. Ability to support production planning and line balancing for technical textile.
44. Skills in process monitoring and troubleshooting.
45. Exposure to technical textiles, functional finishes, smart textiles.

Garment Manufacturing Industry

46. Basic garment manufacturing techniques (cutting, stitching, finishing).
47. Understanding of eco-friendly materials, water/waste

management.

48. Familiarity with environmental and safety standards in garment industry.

Home Textiles

49. Skills in process monitoring and troubleshooting in home textile industries.
50. Awareness of lean manufacturing and cost reduction strategies in home textile industries.
51. Basic knowledge of Excel, ERP systems and production reports in home textile industries.

Apparel Merchandising

52. Basic garment manufacturing techniques (cutting, stitching, finishing) for marketing and merchandising.
53. Exposure to tech pack preparation and BOM (Bill of Materials) for marketing and merchandising.
54. Ability to communicate with buyers, vendors, designers and teams for apparel.
55. Basic knowledge of Excel, ERP systems, and production reports for merchandising.
56. Ability to support production planning and line balancing in merchandising.

Textile Machine Manufacturing

57. Ability to support production planning and line balancing in Textile Machine manufacturing industries.
58. Exposure to technical textiles, functional finishes, smart textiles for making machines.

Textile Products Sales, Servicing and Marketing

59. Awareness of national/international standards (ISO, BIS, OEKO- TEX, GOTS) for textile product, sales, servicing and marketing
60. Ability to support production planning and line balancing for textile product, sales, servicing and marketing.

Textile Education & Research Institutes

61. Knowledge and Use of textile testing equipment in Textile Education and research institutes.
62. Participation in R&D, prototyping, and new product development.
63. Knowledge of quality control and assurance protocols in Textile Education

Government and Public Sectors

64. Skills in process monitoring and troubleshooting in Government sectors like Ministry of textiles, DRDO
65. Participation in R&D, prototyping, and new product development in challenging area of government schemes

Textile Certifications

66. Knowledge and Use of textile testing equipment for certification.

67. Awareness of national/international standards (ISO, BIS, OEKO- TEX, GOTS) for certification.
68. Knowledge of quality control and assurance protocols for certification

Fashion and Apparel Designing/Consultants

69. Basic garment manufacturing techniques (cutting, stitching, finishing) for making garment.
70. Exposure to tech pack preparation and BOM (Bill of Materials) for competing complete order.
71. Knowledge of Fashion design/CAD softwares for fashion designing and ERP systems for automatic operations in garment industry.
72. Proficiency in MS Office, Excel, for preparation of reports.
73. Basic knowledge of Excel, ERP systems and production reports for garment production.

Basic Science

74. Apply mathematical techniques such as algebra, trigonometry, calculus, differential equations, linear algebra, probability and statistics to solve problems.
75. Apply physical principles such as motion, forces, energy and materials to solve problems.
76. Apply knowledge of chemical properties and reactions for construction material and environment (Corrosion, polymer, electrochemistry etc.).

Engineering Science Courses

77. Demonstrate proficiency in basic workshop operations (fitting, carpentry, welding, sheet metal, plumbing and machining etc.).
78. Apply the principles of engineering mechanics to analyse and solve problems involving forces, moment, equilibrium, friction, centred and MOI etc.
79. Apply the principles electrical engineering to analyse and maintain electrical systems, circuits, machines and power systems.
80. Demonstrate ability to interpreted and created draw ings using geometric constructions, orthographic projections, isometric projections and CAD tools.
81. Demonstrate ability to apply fundamental principles of algorithms, programming, data structures and computing system to solve conceptual problems.

Generic Competencies (Textile Engineering)

A. Problem-Solving Skills

82. Analytical Thinking: Ability to analyze complex problems, break them down into smaller components, and find effective solutions.
83. Critical Thinking: Ability to evaluate multiple solutions to a problem and choose the best course of action based on available data, safety, and cost-efficiency.

B. Communication Skills

84. Oral Communication: Ability to communicate complex technical information clearly to a variety of audiences, including clients, stakeholders, contractors, and team members.
85. Written Communication: Proficiency in drafting reports, proposals, technical specifications, and documentation that are clear, concise, and accurate.
86. Interpersonal Communication: Ability to collaborate effectively with multidisciplinary teams, clients, and project stakeholders.

C. Project Management

87. Time Management: Efficiently managing time and prioritizing tasks to meet deadlines in a dynamic project environment.
88. Resource Management: Ability to plan, allocate, and manage resources such as labour, materials, and equipment to ensure project efficiency.
89. Budgeting and Cost Control: Skills in estimating project costs, monitoring budgets, and ensuring projects are completed within financial constraints.
90. Risk Management: Ability to identify, assess, and mitigate risks during the planning and execution of engineering projects.

D. Teamwork and Leadership

91. Team Collaboration: Working effectively as part of a team, contributing to the success of the project through collaboration, open communication, and respect for others' expertise.
92. Leadership Skills: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
93. Conflict Resolution: Ability to resolve conflicts between team members, clients, or contractors, ensuring that project objectives are still achieved.

E. Attention to Detail

94. Accuracy: Ensuring all engineering calculations, designs, and project plans are accurate and align with weave and design og fabric, regulations, and standards.
95. Quality Assurance: Ensuring that the materials and processes used in construction adhere to high standards of quality and safety.

F. Ethical and Professional Integrity

96. Ethical Decision Making: Adhering to a strict code of ethics, ensuring public safety, environmental protection, and transparency in all dealings.
97. Accountability: Taking responsibility for the success or failure of a project, being proactive in addressing issues, and delivering results.

G. Adaptability and Flexibility

98. Openness to Change: Being able to adapt to new technologies, tools, and methods, as well as evolving project requirements or environmental conditions.
99. Learning and Development: Actively seeking opportunities for professional growth, staying current with industry trends, and acquiring new skills to remain competitive.

H. Creativity and Innovation

100. Creative Problem Solving: Thinking outside the box and coming up with novel solutions to engineering challenges.
101. Innovative Design: Contributing new ideas for designs and processes that can improve efficiency, reduce costs, or make better use of resources.

I. Cultural and Environmental Awareness

102. Sustainability Awareness: Knowledge of sustainable construction methods, green building practices and the importance of reducing the environmental impact of engineering projects.
103. Cultural Sensitivity: Understanding and respecting cultural differences when working in diverse teams or international projects.
104. Environmental Impact Understanding: Considering the environmental consequences of engineering decisions and striving to minimize negative impacts through design and construction methods.

J. Decision-Making Skills

105. Data-Driven Decisions: Using available data, facts, and technical analysis to make informed decisions about the design, execution, and management of projects.
106. Prioritizing Decisions: Knowing which decisions need immediate attention and which can be deferred, especially in a high-pressure environment.

K. Regulatory and Legal Knowledge

107. Familiarity with Building Codes and Standards: Understanding and ensuring compliance with local, national, and international building codes, safety regulations, and legal standards.
108. Health and Safety: Knowledge of safety regulations and best practices for ensuring the health and safety of workers, the public, and the environment throughout the project lifecycle.

L. Client-Focused Mindset

109. Client Management: Building and maintaining strong relationships with clients, understanding their needs, and ensuring their expectations are met throughout the project.
110. Customer Service Orientation: Ensuring that client concerns are addressed promptly, and working toward providing value-added solutions that meet their goals.

8. Scheme of Textile Engineering Department

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Textile Engineering Degree Programme

Semester - I (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - I	BSC	1SH101BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Physics	BSC	1SH102BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Programming for Problem Solving	ESC	1CS103ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Mechanics	ESC	1CE104ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Applied Physics Lab	BSC	1SH105BS1	0	0	2	0	2	1					25	25	50	25	50	
6	Programming for Problem Solving Lab	ESC	1CS106ES1	0	0	2	0	2	1					25	25	50	25	50	
7	Engineering Mechanics Lab	ESC	1CE107ES1	0	0	2	0	2	1					25	25	50	25	50	
8	Workshop	ESC	1ME108ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Fashion Designing	VSC	1TX109VS1	1	0	2	1	4	2						50	50	25	50	
10	English Communication	AEC	1SH110AE1	1	0	2	1	4	2					25	25	50	25	50	
11	Sports & Yoga	CC	1SH111CC1	0	0	4	0	4	2						50	50	25	50	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Textile Engineering Degree Programme

Semester - II (First Year) [Group - A/B]

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Mathematics - II	BSC	2SH112BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Applied Chemistry	BSC	2SH113BS1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Basic Electrical Engineering	ESC	2EE114ES1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Engineering Graphics	ESC	2ME115ES1	2	0	0	2	4	2	60	40	100	40					100	4 Hrs.
5	Textile Materials and products	PCC	2TX116PC1	1	0	2	1	4	2						50	50	25	50	
6	Cultural Aesthetics in Indian Textile Design	IKS	2TX117IK1	1	0	2	1	4	2						50	50	25	50	
7	Applied Chemistry - Lab	BSC	2SH118BS1	0	0	2	0	2	1					25	25	50	25	50	
8	Basic Electrical Engineering - Lab	ESC	2EE119ES1	0	0	2	0	2	1					25	25	50	25	50	
9	Engineering Graphics/CAD Lab	ESC	2ME120ES1	0	0	2	0	2	1					25	25	50	25	50	
10	Universal Human values	SEC	2SH121VS1	1	0	2	1	4	2						50	50	25	50	
11	Digital Wellness	CC	2SH122CC1	1	0	2	1	4	2						50	50	25	50	
Total				**15**	**0**	**14**	**15**	**44**	**22**			**400**				**350**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 15x15 = 225 Hrs]

Exit Option (Level 4.5) for Undergraduate Certificate in Odd Semester of next Academic Year as approved by BOS																			
12	Testing of Textile Materials	EC	3TX123EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Fabric and Garment Inspection	EC	3TX124EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	3TX125EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	3TX126OC1_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Textile Engineering Degree Programme

Semester - III (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Yarn Manufacturing-I	PCC	3TX201PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Textile Fibre-I	PCC	3TX202PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Fabric Manufacturing -I	PCC	3TX203PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - I	MDM	3TX204MD1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - I	OE-I	3SH205OE1/2	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Yarn Manufacturing-I Lab	PCC	3TX206PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Textile Fibre-I Lab	PCC	3TX207PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Fabric Manufacturing -I Lab	PCC	3TX208PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Principles of Managements	EEM	3TX209EM1	2	0	0	2	4	2						50	50	25	50	
10	Constitutional Values and Fundamental Duties	VEC	3SH210VE1	2	0	0	2	4	2						50	50	25	50	
11	Field Project	FP	3TX400FP1	0	0	4	0	4	2					25	25	50	25	50	
12	Disaster Management and Preparedness	NC	3ALE001NC1	2	0	0	0	2	-						50	50	25	50	
Total				**19**	**0**	**10**	**17**	**46**	**22**			**450**				**300**		**750**	
Notional Learning Hours : [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 17x15 = 255 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
13	Double Minor / Honours Course - I	DH	3TX211DH1/DH2	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Textile Engineering Degree Programme

Semester - IV (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Textile Fiber-II	PCC	4TX212PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Yarn Manufacturing-II	PCC	4TX213PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Fabric Manufacturing -II	PCC	4TX214PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - II	MDM	4TX215MD1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - II	OE	4SH216OE1/2	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Yarn Manufacturing-II Lab	PCC	4TX217PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Fabric Manufacturing -II Lab	PCC	4TX218PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Garment Manufacturing Technology	VSC	4TX219VS1	0	0	4	0	4	2						50	50	25	50	
9	Technical Writing	AEC	4SH220AE1	1	0	2	1	4	2						50	50	25	50	
10	Elements of Costing and Economics	EEM	4SH221EM1	1	0	2	1	4	2						50	50	25	50	
11	Environmental Science	VEC	4CE222VE1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
Total				**16**	**0**	**12**	**16**	**44**	**22**			**500**				**250**		**750**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 28x15 = 420 Hrs] + [Learner-engaged time 16x15 = 240 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
12	Double Minor / Honours Course - II	DH	4TX223DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5) for Undergraduate Diploma in Odd Semester of next Academic Year as approved by BOS																			
13	Chemical Processing of Textile materials	EC	5TX224EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
14	Modern Yarn and Fabric Manufacturing Technology	EC	5TX225EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
15	Internship / Apprenticeship in Industry	EI	5TX226EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
16	Two MOOC/NPTEL Courses	EC	5TX227OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Textile Engineering Degree Programme

Semester - V (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Fabric Structure and Design	PCC	5TX228PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Textile Testing- I	PCC	5TX229PC1	3	1	0	4	8	4	60	40	100	40					100	3 Hrs.
3	Advance Yarn Manufacturing Technology	PCC	5TX230PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - I	PEC	5TX231PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - III	MDM	5TX232MD_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Open Elective - III	OE	5SH233OE1/2	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Fabric structure and design - Lab	PCC	5TX234PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Textile Testing- I - Lab	PCC	5TX235PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - I - Lab	PEC	5TX236PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Multidisciplinary Minor - III - Lab	MDM	5TX237MD_	0	0	2	0	2	1					25	25	50	25	50	
Total				**17**	**1**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]

Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - III	DH	5TX238DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Textile Engineering Degree Programme
Semester - VI (Third Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Textile Testing- II	PCC	6TX239PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Advance Fabric Manufacturing Technology	PCC	6TX240PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Fundamentals & Applications of Technical Textiles	PCC	6TX241PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - II	PEC	6TX242PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Programme Elective Course - III	PEC	6TX243PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Multidisciplinary Minor - IV	MDM	6TX244MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
7	Textile Testing- II Lab	PCC	6TX245PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Advance Fabric Manufacturing Technology - Lab	PCC	6TX246PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - II - Lab	PEC	6TX247PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Personal Skills (GD& PI)	SEC	6SH248VS1	1	0	2	1	4	2						50	50	25	50	
Total				**18**	**0**	**8**	**18**	**44**	**22**			**550**				**200**		**750**	
Notional Learning Hours: [Workload (teaching/guidance/practicum) 26x15 = 390 Hrs] + [Learner-engaged time 18x15 = 270 Hrs]																			
Optional Course for Double Minor / Honours Degree																			
11	Double Minor / Honours Course - IV	DH	6TX249DH_	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
Exit Option (Level 5.5) for B. Voc in Odd Semester of next Academic Year as approved by BOS																			
12	Knitting	EC	7TX250EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	Nonwovens and Technical Textiles	EC	7TX251EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	7TX252EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	7TX253OC_	8	0	0	8	16	8										

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Textile Engineering Degree Programme

Semester - VII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Textile Mathematics	PCC	7TX301PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
2	Technical Textiles Manufacturing & Evaluation	PCC	7TX302PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Programme Elective Course - IV	PEC	7TX303PE_	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - V	PEC	7TX304PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Multidisciplinary Minor - V	MDM	7TX305MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
6	Technical Textiles Manufacturing & Evaluation Lab	PEC	7TX306PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Programme Elective Course - IV - Lab	PCC	7TX307PE_	0	0	2	0	2	1					25	25	50	25	50	
8	Research Methodology	RM	7TX401RM1	2	0	4	2	8	4	30	20	50	20		50	50	25	100	2 Hrs.
9	Project	PR	7TX402PR1	0	0	8	0	8	4					50	100	150	75	150	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**500**				**300**		**800**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 30x15 = 450 Hrs] + [Learner-engaged time 14x15 = 210 Hrs]

Optional Course for Double Minor / Honours Degree																			
10	Double Minor / Honours Course - V	DH	7TX308DH_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
Optional Course for Honours with Research Degree																			
11	Research Project	RP	7TX403RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Textile Engineering Degree Programme

Semester - VIII (Final Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SEE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Process Control in Textile Manufacturing (Online)	PCC	8TX309PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Programme Elective Course - VI (Online)*	PEC	8TX310PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Multidisciplinary Minor - VI (Online)	MDM	8TX311MD_	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
4	On Job Training (Internship/Apprenticeship)	OJT	8TX404IN1	0	0	24	0	24	12					100	100	200	100	200	
Total				**8**	**0**	**24**	**8**	**40**	**20**			**250**				**200**		**450**	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 32x15 = 480 Hrs] + [Learner-engaged time 8x15 = 120 Hrs]

Optional Course for Honours with Research Degree																			
5	Research Project	RP	8TX405RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

9. List of Programme Elective Courses

Students will have an option to choose the PEC offered by their respective Major Discipline offered during semester V to VIII Programme Elective Courses offered by Textile Engineering

Sr No.	Semester	Programme Elective Course/Subjects Name	Course Code
1	V	Chemical Processing-I (PEC-I)	5TX231PE1
2		Chemical Processing-I-Lab (PEC-I Lab)	5TX236PE1
		OR	
3		Specialty Textile Materials (PEC-I)	5TX231PE2
4		Specialty Textile Materials-Lab (PEC-I Lab)	5TX236PE2
5	VI	Chemical Processing-II (PEC-II)	6TX242PE1
6		Chemical Processing-II-Lab (PEC-II Lab)	6TX246PE1
		OR	
7		Textile Composites (PEC-II)	6TX242PE2
8		Textile Composites-Lab (PEC-II Lab)	6TX246PE2
9		High Performance Fibers (PEC-III)	6TX243PE1
		OR	
10		Nano Technology (PEC-III)	6TX243PE2
11	VII	Knitting Technology (PEC-IV)	7TX303PE1
12		Knitting Technology-Lab (PEC-IV Lab)	7TX307PE1
		OR	
13		3D Fabrics (PEC-IV)	7TX303PE2
14		3D Fabrics-Lab (PEC-IV Lab)	7TX307PE2
15		Fibre Manufacturing Technologies (PEC-V)	7TX304PE1
		OR	
16		Textured Yarn Technology (PEC-V)	7TX304PE2
17	VIII	Textile product and development (PEC-VI)	8TX310PE1
		OR	
18		Sustainability and Circularity in Textiles (PEC-VI)	8TX310PE2

10. Syllabus for Semester III & IV

Level: **5**	Course Code: **3TX201PC1**		Course Category: **PCC**		
Course Name	**Yarn Manufacturing-I**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**03 hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 3TX201PC1 Yarn Manufacturing-I is a compulsory Program Core Course for Second Year B. Tech Textile Engineering.

Course Objectives:
The objective of this course is to provide students with a foundational understanding of the key concepts, terminology, and processes involved in yarn production. It focuses on the basic principles of yarn manufacturing.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX201PC1.1	Illustrate the process concepts, constructional details, and operational principles of blowroom machines involved in fibre opening, cleaning, and blending.	C-3
3TX201PC1.2	Demonstrate the constructional features and working principles of carding machines for fibre individualization and web formation.	C-3
3TX201PC1.3	Explain the principles, machine components, and operational sequence of draw frame machines used for fibre straightening and drafting.	C-2
3TX201PC1.4	Describe the construction, functions, and process flow of combing preparatory machines essential for lap formation and uniform feed to the comber.	C-2
3TX201PC1.5	Demonstrate the working principles and technical features of comber machines for removal of short fibres, and improvement in sliver quality.	C-3
3TX201PC1.6	Determine the key process parameters related to blowroom, carding, drawing, and combing to assess their influence on fibre behavior and sliver quality.	C-3

Course Contents:

Unit 1	**Ginning & Blowroom Process:** Objectives, principle and working details of ginning machines, importance and objectives of baling and pressing; baling and pressing machines. Process flow chart of spinning process. Blowroom: Objectives, principle, degree of opening, cleaning, and factors affecting cleaning efficiency. Machines: Automatic bale openers, cleaners, multi-roll systems, and multifunction separators. Calculations: Cleaning efficiency.	9 Hrs
Unit 2	**Mixing & Blending Process:** Objectives, importance of mixing, methods of mixing, principle and working details of mixing machines, integrated mixers etc. Blending- objectives, selection of blend constituents, blend ratio**,** blending techniques, compatibility, principle and working details of blending machines.	6 Hrs
Unit 3	**Carding Process** Objectives, principle, constructional details of new generation cards, operating regions of the card, transfer efficiency, factors affecting transfer efficiency. Auto-levelers-type, principle and working details of autolevellers. Different settings of carding machine, recent developments in carding machine, calculations related to production and cleaning efficiency.	8 Hrs
Unit 4	**Drawing Process** Objectives, constructional details of draw frame machine, principle of drafting, types of drafting system, types of draft, roller setting, drafting irregularities, process parameters affecting drawing performance, recent developments in drawframe machine.	7 Hrs
Unit 5	**Combing Preparatory Process** Objectives, importance of combing preparatory, methods of comber lap preparation, hook reversal process, process parameters- pre-comb draft, lap weight etc. Effect of lap preparation on combing performance, recent developments in combing preparatory machines.	6 Hrs
Unit 6	**Combing Process** Objectives, principle, constructional details of combing machine, stages of combing cycle, settings of combing machine, fractionating efficiency, comber noil and its influence on combing performance. recent developments in combing machine.	9 Hrs

Text Books

1. Klein W, Manual of Textile Technology, Vol. I – III, the Textile Institute, UK, 1987.
2. Oxtoby E, Spun Yarn Technology, Butterworth and Co. Ltd. Publication, 1987.
3. Lord P R, Handbook of Yarn Production, the Textile Institute, Woodhead Publication Limited.

Reference Books

1. Dr. Zoltan S. Szaloki, Opening Cleaning and Picking, Institute of Textile Technology, Virginia.
2. T. K. Pattabhiraman, Essential calculations of practical cotton spinning.
3. Dr. A. R. Khare, Elements of Blowroom and Carding.

E- Resources

1. Spinning https://nptel.ac.in/courses/116/102/116102058/
2. Blowroom in Spinning https://www.textileschool.com/361/blowroom-in-spinning
3. Mixing and Blending https://textilelearner.net/mixing-and-blending-in-spinning-industry
4. Blending Process https://textilestudycenter.com/blending-process-in-yarn manufacturing
5. Carding Process https://www.textileschool.com/323/carding-process-and-itsimportance
6. Textile World https://www.textileworld.com
7. Textile Today https://www.textiletoday.com.bd

Mapping of COs with Pos & PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3TX201PC1.1	3	2	2	-	2	-	-	2	2	-	-	2	2	-
3TX201PC1.2	3	2	2	-	3	-	-	2	-	-	-	2	2	-
3TX201PC1.3	2	2	2	-	2	-	-	2	3	-	-	2	2	-
3TX201PC1.4	3	3	2	-	2	-	-	2	2	-	-	2	2	-
3TX201PC1.5	3	2	3	-	3	-	-	2	2	-	-	2	2	-
3TX201PC1.6	3	3	2	3	3	-	-	2	2	-	2	2	2	-
3TX201PC.CO	3	2	2	1	3	-	-	2	2	-	1	2	2	-

Correlation levels – 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3TX202PC1**		Course Category: **PCC**		
Course Name	**Textile Fiber-I**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3TX202PC1 Textile Fiber-I is a compulsory Programme Core Course for Second Year B. Tech. Textile Engineering.

Course Objectives:

The objective of this course is to introduce the basics of natural textile fibers, including their classifications, methods of extraction, morphological structures, fiber properties in relation to their end-use performance in textiles.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX202PC1.1	Describe the essential and desirable properties of textile fibers and the requirements of fiber-forming polymers.	C-2
3TX202PC1.2	Explain the structure, properties, and applications of cotton fibers for their significance in the textile industry.	C-2
3TX202PC1.3	Illustrate the extraction process, structure, and characteristics of bast fibers such as jute, flax, hemp, and ramie.	C-3
3TX202PC1.4	Analyze the morphological structure, polymer system, and chemical composition of wool fibers.	C-4
3TX202PC1.5	Explain the life cycle of the silkworm and the production process of silk, including cocoon formation and reeling and polymer system of silk for determining fiber properties.	C-2
3TX202PC1.6	Explain emerging unconventional natural fibers, their distinctive features, and potential applications.	C-2

Course Contents:

Unit 1	**Introduction to Textile Fiber:** Definition of fibre, Staple fiber, Filament, Classification of Textile fibres, Essential and desirable properties of Textile fibres, Definition of Polymers, Types of polymers, Requirements of fibre forming polymers.	5 Hrs
Unit 2	**Cotton Fiber**: Introduction to cotton fiber, Chemical structure of cotton fiber, Morphological structure, Physical, chemical and biological properties, Applications.	5 Hrs
Unit 3	**Bast Fiber:** Jute: Cultivation and Extraction of jute fiber, Morphological structure, Physical, chemical and biological Properties, Applications. Flax: Retting and extraction process, morphological structure of flax fibre, physical, chemical and biological properties, Applications, Introduction to hemp and Ramie and its distinctive features	5 Hrs
Unit 4	**Wool Fiber:** Types of wool fiber, Morphological structure of wool fiber, Chemical composition, polymer system of wool, physical, Chemical properties.	5 Hrs
Unit 5	**Silk Fiber:** Types of silk, Production of silk (life cycle, reeling), Morphological structure, Chemical composition, polymer system of silk, Physical and Chemical properties and Applications.	5 Hrs
Unit 6	**Emerging Unconventional Natural Fibers:** Introduction to Banana, Pinaaaple and their distinctive features, Introduction to fibers like mohair, camel and spider silk and their distinctive features and applications, BT Cotton.	5 Hrs

Text Books

1. S. P. Mishra Fiber Science and Technology, New age International Publications.
2. V. K. Kothari Textile Fibers: Developments and Innovations, IAFL Publications.
3. V. A. Shenai, Textile Fibers-Vol.-I, Sevak Publications.

Reference Books

1. C. Santulli, Pineapple fibers, their composites and applications.
2. M. J. John, Natural Polymers-Volume 1: Composites.
3. N. Shreenivasan, BT Cotton in India, an Introduction, ICFAI University Press Publications.

4. H. V. Sreenivasa, Introduction to Textile Fibers,

E- Resources

1. Classification of fibers and their general properties Link:https://nptel.ac.in/courses/116102026
2. Introduction to Textile Fibers Link : https://gphisar.ac.in/wp-content/uploads/2022/09/TEXTILE-FUNDAMENTALS.pdf
3. Recent Advances in Sustainable Natural Fiber Composites Link :https://www.researchgate.net/publication/381923803
4. Classification of Textile Fibers Link:https://textilelearner.net/classification-of-textile-fibers/

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3TX202PC1.1	3	2	-	2	1	-	-	-	-	-	2	3	2	-
3TX202PC1.2	3	2	2	2	1	-	-	-	-	-	2	3	2	-
3TX202PC1.3	3	2	2	2	1	2	-	-	-	-	2	3	2	-
3TX202PC1.4	3	3	2	2	1	-	-	-	-	-	2	3	2	-
3TX202PC1.5	3	2	2	2	1	2	-	-	-	-	2	3	2	-
3TX202PC1.6	3	3	2	2	1	2	-	-	-	-	2	3	2	-
3TX202PC1.CO	3	2	2	2	1	1	-	-	-	-	2	3	2	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3TX203PC1**		Course Category: **PCC**		
Course Name	**Fabric Manufacturing - I**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hr**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3TX203PC1 Fabric Manufacturing-I is a compulsory Program Core Course for Second Year B.Tech. Textile Engineering.

Course Objectives:

The objective of this course is the basic knowledge about conventional and modern aspects of winding, warping and sizing process and their applications in Textile Engineering with practical skills.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX203PC1.1	Demonstrate the concept and principle of winding and high speed winding machines.	C-3
3TX203PC1.2	Describe the technical features and operating principles of automatic winding machines.	C-2
3TX203PC1.3	Explain the concept and principles of warping and high speed warping machines.	C-2
3TX203PC1.4	Describe the technical features and operating principles of automatic warping machines	C-2
3TX203PC1.5	Describe the concepts and description of sizing process and machines.	C-2
3TX203PC1.6	Distinguish the sizing ingredients and various control systems, size paste ingredients used in sizing process.	C-5

Course Contents:

Unit 1	**Introduction to Winding Process:** Brief outline of the process involve in weaving, Yarn quality attributes, objectionable faults & its classification as per Uster calssimate. Winding: Objectives and construction details of High speed winding process, Concept of cone angle, angle of wind, wind per traverse, production calculation.	7 Hrs
Unit 2	**Automatic Winding Machines:** Automatic cone and cheese winding machines, methods of yarn joining. Concept and constructional details of automatic winding machines. Types of splicers, Splice quality assessment. Internal and between machine material flow with respect to weft winding, brief description about pirn winding process.	8 Hrs
Unit 3	**Introduction to Warping Process:** Objectives and classification of warping process, construction details about beam warping. Modern developments in warping: viz. modern types of creel, pre tensioner, automatic tension regulation system.	7 Hrs
Unit 4	**Automatic Warping Machines:** Modern developments with respect to beam warping. Sectional warping: objective, constructional details of sectional warping process, cone angle adjustment and beam traverse. Production Calculation.	8 Hrs
Unit 5	**Introduction to Sizing Process and machines:** Concept of yarn weaveability, Sizing: Necessity and objectives, constructional details and calculations regarding slasher sizing and multi-cylinder sizing. Modern developments in sizing machine elements viz. creels, unwinding tension control, saw box, yarn drying methods, head stock weavers beam pressing and doffing.	7 Hrs
Unit 6	**Introduction to Sizing ingredients and its recipes:** Introduction to various sizing ingredients, concept of sizing control systems viz. size paste level, temperature, stretch, moisture control of sizing machines, production calculation. Concept of optimum size pick-up and add-on, Description about size paste cooking. Types of sizing: Heavy, medium, light and pure. Sizing recipe of polyester, PV, PC blends.	8 Hrs

Text Books

1. R.Sengupta, Yarn Preparation (Vol-1 and 2) Published by Popular Prakashan in Bombay in 1963
2. D.B.Ajgaokar And talukdar, Sizing Method, Material and Mechanism Published by Textile Trade Press, 1982.
3. R. Sengupta, Weaving Calcutions Published by D.B. Taraporevala Sons and Company, spanning , 1961.
4. J.E.Booth, Textile Mathematics (Vol-3) Published by The Textile Institute in 1977.

Reference Books

1. Allan Armored And walter S Sondhel, Weaving Technology and Operation Published by The Textile Institute in 1995.
2. N.M.Kulkarni, Weaving Technology.

E- Resources

1. Winding and Winding Machine: Types, Features, Efficiency, Functions and Driving Methods
   Link: https://textilelearner.net/winding-and-winding-machine/
2. Introduction to Fabric Manufacturing
   Link: https://nptel.ac.in/courses/116102005
3. Textile Warping
   Link: https://www.slideshare.net/slideshow/textile-warping/53197340
4. Introduction to Warping
   Link: https://www.scribd.com/document/609537513/8-9-Warping
5. Textile Sizing Techniques Guide
   Link: https://www.scribd.com/presentation/615734195/Presentation-SIZING-3-1
6. Techniques of Warp Yarn Sizing in Weaving Preparatory Process
   Link: https://textilelearner.net/techniques-of-warp-yarn-sizing/

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3TX203PC1.1	3	2	2	-	2	-	-	2	2	-	-	3	2	1
3TX203PC1.2	3	2	2	-	3	-	-	2	-	-	-	2	2	1
3TX203PC1.3	2	2	2	-	2	-	-	2	3	-	-	3	2	1
3TX203PC1.4	3	3	2	-	2	-	-	2	2	-	-	2	2	1
3TX203PC1.5	2	2	3	-	3	-	-	2	2	-	-	2	1	1
3TX203PC1.6	3	2	2	-	2	-	-	2	2	-	-	3	2	1
3TX203PC1CO	3	2	2	-	2	-	-	2	2	-	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3TX204MD1**		Course Category: **MDM**		
Course Name	**Introduction to Fashion Designing**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks		PA Marks		Total Marks	**50**

Course Description:
Subject 3TX204MD1 Introduction to Fashion Designing is a compulsory Multi-Disciplinary Minor Courses for Second year B. Tech Textile Engineering.

Course Objective
The objective of this course is to prepare students with the essential knowledge and skills needed in the field of fashion and apparel design which ensures a holistic understanding of the fashion industry, from concept development to market execution.

Course Outcomes
After completing the course students will be able to:

CO	**Course Outcomes**	**Domain Level**
3TX204MD1.1	Illustrate fundamental research and design techniques to explore historical, contemporary and client-based fashion concepts for holistic understanding of the fashion industry.	C-4
3TX204MD1.2	Demonstrate technical skills in fashion visualization, mood/storyboard creation and flat garment drawing to communicate design ideas.	C-3
3TX204MD1.3	Apply and executive foundational skills in drawing fashion figures, color theory to prepare flats	C-3

Course Contents:

Unit 1	**Fundamentals of Fashion & Fashion Designing** Meaning & Definition of Fashion. Evolution & History of Fashion. Fashion Cycle. Role and Responsibilities of Fashion Designer. Fashion Terminology. Structure of Fashion Industry.	10 hrs

Unit 2	**Elements & Principles of Fashion Design** Elements of Design: Line, Shape, Texture, Colour, Pattern Principles of Design: Balance, Harmony, Rhythm, Emphasis, Proportion Application of principles in Apparel Fashion Figure Proportions.	10 hrs
Unit 3	**Fashion Design Process, Research & Boards** Fashion Design Process, Research in Fashion, Mood Board, Story Board, Concept Board, Collection Development, Portfolio Preparation	10 hrs

Text Books:

1. Malcolm Barnard, Fashion Theory A Reader.
2. Roland Barthes, The Fashion System.
3. Kathryn McKinley & Janine Munslow, Fashion Design: A Process of
4. Bina Abling, Fashion Sketchbook.

Reference Books:

1. Anna Kiper, Fashion Illustration: Inspiration and Technique
2. Joen Wolfrom,Color for Fashion
3. Michele Wesen Bryant, Fashion Drawing: A Visual Guide to Drawing Fashion
4. Connie Amaden-Crawford, The Art of Fashion Draping.

E- Resources:

1. Apparel Designing (Swayam)
   https://onlinecourses.swayam2.ac.in/cec21_hs14/preview
   (Basics of fashion design, color theory, garment drawing, flats, mood boards, and portfolio preparation.)
2. Colour in Design (NPTEL – IIT Kanpur)
   https://archive.nptel.ac.in/courses/109/104/109104075/
   (Intro to color perception, harmony, and application in design.)
3. Design Fundamentals (NPTEL – IIT Guwahati)
   https://nptel.ac.in/courses/107/103/107103002/
   (Basics of design principles, visual elements, and communication.)

Mapping of COs with Pos

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3TX204MD1.1	1	-	-	-	2	-	-		2	-	-	2	3	2
3TX204MD1.2	-	-	-	-	2	-	-	-	3	-	-	1	3	3
3TX204MD1.3	3	-	-	-	3	-	-	-	-	-	-	1	2	3
3TX204MD1	2	-	-	-	2	-	-	-	2	-	-	1	3	3

orrelation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3SH205OE1**	Course Category:	**OE**
Course Name	**Soft Skills & Profile Building**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3SH205OE1Soft Skills & Profile Building is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The objective of this course is to focus on developing advanced communication skills, leadership qualities and professional etiquette among engineering graduates. The course emphasizes workplace communication, interview preparedness, personal branding, and employability skills aligned with industry expectations. It integrates emotional intelligence, digital professional identity, and strategic career planning for holistic professional development.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE1.1	Apply advanced interpersonal, analytical, and persuasive communication techniques in professional contexts for effective professional interactions.	C-3
3SH205OE1.2	Demonstrate professional workplace etiquette, business communication, and group discussion skills to enhance employability.	C-3 A-3
3SH205OE1.3	Analyze leadership styles, emotional intelligence, and team dynamics for effective collaboration.	C-4 A-3
3SH205OE1.4	Design a structured and realistic career plan aligned with industry expectations and personal goals for professional growth.	C-6
3SH205OE1.5	Create ATS-friendly résumés, professional portfolios, and digital profiles for personal branding.	C-6 P-4
3SH205OE1.6	Perform effectively in interviews, workplace	C-3

	simulations, and job-search processes with professional confidence for enhanced employability.	P-3 A-3

Course Contents:

Unit 1	**Advanced Communication Dynamics:** Advanced interpersonal communication strategies; speech articulation; structuring thoughts and fluency techniques; analytical and critical communication; storytelling techniques for impactful presentations; persuasive communication models.	7Hrs
Unit 2	**Global Workplace Etiquettes, Email Writing & GD–PI Perspective:** Professional greetings and workplace conduct; giving and receiving feedback; handling criticism and adaptability issues; professional values such as punctuality and attire; types of handshakes and significance; effective business email writing; types of Group Discussions, purpose of GDs; mock GDs (video-based); interview strategies and techniques.	8Hrs
Unit 3	**Leadership, Team Dynamics & Corporate Skills:** Personality types using 9/9 matrix; leadership styles; emotional intelligence and leadership relationship; conflict resolution and negotiation techniques; team-building skills (Johari Window perspective); cross-cultural communication; creativity and design thinking; structured problem-solving and decision-making**.**	7 Hrs
Unit 4	**Strategizing Career Planning:** SMART goal setting; mapping skills to career paths; understanding industry expectations; emerging futuristic soft and hard skills (domain-wise); personalized career roadmap; certification planning (technical and non-technical); networking skills and participation in professional communities	7 Hrs
Unit 5	**Profile Building, Portfolio & Personal Branding :** ATS-friendly résumé preparation and common mistakes; video résumé creation and self-marketing pitch; LinkedIn profile optimization and networking strategies; developing online portfolios using platforms such as GitHub, Behance, Google Sites, and Toastmasters	8 Hrs
Unit 6	**Employment Readiness & Industry Integration:** Workplace simulation activities (mock emails, meetings,	8 Hrs

	discussions); mock personal interviews; understanding sector-specific industry dynamics; unconventional career opportunities after engineering; job-hunting strategies and popular job platforms	

Text Books:

1. Alex K., Soft Skills, S. Chand Publishing
2. Meenakshi Raman & Prakash Singh, Business Communication, Oxford University Press

Reference Books:

1. Stephen R. Covey,The 7 Habits of Highly Effective People,Free Press Publication
2. Daniel Goleman, Emotional Intelligence,published by Bantam Books.
3. Shiv Khera, You Can Win,published by Bloomsbury Publishing
4. Richard N. Bolles, What Color Is Your Parachute? Published by Ten Speed Press, Crown Publishing Group

E Resources:

1. NPTEL: Soft Skills and Personality Development
2. LinkedIn Learning – Communication & Career Development Courses
3. Harvard Business Review – Communication & Leadership Articles
4. Coursera /edX – Career Development & Employability Skills Modules

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE1.1	2	3	2	–	–	–	–	2	3	–	–	2	2	3
3SH205OE1.2	–	2	–	–	–	2	3	3	3	–	–	1	2	3
3SH205OE1.3	–	3	2	–	–	2	2	3	–	–	–	2	3	3
3SH205OE1.4	–	3	3	–	–	2	–	–	–	2	3	2	3	2
3SH205OE1.5	–	2	3	–	3	–	–	–	2	–	2	1	2	2
3SH205OE1.6	–	2	2	–	2	2	–	2	3	–	2	2	3	3
3SH205OE1CO	1	3	2	-	1	2	1	2	2	1	1	1	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3SH205OE2**	Course Category:	**OE**
Course Name	**Team Building & Management**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3SH205OE2Team Building & Management is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the course is to develop teamwork capabilities, leadership and managerial skills, collaborative problem-solving abilities, conflict management techniques, and effective decision-making skills required in professional and organizational settings.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE2.1	Explain the principles and importance of effective team building in organizations to foster collaborative work culture.	C-2
3SH205OE2.2	Apply team dynamics and collaboration strategies to achieve common goals.	C-3 A-3
3SH205OE2.3	Analyze leadership styles and managerial roles for effective team performance.	C-4
3SH205OE2.4	Demonstrate conflict resolution, negotiation, and interpersonal management skills for effective team performance.	C-3 A-3
3SH205OE2.5	Apply motivation and performance management techniques in team-based environments for achieving organizational goals.	C-3
3SH205OE2.6	Perform effectively as a team member or leader in simulated managerial scenarios to develop leadership competencies	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Team Building:** Concept of teams; types of teams; stages of team development; characteristics of effective teams; roles and responsibilities of team members; barriers to effective teamwork; team norms and values.	7Hrs
Unit 2	**Team Dynamics & Interpersonal Relationships:** Group behaviour and dynamics; interpersonal communication in teams; trust and collaboration; listening as a team skill; diversity and inclusion in teams; cross-cultural team management	8Hrs
Unit 3	**Leadership in Teams:** Leadership concepts; leadership styles; emotional intelligence and leadership; situational leadership; influence and power in teams; leadership ethics and responsibilities.	7 Hrs
Unit 4	**Conflict Management & Negotiation:** Sources and types of conflict; conflict resolution techniques; negotiation strategies; managing difficult team members; stress management; maintaining team harmony	7 Hrs
Unit 5	**Motivation, Performance & Team Effectiveness:** Motivation theories; team motivation techniques; goal setting and performance measurement; feedback and appraisal systems; decision-making in teams; problem-solving techniques.	8 Hrs
Unit 6	**Managerial Skills & Team-Based Applications:** Managerial roles and functions; planning, organizing, and controlling teams; delegation and coordination; workplace simulations (team meetings, role plays); case studies on team management; team performance evaluation.	8 Hrs

Text Books:

1. Stephen P. Robbins, Organizational Behaviour, Pearson Education
2. L.M. Prasad, Management Principles and Practices, published by Sultan Chand & Sons

Reference Books:

1. Patrick Lencioni, The Five Dysfunctions of a Team, published by Jossey-Bass
2. Peter G. Northouse, Leadership, published by SAGE Publications
3. Daniel Goleman, Emotional Intelligence, published by Bantam Books

E Resources:

1. NPTEL – Organizational Behavior& Management Courses
2. LinkedIn Learning – Team Leadership & Management Modules
3. Harvard Business Review – Teamwork & Leadership Articles
4. Coursera / edX – Team Management and Leadership Courses

Mapping of COs with POs & PSO

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3SH205OE2.1	2	–	–	–	–	–	–	–	–	–	–	1	2	3
3SH205OE2.2	–	2	2	–	–	–	–	3	2	–	–	2	3	3
3SH205OE2.3	–	3	3	–	–	–	–	2	–	–	–	2	3	3
3SH205OE2.4	–	2	2	–	–	2	3	3	–	–	–	2	3	3
3SH205OE2.5	–	2	2	–	–	–	–	2	–	2	–	2	3	3
3SH205OE2.6	–	2	2	–	–	2	–	3	2	–	2	2	3	3
3SH205OE2 CO	1	2	2	-	-	1	1	2	1	1	1	2	3	3

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3TX206PC1**		Course Category: **PCC**		
Course Name	**Yarn Manufacturing-I Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 3TX206PC1 Yarn Manufacturing-I Lab is a compulsory Program Core Course for Second Year B. Tech Textile Engineering. This course serves as a core subject of the program.

Course Objectives:

The objective of this course is to provide practical exposure to the fundamental concepts of yarn manufacturing processes. It emphasizes understanding the working principles and functions of yarn manufacturing machines. The course aims to develop technical skills through hands-on machine operation and experimentation.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX206PC1.1	Demonstrate the construction, working principles and material passage through ginning, blowroom, carding, draw frame, and comber machines to develop fundamental operational understanding.	C-3 P-5
3TX206PC1.2	Perform essential machine settings and gearing calculations for carding, draw frame, and comber machines to achieve accurate processing performance.	C-3 P-4
3TX206PC1.3	Analyze how different machine settings affect fibre movement and machine performance to improve the quality of processing.	C-4 P-4

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. To study the construction and working of roller ginning machine.
2. To study the construction and working of an automatic bale opener.

3. To study the construction and working details of the blowroom.
4. To study the passage of material through carding machine.
5. To study the settings of carding machine.
6. To study the gearing calculations of carding machine.
7. To study the passage of material through draw frame machine.
8. To study the drafting system of draw frame machine.
9. To study the passage of material through comber machine.
10. To study important settings of comber machine.

E- Resources

1. Ginning Technologies: https://circot.res.in
2. Roller Ginning Basics: https://cotton.tamu.edu
3. Cotton Ginning Research: https://www.ars.usda.gov
4. Truetzschler Technologies: https://www.truetzschler.in
5. Rieter Blowroom Concepts: https://www.rieter.com
6. Rieter Carding Technology: https://www.rieter.com
7. Truetzschler Card TC Series: https://www.truetzschler.in
8. Textile Learner – Carding Process: https://textilelearner.net

Mapping of COs with POs

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
3TX206PC1.1	3	1	-	-	1	-	-	1	1	-	-	2	2	-
3TX206PC1.2	3	1	-	2	1	-	-	1	1	-	-	2	2	-
3TX206PC1.3	3	1	-	2	1	-	-	1	1	-	-	2	2	-
3TX206PC.CO	3	1	-	2	1	-	-	1	1	-	-	2	2	-

Correlation levels – 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3TX207PC1**	Course Category:	**PCC**
Course Name	**Textile Fiber-I Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	**--**
Total Credit Hours	**30 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Comp. Mapping (PO1, PO2, PO4, P7, PO8, PO9, PO10, P11)

Course Description:

Subject Code 3TX207PC1 Textile Fiber-I Lab is a compulsory Program Core Course for Second Year B. Tech B. Tech. Textile Engineering.

Course Objectives:

The objective of this course is to perform practicals on the concepts of Textile Fiber and identify, extract, analyze, and characterize natural fibers through visual, tactile, chemical, burning, and microscopic methods.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX207PC1.1	Identify natural fibers such as cotton, jute, wool, silk, and unconventional fibers using visual, tactile, chemical, and burning tests.	C-2, P-1
3TX207PC1.2	Prepare and Analyze microscopic slides of cotton, jute, wool, silk, and unconventional fibers to observe morphological characteristics.	C-4, P-2
3TX207PC1.3	Measure moisture regain and density of natural fibers using standard laboratory methods such as the density gradient technique for determine their fundamental physical characteristics	C-5, P-3, A-2

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Identification of natural fibers by feel and visual method.
2. Extraction of unconventional natural fiber by water retting method.
3. Conduct degumming and reeling of silk.
4. Microscopic study of cotton and jute fiber.
5. Study of cotton and jute fiber by chemical and burning method.

6. Microscopic study of unconventional natural fibers extracted by water retting method.
7. Study of unconventional natural fibers by chemical and burning method.
8. Microscopic study of wool and silk fiber.
9. Study of wool and silk fiber by chemical and burning method.
10. To determine moisture regain of fiber samples.
11. Determination of density of natural fibers by density gradient method.

E Resources:

1. Textile Fiber Microscopy Link: L-12302465-de6f76f788.pdf
2. Fiber Science and Technology Link: A_Text_Book_of_Fibre_Science _and_Technol.html?id=uHz-l5RTP1IC

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3TX207PC1.1	3	3	-	3	-	-	1	2	2	1	2	3	2	1
3TX207PC1.2	3	3	-	3	-	-	1	2	2	1	2	3	2	1
3TX207PC1.3	3	3	-	3	-	-	1	2	3	1	1	3	2	1
3TX207PC1CO	3	3	-	3	-	-	1	2	2	1	2	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**3TX208PC1**	Course Category:	**PCC**	
Course Name	**Fabric Manufacturing-I Lab**					
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours		**--**
Total Credit Hours	**30 Hrs**					
SEE Marks	**--**	SEE Time	**--**	CIA Marks		**--**
EE Marks	**25**	PA Marks	**25**	Total Marks		**50**

Course Description:

Subject Code 3TX208PC1 Fabric Manufacturing-I Lab is a compulsory Program Core Course for Second Year B.Tech. Textile Engineering.

Course Objectives:

The objective of this course is to perform practicals on the concepts of weaving preparatory like mechanisms of yarn warp and weft winding machines, warping machines and aspects of sizing machine in Fabric Manufacturing-I lab.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX208PC1.1	Demonstrate various mechanisms of yarn winding machine	C-3, P-5
3TX208PC1.2	Demonstrate various mechanisms of weft winding machine	C-3, P-4
3TX208PC1.3	Demonstrate various mechanisms of warping machine and aspects of sizing machine	C-3, P-5, A-2

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. To determine the yarn count of various yarns using various yarn numbering systems.
2. To find out and clarify yarn objectionable faults by using yarn appearance board.
3. To compare the properties of yarn before and after winding process.
4. To study the passage of material through cimmco muller cone winding machine.
5. To study the gearing and its related calculation of cimmco muller cone winding machine.
6. To study the thread break stop motion of cimmco muller cone winding machine.

7. To study the passage of yarn through pirn winding machine.
8. To study the passage of material through warping machine.
9. To study the passage of material through single end sizing machine.
10. To compare the properties of sized and unsized yarn.

E Resources:

1. Yarn Winding Machine Process
   https://meeraind.com/blog/yarn-winding-machine-types-functions
2. Yarn Sizing: Important Warp Preparatory Process
   https://textilelearner.net/yarn-sizing-important-warp-preparatory-process/

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3TX208PC1.1	3	1	-	2	-	-	-	3	2	-	-	3	2	1
3TX208PC1.2	3	1	-	-	-	-	-	-	-	-	-	3	2	1
3TX208PC1.3	3	1	-	1	-	-	-	3	3	-	-	3	2	2
3TX208PC1CO	3	1	-	1	-	-	-	2	2	-	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3TX209EM1**		Course Category: **EEM**		
Course Name	**Principles of Managements**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 3TX209EM1 Principles of Managements is a compulsory Humanities Social Science and Management Course for Second Year B. Tech. Textile Engineering.

Course Objectives:

The course aims to provide an understanding of basic management concepts, managerial roles and responsibilities in organizations and equip students with essential decision-making and problem-solving skills in management contexts.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX209EM1.1	Explain the core principles and functions of management for implementing in organisation.	C-2
3TX209EM1.2	Apply planning and organizing principles to business situations.	C-3
3TX209EM1.3	Demonstrate the use motivation, leadership, communication, and behavioural concepts in organisational working.	C-3

Course Contents:

Unit 1	**Introduction To Management:** Definition of Management, Science or Art; Manager Vs Entrepreneur; types of managers; managerial roles and skills; Functions of Management: Planning, Organizing, Directing Controlling; Evolution of Management, Management thoughts: Peter Drucker's Analysis Thoughts; Scientific Management Theory by F. W. Taylor; Administrative Management Theory by Henri Fayol; Human Relations Theory by Elton Mayo and Hawthorne Experiments; Henry Mintzberg Managerial Roles.	10 Hrs

Unit 2	**Planning and Organising:** Planning: Nature and purpose of planning; planning process; types of planning; objectives; setting objectives, policies, Planning premises, Strategic Management; Planning Tools and Techniques; Decision making steps and process. Organisation: Nature and purpose, Formal and informal organization, organization chart, organization structure, types. Line and staff authority, departmentalization, delegation of authority, centralization and decentralization, Job Design, Human Resource Management, HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.	10 Hrs
Unit 3	**Directing and Controlling:** Directing: Foundations of individual and group behaviour, motivation, motivation theories, motivational techniques, job satisfaction, job enrichment, leadership, types and theories of leadership, communication, process of communication, barrier in communication, effective communication. Controlling: System and process of controlling, budgetary and non-budgetary control techniques, Productivity problems and management, control and performance, direct and preventive control – reporting.	10 Hrs

Text Books

1. P. C. Tripathi & P. N. Reddy, Principles of Management, Mcgraw Hill Education(India) Private Limited, 2023
2. Harold Koontz & Heinz Weihrich, Essentials of Management, Mcgraw Hill Education(India) Private Limited, 2020
3. Peter F. Drucker, Management: Tasks, Responsibilities, Practices, New Delhi Allied Publisher Pvt. Ltd.

Reference Books

1. C.B. Gupta, Management Theory and Practice –Sultan Chand & Sons Pvt Ltd.
2. Stephen Robbins, Organizational Behaviour, Pearson Education.
3. Gary Dessler, Human Resource Management, Pearson Education.

E- Resources

1. NPTEL – Management Courses
2. Swayam – Management & Organizational Behaviour
3. eGyankosh – IGNOU Resources
4. https://www.managementstudyguide.com

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3TX209EM1.1	-	-	-	-	-	-	-	-	-	3	-			
3TX209EM1.2	-	-	-	-	-	-	-	-	-	3	-		3	
3TX209EM1.3	-	-	-	-	-	-	-	3	-	2	-		2	
3TX209EM1CO	-	-	-	-	-	-	-	1	-	3	-		2	

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**3SH210VE1**	Course Category:	**VEC**
Course Name	**Constitutional Values and Fundamental Duties**			
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours **30 Hrs**
Total Credit Hours	**60 Hrs**			
SEE Marks	--	SEE Time	--	CIA Marks --
EE Marks	**25**	PA Marks	**25**	Total Marks **50**

Course Description:

Subject Code 3SH210VE1 Constitutional Values and Fundamental Duties is a compulsory Values enhancement Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to introduce the Indian Constitution, its historical background, fundamental values, rights, and duties.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH210VE1.1	Explain the historical background, making, and significance of the Indian Constitution to Understand the Constitution, Preamble, and core values.	C2
3SH210VE1.2	Interpret Fundamental Rights and Duties (Articles 12–35, 51A) to evaluate their implications through case studies in professional and civic life.	C3
3SH210VE1.3	Apply constitutional principles to engineering ethics, sustainability concerns (Articles 48A, 51A (g)), and demonstrate social commitment, innovation, and inclusive growth as nation builders.	C3

Course Contents:

Unit 1	**Introduction to the Constitution and Fundamental Values**: Overview of the Indian Constitution – Historical background and making of the Constitution; Meaning of Constitution; Preamble – Meaning and significance. Core Constitutional Values – Justice (Social, Economic, Political); Liberty (thought, expression, belief, faith, worship); Equality (status and opportunity); Fraternity (dignity and unity of the nation). Relevance of constitutional values for professionals	10 Hrs

	and citizens.	
Unit 2	**Fundamental Rights and Duties**: Fundamental Rights (Articles 12–35) – Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies. Fundamental Duties (Article 51-A) – Importance and implications; Role of youth and professionals in upholding duties. Case studies highlighting real-life significance of rights and duties.	10 Hrs
Unit 3	**Application of Constitutional Values in Engineering and Public Life**: Ethical Responsibilities and Constitutional Alignment – Engineering ethics and public interest; Environment and sustainability as constitutional concern (Articles 48A, 51A(g)); Engineers as nation builders – Social commitment, innovation, and inclusive growth.	10 Hrs

Text Books:

1. Basu D. D., Introduction to the Constitution of India, LexisNexis Publication, New Delhi (Twenty-Third Edition).
2. Jain M. P., Constitution of India, LexisNexis Publication, New Delhi (Eighth Edition).
3. Laxmikanth M., Indian Polity, McGraw Hill Education, New Delhi (Sixth Edition).
4. Austin Granville, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, New Delhi.
5. Shukla V. N., Constitution of India, Eastern Book Company, Lucknow (Twelfth Edition).
6. Government of India, Constitution of India (Bare Act), Government of India Publication, New Delhi.

Reference Books:

1. Subhash Kashyap, Our Constitution, National Book Trust, New Delhi.
2. Durga Das Basu, Shorter Constitution of India, LexisNexis Publication.
3. P. M. Bakshi, The Constitution of India, Universal Law Publishing.
4. J. N. Pandey, Constitutional Law of India, Central Law Agency.
5. Seervai H. M., Constitutional Law of India, N. M. Tripathi Pvt. Ltd. (Vols. I–III).
6. B. Shiva Rao, The Framing of India's Constitution: A Study, Indian Institute of Public Administration.
7. D. C. Wadhwa, Political Science and Constitutional Law, Eastern Book Company.
8. Madhav Khosla, The Indian Constitution: Oxford India Short Introductions, Oxford University Press.

E Resources:

1. NPTEL course on Constitutional Studies, Prof. Sudhir Krishnaswamy, National Law School of India University
2. Constitutional Values and Fundamental Duties (University of Delhi – aligned with NEP 2020, available via NPTEL/DU open learning) https://kmc.du.ac.in/kmcouter/collnews/download/407274481690637 91359.pdf/LinkedContents/pdf/All/All

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH210VE1.1	3	2	-	1	-	-	-	-	-	-	-	2	2	
3SH210VE1.2	-	3	2	2	-	2	3	3	-	-	-	3	2	-
3SH210VE1.3	-	-	3	3	-	2	3	2	-	2	-	3	3	2
3SH210VE1CO	1	2	2	2	-	2	2	2	-	1	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3TX400FP1**		Course Category: **FP**		
Course Name	**Field Project**				
Credits	**02**	Total L:T:P Hours	0:0:4 **60 Hrs**	Total SL Hours	--
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 3TX400FP1Community engagement project is a compulsory Experimental Learning Course for Second Year B. Tech. Textile Engineering

Course Objectives:
Objective of the course is to develop student's ability to identify and address real-world textile-related challenges in rural and urban communities through problem-solving, team work, and effective communication while fostering community-centric and sustainable engineering practices.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX400FP1.1	Identify basic textile-related community issues for recognising and understanding key problem faced by communities in textile sector	C-1, P-1, A-1
3TX400FP1.2	Suggest simple, practical solutions based on textile knowledge for applying fundamental textile knowledge to develop feasible and easily implementable solutions	C-3, P-2, A-2
3TX400FP1.3	Present findings and recommendations effectively for proposing solution in a understandable manner	C-5, P-7

Course Contents:

Module	Description	Hours
Module 1	Orientation & Sensitization	4
Module 2	Field Visit & Problem Identification	24
Module 3	Problem–Solution Design & Implementation	20
Module 4	Documentation, Presentation & Reflection	12

Note:

1. Students must collaborate within their assigned practical batches. Each batch should be further divided into subgroups, with five students per subgroup, in accordance with the prescribed guidelines
2. **Project Type: (Must select from the guidelines provided)**

1. Interaction with Self Help Groups (SHGs) women members, for their skill-building activities

2. Small business ideas (handloom, handicraft, khadi, food products, etc.) for rural areas to make the people self reliant
3. Climate Change Awareness and Community Impact Assessment

3. Suggested Textile Project Themes

1. Recycling and reusing textile waste.
2. Support for traditional crafts using basic tools.
3. Basic skill-building sessions for artisans (e.g., dyeing or stitching techniques).
4. Awareness campaigns on eco-friendly textile practices.

4. Documentation /Project Report Format:

The Documentation /Project Report shall contain the following sections:

1. Title Page
2. Certificate & Declaration
3. Abstract
4. Introduction (Community + Textile relevance)
5. Objectives
6. Literature Survey
7. Methodology (Survey + Technical)
8. Problem Identification
9. Proposed Textile Solution
10. Implementation / Simulation
11. Results & Analysis
12. Community Feedback & Social Impact
13. Conclusion & Future Scope
14. References
15. Appendices (Photos, questionnaires, certification letter issued by the Gram Panchayat office)

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3TX400FP1.1	3	2	2	-	2	-	-	2	2	-	2	2	3	-
3TX400FP1.2	3	2	2	-	3	-	-	2	-	-	2	2	-	-
3TX400FP1.3	2	2	2	-	2	-	-	2	3	-	2	-	-	3
3TX400FP1CO	3	2	2	-	2	-	-	2	2	-	2	-	-	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Course Plan:

Lecture No.	Module Title	Topic	Hours
1	Module1: Orientation & Sensitization	NEP 2020: Community Engagement & Role of Engineers, Ethics, Social Responsibility & SDGs for Textile Engineers, Overview of Rural & Urban Communication Infrastructure, Identification of Community Institutions (GP, School, Self Help Group (SHG), Health Centre), Field Safety, Team Formation, Area & Theme Allocation, Reorganization	4
2	Module 2: Field Visits & Problem Identification	Community visits to identify one specific issue.	24
3		Interaction with stakeholders (artisans, small-scale workers, cottage industry personals).	
4		Prepare a simplified problem statement.	
5		Conduct community visits for data collection.	
6		Identify one area of intervention (e.g., skill training, basic waste recycling ideas etc).	
7			
8	Module3: Engineering Problem–Solution Design & Implementation-	Analysis of Collected Field Data and Identification of Problems	20
9		Propose simple, actionable solutions.	
10		Create basic prototypes or plan a small activity	
11		Preparation of Quantity and Cost Estimate	
12		Evaluation of Feasibility and Expected Community Benefits	
13	Module4: Documentation, Presentation & Reflection	Data Analysis & Graphical Representation, Writing Methodology & Analysis Sections, Results, Discussion & Conclusion	12
14		Project Report Structure & Guidelines, Report Finalization, Presentation Preparation	
15		Evaluation and Viva	

Level: **5**	Course Code: **3AL001NC1**		Course Category: **NC**		
Course Name	**Disaster Management and Preparedness**				
Credits	--	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	--
Total Credit Hours	--				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	--	Total Marks	--

Course Description:

Subject Code 3AL001NC1 Disaster Management and Preparedness is a Compulsory Non-Credit course for Second Year B. Tech all disciplines.

Course Objectives:

The objective of this course is to provide students with a comprehensive understanding of disasters, their types, impacts, the complete disaster management cycle, and the roles of various agencies in Disaster Risk Reduction.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3AL001NC1.1	Identify the concepts of disaster, hazard, vulnerability and risk, and classify disasters to understand the basic nature, causes and profiles of disasters in India.	C-2
3AL001NC1.2	Analyze the disaster management cycle for risk assessment, mitigation, preparedness, response, recovery, and international disaster management frameworks.	C-4
3AL001NC1.3	Apply disaster management practices, including stakeholder roles, national policies, engineers' responsibilities, and preparedness measures for effective disaster risk reduction.	C-3

Course Contents:

Unit 1	**Introduction to Disaster Management:** Concepts and definitions – disaster, hazard, vulnerability, risk, severity, frequency, exposure, capacity, and impact; classification of disasters- Natural disasters: earthquakes, tsunami, landslides, mining, Hydro-Meteorological Disasters: floods, draught, cyclones, coastal erosion. Biological Disaster: epidemics, pest attacks, forest fire, Manmade disasters:	10 hrs

	Industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, vulnerability profile of India, ecological fragility; principles of disaster prevention and mitigation	
Unit 2	**Disaster Management Cycle and Framework:** Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development. Awareness During Disaster – Evacuation, Disaster Communication, Search and Rescue, Emergency Operation Centre, Incident Command System, Relief and Rehabilitation. Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action Phases of disaster management; vulnerability and capacity assessment, post-disaster environmental response	12 hrs
Unit 3	**Disaster Management practices:** Roles and responsibilities of government, community, local bodies, NGOs, and other stakeholders, National Policy on Disaster Management Act 2005 Mega Disasters of India and Lessons Learnt, Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster.	8 hrs

Textbooks:

1. Sharma, S. C. (2022). Disaster Management, Khanna Publication.
2. Subramanian, R. (2024). Disaster Management. Vikas Publication.

Reference Books:

1. Gaur, R. C. (2018). Environmental Engineering and Disaster Management. New Age International.
2. Pradeep Sahni, 2024, Disaster Risk Reduction in South Asia, Prentice Hall.
3. Mondal, D. (2022). Disaster Management. New Delhi: CBS Publishers & Distributors
4. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
5. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
6. Natural Disaster Management Policy , 2009,GOI
7. H.N. Shrivastava& G.D. Gupta, Management of Natural Disasters in developing Countries, Daya Publishers , Delhi

8. S.L. Goyal, Encyclopedia of disaster Management, Vol I,II & III Disaster Managemnt Policy and administration, Deep & Deep, New Delhi,2006
9. Coppola D P, Introduction to International Disaster Management, Elsevier Science (B/H), London, 2007
10. Disaster Mitigation in Asia & Pacific, Asian Development Bank

Course Assignments

Internal Assessment at Institute level will be based on following assignments:

1.Study of Recent Disasters (at local, state and national level)
2.Preparation of Disaster Risk Management Plan of an Area or Sector
3.A Case study on Disaster Management

E Recourses:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed61/preview

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3AL001NC1.1	3	2	-	-	-	3	2	-	-	-	3	1	1	2
3AL001NC1.2	3	3	-	-	-	3	3	-	-	-	3	2	2	3
3AL001NC1.3	3	3	-	-	-	3	3	-	-	3	3	2	2	3
3AL001NC1.CO	3	3	-	-	-	3	3	-	-	1	3	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3TX211DH1**		Course Category: **DH1**		
Course Name	**Introduction to Smart Textiles**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3TX211DH1 Introduction to Smart Textiles is a double minor/honours course offered by the department of Textile Engineering for Second Year B. Tech of all Discipline.

Course Objectives:

The objective of this course is to introduce students to the fundamental concepts of smart textiles, including the material, technologies and methods used to create textiles that can sense, respond adapt to environmental stimuli for potential applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX211DH1.1	Describe the various functions of smart textiles and analyze their importance and scope for modern applications.	C-1
3TX211DH1.2	Explain the roles of different textile structures such as woven, knitted, and nonwoven fabrics for smart textiles.	C-2
3TX211DH1.3	Identify various types of sensors integrated into textiles and their principles of operation for wearing sensing systems.	C-1
3TX211DH1.4	Explain various conductive materials and electronic components for integration in textiles.	C-2
3TX211DH1.5	Understand various techniques for embedding sensors and electronics into textiles through weaving, knitting, embroidery, and printing.	C-2
3TX211DH1.6	Analyze applications of smart textiles in various fields such as human health, safety, comfort, performance, communication, and environmental awareness by integrating sensing and adaptive technologies directly into fabrics.	C-4

Course Contents:

Unit 1	**Introduction to Smart Textiles:** Definition, Historical development and evolution, Classification of Smart Textiles -passive, active and ultra smart textiles, Functions of smart textile, Importance and scope of smart textiles.	7 hrs
Unit 2	**Textile Materials and structures for Smart Textiles:** Natural and synthetic fibers and fabrics, Textile structures: woven, knitted, nonwoven, Functional finishes and coatings, Nano material and composites in smart textiles.	8 hrs
Unit 3	**Sensors and Actuators in Smart Textiles:** Types of sensors integrated into textiles: temperature, pressure, humidity, strain, bio-sensors. Actuators for smart textiles: shape memory alloys, electroactive polymers, micro-heaters. Principles and working mechanisms.	8 hrs
Unit 4	**Conductive Materials and Electronic Components:** Conductive fibers, yarn and fabrics, Conductive inks and printable electronics, Flexible and stretchable electronic components, Integration of electronics with textiles	7 hrs
Unit 5	**Design and Fabrication of Smart Textiles:** Methods of embedding sensors and electronics: weaving, knitting, embroidery, printing. Wearable electronics Challenges in durability, washability, and user comfort	7 hrs
Unit 6	**Applications of Smart Textiles** Healthcare and medical monitoring: ECG, temperature, movement, Sports and fitness wearable, Fashion and interactive textiles, Protective clothing for military and industry, Environmental sensing and automotive applications.	8 hrs

Text Books

1. Xiaoming Tao, Handbook of Smart Textiles
2. Xiaoming Tao, Smart fibres, fabrics and clothing, Wood head publishing.
3. H. R. Mattila, Intelligent Textile and clothing edited by, Wood head publishing.
4. Vladan Koncar, Smart textiles and their applications, Wood head publishing.

Reference Books:

1. Y. L. and A. S. W Wang, Clothing Biosensor Engineering.
2. P. Westbrock, G. Priniotakis and P.Kienkens, Analytical Electro Chemistry in textiles.
3. William C. Smith, Smart textile coatings and laminates.

E- Resources:

1. https://link.springer.com
2. https://ocw.mit.edu
3. https://nptel.ac.in/courses/116/102/116102034

Mapping of COs with Pos & PSOs

CO	**PO**											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	3
3TX211DH2.1	3	2	1	-	-	2	-	-	-	-	1	2	1	2
3TX211DH2.2	3	2	1	-	-	1	-	-	-	-	1	2	1	2
3TX211DH2.3	2	3	3	2	2	2	1	1	1	1	1	3	2	3
3TX211DH2.4	3	2	2	-	-	3	-	-	-	-	1	2	2	2
3TX211DH2.5	3	2	1	1	-	1	-	-	-	-	1	3	2	2
3TX211DH2.6	3	3	2	3	2	2	-	-	1	-	1	3	2	3
3TX211DH2.CO	3	2	2	2	2	-	1	1	1	1	1	3	2	2

Correlation levels – 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **3TX211DH2**		Course Category: **DH2**		
Course Name	**Geo and Agro Textiles**				
Credits	**03**	Total L:T:P etc. Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 3TX211DH2 Geo and Agro Textiles is a double minor/honours course offered by the department of Textile Engineering for Second Year B. Tech of all Discipline.

Course Objectives:

The objective of this course is to identify and describe students to various types of geo textiles and agro textiles along with their manufacturing methods, applications and explore the role of geotextiles in civil engineering applications and agro textiles in enhancing agricultural productivity.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX211DH2.1	Classify the various types of geosynthetics textiles for their applications civil engineering	C-4
3TX211DH2.2	Understand the roles of different textile structures such as woven, knitted, and nonwoven fabrics in geo textiles.	C-2
3TX211DH2.3	Design geotextile-based solutions for applications such as soil reinforcement, drainage, filtration, separation, and erosion control in civil engineering.	C-6
3TX211DH2.4	Understand the various agrotextile systems for crop protection, climate control, and water and soil management in agriculture.	C-2
3TX211DH2.5	Describe manufacturing techniques, raw materials, and structural characteristics of agrotextiles.	C-2
3TX211DH2.6	Analyze physical, mechanical, hydraulic, and functional properties relevant to agrotextiles.	C-4

Course Contents:

Unit 1	**Introduction to Geosynthetics:** Definition, Types of geosynthetics -geotextiles, geogrids, geomembranes, geocomposites, Historical development, Applications of geosynthetics in civil engineering.	7 hrs
Unit 2	**Types and Properties of Geotextiles:** Textile fibers used in geotextiles and their requirements, Types of geotextiles- woven, knitted, nonwoven, Properties of geotextiles- physical, mechanical and hydraulic.	7 hrs
Unit 3	**Design principles and methods of geotextiles:** Functions: Separation, filtration, drainage, reinforcement, protection. Design for separation and filtration in roads and railways, Design for reinforcement in embankments on soft soils, retaining walls, slopes; Pavement design with geotextiles, Drainage systems- design and construction, landfills and erosion control	8 hrs
Unit 4	**Introduction to Agrotextiles:** Definition and scope of agro textiles, Importance in agriculture and horticulture, Historical development and global trends, Advantages of using agrotextiles, Classification based on functions-crop protection, soil management, climate control, water management	8 hrs
Unit 5	**Raw Materials and Manufacturing:** Fibers used in agro textiles and their requirements, yarn structures, fabrication methods-woven, knitted, nonwoven, braided, composites. Functional finishes-UV resistance, antifungal, hydrophilic coatings.	7 hrs
Unit 6	**Properties and Testing of Agro textiles:** Physical properties: weight, thickness, porosity Mechanical properties: tensile strength, elongation, tear resistance, Functional properties: UV stability, water permeability, durability	8 hrs

Text Books

1. Horrocks & S. C. Anand, Handbook of Technical Textiles
2. G. P. Raymond, Handbook of Geosynthetic Engineering, Wood head publishing.
3. S. K. Rajendran, Agrotextiles and its Applications, Wood head publishing.
4. M. A. R. Ghani, Agrotextiles: Structure, Properties and Applications, Wood head publishing.

Reference Books:

1. Robert M. Koerner, Designing with Geosynthetics, Pearson Publishing.
2. B. Purushothama, Textiles for Agricultural Application, Woodhead Publishing.
3. Sabit Adanur, Hand book of Industrial Textiles, Wellington Sears.

E- Resources:

1. https://www.researchgate.net
2. https://pmc.ncbi.nlm.nih.gov
3. https://nptel.ac.in/courses/116102057

Mapping of COs with Pos & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
3TX211DH2.1	3	2	1	-	-	2	-	-	-	-	1	2	1	2
3TX211DH2.2	3	2	1	-	-	1	-	-	-	-	1	2	1	2
3TX211DH2.3	2	3	3	2	2	2	1	1	1	1	1	3	2	3
3TX211DH2.4	3	2	2	-	-	3	-	-	-	-	1	2	2	2
3TX211DH2.5	3	2	1	1	-	1	-	-	-	-	1	3	2	2
3TX211DH2.6	3	3	2	3	2	2	-	-	1	-	1	3	2	3
3TX211DH2.CO	3	2	2	2	2	-	1	1	1	1	1	3	2	2

Correlation levels – 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4TX212PC1**		Course Category: **PCC**		
Course Name	**Textile Fiber-II**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4TX212PC1 Textile Fiber-II is a compulsory Programme core Course for Second Year B. Tech. Textile Engineering.

Course Objectives:

The objective of this course is to provide fundamentals knowledge of manmade fibers, their classifications, various manufacturing technologies, properties and applications of manmade fiber.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4TX212PC1.1	Describe the classification, merits and demerits of manmade and natural fibers.	C-1
4TX212PC1.2	Illustrate the manufacturing process, structure, and properties of regenerated fibers such as viscose, cuprammonium and acetate fibers.	C-3
4TX212PC1.3	Analyze the production, structure, and properties of polyamide and polyester fibers.	C-4
4TX212PC1.4	Compare the characteristics and production techniques of acrylic, modacrylic, PVC, PVA, polyethylene, and polypropylene fibers	C-5
4TX212PC1.5	Demonstrate knowledge of texturizing techniques such as air-jet, false twist, stuffer box and evaluate their effect on yarn properties.	C-3
4TX212PC1.6	Evaluate the role and performance of sustainable fibers such as PLA, biodegradable polyesters/polyamides, and recycled polyester in modern textiles.	C-5

Course Contents:

Unit 1	**Introduction to Manmade Fibers:** Introduction to manmade fibers, Merits and Demerits of manmade and natural fibers, Addition and Condensation polymerisation methods, concept of thermoplastic and thermoset material, Introduction to melt spinning, dry spinning and wet spinning.	7 Hrs
Unit 2	**Regenerated Fiber:** Viscose Rayon: Manufacturing process, Physical and Chemical properties, Applications. Cuprammonium Rayon: Manufacturing process, Physical and chemical properties, Applications. High wet modulus and Polynosic Rayon: Manufacturing process, Physical and chemical properties, Applications. Introction to Acetate and Triacetate fibers, Bamboo fiber.	8Hrs
Unit 3	**Synthetic Fibers: Polyamide and Polyester** Polyamide: Nylon 6, Nylon 66, Raw materials, Manufacturing Process, Microscopic structure, Physical and Chemical properties, Applications. Polyester: Raw materials, Manufacturing Process, Microscopic structure, Physical and Chemical properties, Applications.	7 Hrs
Unit 4	**Vinyl and Polyolefin Fibers:** Polyacrylonitrile fibres: Acrylic and Modacrylic fibres, Raw materials, Manufacturing process, Microscopic structure, Physical and chemical properties, Applications. Polyvinyl alcohol and Polyvinyl chloride fibres: Raw materials, Manufacturing process, Microscopic structure, Physical and chemical properties, Applications. Polyethylene & Polypropylene fibres: Raw materials, Manufacturing process, Microscopic structure, Physical and chemical properties, Applications.	8 Hrs
Unit 5	**Texturizing Methods:** Introduction to various methods of texturizing: Draw Texturizing, sequential (False twist process) and simultaneous draw texturizing. Principle and working of machine of airjet texturizing machine. Other Texturizing Methods: Stuffer box crimping, Edge Crimping, Knit-de-knit, Gear, crimping. Properties of air and draw textured yarn	8 Hrs
Unit 6	**Sustainable Manmade Fibers:** Biodegradable Polyesters and Polyamides: Manufacturing process, Properties and Applications.	7 Hrs

	Polylactic acid fiber: Manufacturing process, Properties and Applications, Recycled polyester, Manufacturing process, Properties and Applications.	

Text Books

1. S. P. Mishra Fiber Science and Technology, New age International Publications.
2. Gohl and Vilensky, Textile Science.
1. V. K. Kothari, Textile Fibers: Developments and Innovations, IAFL Publications.
2. V. A. Shenai, Textile Fibers-Vol.-I, Sevak Publications.

Reference Books

1. Chi Zang, Biodegradable Polyesters, Wile Publications.
2. S. S. Muthu, Recycled Polyesters, Springer Publications.
3. R.W. Moncrieff, Manmade Fibers.
4. H. V. Sreenivasa Murthy, Introduction to Textile Fibers.

E- Resources

1. Classification of fibers and their properties Link: https://nptel.ac.in/courses/116102026
2. A book of manmade Fibers Link: https://www.slideshare.net/slideshow/mmf-54745894/54745894
3. Different types of manmade fibers with their applications Link :https://textilelearner.net/different-types-of-man-made-fibers-with-their-application/

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4TX212PC1.1	3	2	-	1	-	2	-	-	-	-	-	3	2	-
4TX212PC1.2	3	2	2	2	1	1	-	-	-	-	2	3	2	-
4TX212PC1.3	3	3	2	2	1	1	-	-	-	-	2	3	2	-
4TX212PC1.4	3	3	2	2	1	2	-	-	-	-	2	3	2	-
4TX212PC1.5	3	3	3	2	2	-	-	-	-	-	2	3	2	-
4TX212PC1.6	3	3	3	2	1	3	-	1	-	-	2	3	2	-
4TX212PC1.CO	3	3	2	2	1	2	-	1	-	-	2	3	2	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4TX213PC1**		Course Category: **PCC**		
Course Name	**Yarn Manufacturing - II**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hr**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

(*PO1, PO2, PO3, PO5, PO8, PO9, PSO1, PSO2, PSO3*)

Course Description:

Subject Code 4TX213PC1 Yarn Manufacturing - II is a compulsory Program Core Course for Second Year B.Tech. Textile Engineering.

Course Objectives:

The objective of this course is the basic knowledge about the speed frame, ring spinning, compact spinning and doubling processes and their applications in Textile Engineering with practical skills.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4TX213PC1.1	Explain the concept, construction and working of speed frame machine.	C-2
4TX213PC1.2	Demonstrate the concept construction and working of ring frame machine.	C-3
4TX213PC1.3	Illustrate the principle of drafting and various drafting systems.	C-3
4TX213PC1.4	Describe the influence of spinning geometry and spinning triangle on yarn quality.	C-2
4TX213PC1.5	Describe the concept, construction and working of compact spinning process.	C-2
4TX213PC1.6	Demonstrate the concept construction and working of doubling process.	C-3

Course Contents:

Unit 1	**Speed Frame Process:** Objectives, construction details of modern speed frame, Bobbin leading and flyer leading winding principle. Various parameters affecting roving quality and production. Recent developments in speed frame machine-Auto bobbin transport system etc.	5 Hrs

Unit 2	**Ring Spinning Process:** Objectives, principle of ring spinning, construction details of ring frame machine. Types of spindles and its drives, Building mechanism and influence on bobbin quality, Calculation related to production.	5 Hrs
Unit 3	**Drafting System:** Importance, advantages and principle of drafting system, Types of drafting system. Factors affecting on roller settings and drafting performance, Roller slip, drafting waves and floating fibres in drafting zone.	5 Hrs
Unit 4	**Spinning Geometry:** Importance and details of spinning geometry, yarn structure and properties. Different yarn faults its causes, effect, remedies, Yarn faults- its causes, effect and remedies, Recent developments in ring spinning.	5 Hrs
Unit 5	**Compact Spinning Process:** Principles, importance and advantages of compact spinning, Methods compact spinning systems and its constructional details, Structure and properties of compact yarns.	5 Hrs
Unit 6	**Doubling Process:** Objectives and importance of doubling process, Methods of yarn doubling, types of doubled yarn, Structure and properties of folded yarns.	5 Hrs

Text Books

1. Klein W, Manual of Textile Technology, Vol. I – III, The Textile Institute, UK, 1987.
2. Oxtoby E, Spun Yarn Technology, Butterworth and Co. Ltd. publication, 1987.
3. Lord P R, Handbook of Yarn Production, The Textile Institute, Woodhead Publication Limited.

Reference Books

1. Dr. A. R. Khare, Elements of Ring spinning.
2. T.K. Pattabhiraman, Essential calculations of practical cotton spinning.

E- Resources

1. Speed Frame and function of speed frame
   Link:https://textilestudycenter.com/speed-frame-and-function-of-speed-frame/
2. Study on Material Passage Diagram of Speed Frame
   Link:https://textilelearner.net/material-passage-diagram-of-speed-frame/

3. Ring Frame - Introduction
   Link:https://www.scribd.com/document/321691333/Ring-Frame-Introduction
4. Yarn Doubling & Twisting | Objectives | Twist | Applications
   Link:https://www.textilesphere.com/2021/10/yarn-doubling-and-twisting.html
5. New Spinning Technologies
   Link: https://onlinecourses.nptel.ac.in/noc25_te03/preview

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4TX213PC1.1	3	2	2	-	2	-	-	2	2	-	-	2	1	1
4TX213PC1.2	3	2	2	-	3	-	-	2	-	-	-	3	2	1
4TX213PC1.3	2	2	2	-	2	-	-	2	3	-	-	3	2	1
4TX213PC1.4	3	3	2	-	2	-	-	2	2	-	-	2	1	1
4TX213PC1.5	2	2	3	-	3	-	-	2	2	-	-	2	1	1
4TX213PC1.6	3	2	2	-	2	-	-	2	2	-	-	3	2	1
4TX213PC1.CO	3	2	2	-	2	-	-	2	2	-	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code: **4TX214PC1**		Course Category: **PCC**		
Course Name	**Fabric Manufacturing –II**				
Credits	**02**	Total L:T:P Hours	2:0:2 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**60**	SEE Time	**3 HRS**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4TX214PC1 Fabric Manufacturing –II is a compulsory Professional core Course for Second Year B. Tech. Textile Engineering.

Course Objectives:

The objective of this course is to provide fundamental knowledge of fabric formation through weaving processes including automatic weaving and dobby and jacquard shedding mechanism along with the understanding of various fabric and machine defects.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4TX214PC1.1	Demonstrate about the concept of fabric forming by weaving for enabling students to practically illustrate and clearly present the basic principles involved in fabric formation through weaving.	C-3
4TX214PC1.2	Analyze various weaving mechanisms used in fabric formation for developing analytical skills for comparing and evaluating different weaving mechanisms.	C-2, P-4
4TX214PC1.3	Explain Kinematics and productivity analysis of shuttle weaving machines for helping students understand motion principles and efficiency evaluation of shuttle weaving machines.	C-2
4TX214PC1.4	Explain about the dobby shedding principle and it related machinery for imparting knowledge of dobby shedding operation and associated machinery used for patterned fabric production.	C-2
4TX214PC1.5	Explain about jacquard shedding principle & its related machinery for providing detailed	C-2

	understanding of jacquard shedding systems and machines.	
4TX214PC1.6	Distinguish the various warp way, weft way and loom faults for enabling identification and differentiation of fabric and loom defects for quality control.	C-5

Course Contents:

Unit 1	**Classification of different fabric forming process** weaving, knitting, breading. Non woven: - Brief description of all methods & there application. Looming: - Study of warp tying, leasing, reaching in, warp knotting and drop pinning processes	5 Hrs
Unit 2	**Basics of weaving:** classification of motions, Shedding:- Classification of shedding principle, types of shed, shed geometry, reversing motion, Brief description about shuttle picking and crank beat up	5 Hrs
Unit 3	**Motion and mechanism of weaving** Brief description about tertiary mechanism, kinematics of sley, Calculation regarding reed count, efficiency and production of weaving machine. Automatic loom: - limitations of plain loom and brief description about automatic loom, cop changing mechanism.	5 Hrs
Unit 4	**Automatic loom and Doddy Shedding:** Historical review of shuttle changing looms. Automatic let-off and positive take up system Historical review of about weft mixing by drop box motion. Dobby shedding: - objectives, classification, climax cam dobby, positive and rotary dobby, method of pegging,	5 Hrs
Unit 5	**Jacquard shedding** objectives, classification, principal parts , figuring capacity, harness, working principle of Double lift double cylinder jacquard, open shed jacquard, electronic jacquard comparison between various electronic jacquards	5 Hrs
Unit 6	**Fabric defects:** Warp and weft defects with causes and remedies, various loom faults with respect to their causes and remedies.	5 Hrs

Text Books

1. D. B. Ajagaonkar And M. K. Talukdar, Weaving Machine, Mechanism Management, Mahajan Publisher Pvt. Ltd. Ahmadabad
2. R. Sengupta, Weaving Calculations', By Published by D. B. Taraporevala Sons and Company, Bombay.
3. Allan Armored And walter S Sondhel, Weaving Technology And Operation', Published by The Textile Institute, Manchester.
4. N. M. Kulkarni Weaving Technology', Textile Association India

Reference Books

1. K.T. Aswani, Fancy Weaving, Mahajan Publishers Pvt. Ltd., Ahmedabad
2. N. N. Bannarji, Weaving Mechanism Vol. II, Textile Book Publishers, Bombay
3. R. Marks and A.T.C. Robinson, Principle of weaving, The Textile Institute, Manchester.

E- Resources

1. https://textilelearner.net/basic-weaving-mechanism-of-loom/
2. https://web.itu.edu.tr/~berkalpo/Weaving_Lecture/Weaving_Chapter1a_06S.pdfhttps://be-iitkgp.vlabs.ac.in/List%20of%20experiments.html
3. https://libcat.iitd.ac.in/bib/36515https://be
4. iitkgp.vlabs.ac.in/exp/voltage-regulator/
5. https://nptel.ac.in/courses/116102005

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4TX214PC1.1	3	1	-	-	2	2	-	2	2	-	-	3	2	1
4TX214PC1.2	3	2	2	-	3	-	-	2	-	-	-	3	2	2
4TX214PC1.3	2	2	3	3	2	-	-	2	2	-	-	3	1	1
4TX214PC1.4	3	3	2	-	2	-	-	-	2	-	-	2	2	1
4TX214PC1.5	3	2	2	1	2	1	-	-	2	-	-	2	2	1
4TX214PC1.6	3	3	-	3	-	2	-	2	-	2	2	2	3	2
4TX214PC1CO	3	2	2	2	2	2	-	2	2	2	2	2.5	2	1.5

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4TX215MD1**		Course Category: **MDM**		
Course Name	**Garment Pattern Designing**				
Credits	**02**	Total L:T:P etc. Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject 4TX215MD1 Garment Pattern Designing is a compulsory Multi-Disciplinary Minor Course for second year B. Tech Textile Engineering.

Course Objective

The objective of this course is to provide basic knowledge of garment pattern designing, covering fundamental and advanced techniques with practical applications in the garment manufacturing industry.

Course Outcomes (COs)

After completing the course students will be able to:

CO	**Course Outcomes**	**Domain Level**
4TX215MD1.1	Describe the structure and functioning of the garment industry for value chain awareness.	C-2
4TX215MD1.2	Demonstrate skills in sketching for drafting garment components.	C-3, P-5
4TX215MD1.3	Apply pattern making techniques to create garment patterns.	C-3, P-3

Course Contents:

Unit 1	**Introduction to Pattern Making** Importance and scope of pattern making, Tools and equipment used, Body measurements: importance, methods, standard size charts, Basic pattern terminology, Drafting basic blocks: bodice block, sleeve block, skirt block (theory)	10 Hrs
Unit 2	**Pattern Development Techniques (10 Marks)** Types of patterns: drafted, draped, flat patterns Dart manipulation and fullness control Sleeve variations: cap, puff, raglan, kimono (theory diagrams indicated) Neckline variations: round, V-neck, collar styles Fabric grain, bias,	10 Hrs

	layout & cutting principles	
Unit 3	**Garment Pattern Adaptation & Fit (10 Marks)** Pattern grading basics—concept and rules Fit analysis: common fitting issues and pattern corrections Pattern alteration techniques: length, width, contour adjustments Industrial pattern standards Introduction to CAD pattern making	10 Hrs

Text Books:

1. Malcolm Barnard, Fashion Theory: A Reader
2. Roland Barthes, The Fashion System
3. Kathryn McKinley & Janine Munslow Fashion Design: A Process of Creation

Reference Books:

1. Bina Abling, Fashion Sketchbook
2. Anna Kiper, Fashion Illustration: Inspiration and Technique.
3. Joen Wolfram. Color for Fashion.
4. Michele Wesen Bryant, Fashion Drawing: A Visual Guide to Drawing Fashion.

E- Resource

1. Apparel Designing – Swayam
   https://onlinecourses.swayam2.ac.in/cec21_hs14/preview
2. Pattern Making Basics – University of Fashion (Free Lessons Section)
   https://www.universityoffashion.com/free-lessons/

Mapping of COs with Pos

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4TX215MD1.1	1	-	-	-	-	-	-	-	-	-	-	2	3	2
4TX215MD1.2	-	-	-	-	2	-	-	2	-	-	1	1	3	2
4TX215MD1.3	2	-	-	-	3	-	-	-	-	-	-	2	3	2
4TX215MD1	1	-	-	-	2	-	-	1	-	-	1	2	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4SH216OE1**	Course Category:	**OE**
Course Name	**Quantitative and Logical Reasoning**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4SH216OE1Quantitative and Logical Reasoning is a compulsory Open Elective Course forSecond Year B. Tech All Branch Students.

Course Objectives:

The Objective of the Course is to develop quantitative aptitude, logical reasoning, problem-solving efficiency, and decision-making skills for placements, competitive exams, and real-life applications

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE1.1	Apply arithmetic and numerical techniques to solve quantitative problems accurately.	C-3
4SH216OE1.2	Solve algebraic and equation-based problems using simplification and approximation methods to improve problem-solving efficiency.	C-3
4SH216OE1.3	Analyze logical reasoning problems using structured and critical thinking approaches to improve decision-making skills.	C-4
4SH216OE1.4	Interpret and analyze data using graphical and tabular methods for decision making for strategic planning.	C-4
4SH216OE1.5	Solve complex logical puzzles and advanced reasoning problems efficiently for competitive examination success.	C-3
4SH216OE1.6	Demonstrate effective aptitude test strategies integrating quantitative and logical reasoning skills for career advancement opportunities.	C-3

Course Contents:

Unit 1	**Number System & Arithmetic Foundations:** Number system fundamentals; LCM and HCF applications; divisibility rules; percentage calculations; ratio and proportion; averages; profit and loss; simple and compound interest; speed mathematics and shortcut techniques.	7Hrs
Unit 2	**Algebra, Equations & Simplification Techniques:** Linear and quadratic equations; algebraic expressions; simplification and approximation; indices and surds; inequalities; time and work; pipes and cisterns; time, speed and distance; mixtures and alligation.	7 Hrs
Unit 3	**Logical Reasoning: Analytical & Critical Thinking:** Coding–decoding; blood relations; direction sense; series and pattern recognition; analogies; ranking and ordering; syllogisms; statement and assumption; statement and conclusion; cause–effect reasoning.	7 Hrs
Unit 4	**Data Interpretation & Analytical Aptitude:** Tables; pie charts; line graphs; bar graphs; caselets; data sufficiency; DI shortcut techniques; approximation in data interpretation; comparative and predictive data analysis.	8Hrs
Unit 5	**Advanced Logical Reasoning & Puzzle Solving:**Seating arrangements (linear, circular, and complex); floor-based puzzles; scheduling puzzles; selection-based puzzles; Venn diagrams; logical grouping; critical reasoning frameworks	8 Hrs
Unit 6	**Placement Aptitude Mastery & Test Strategies:** Integrated quantitative and logical reasoning practice; decision-making and elimination strategies; speed improvement techniques; mock placement aptitude patterns (TCS, Infosys, Wipro, Accenture, Capgemini); common error analysis; test-taking strategies; aptitude and reasoning simulations.	8 Hrs

Text Books:

1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing
2. Arun Sharma, Logical Reasoning and Data Interpretation, McGraw Hill

Reference Books:

1Arun Sharma, How to Prepare for Quantitative Aptitude,published by McGraw Hill Education.
2. R.S. Aggarwal, A Modern Approach to Logical Reasoning, published by S. Chand Publishing
3. M.K. Pandey, Analytical Reasoning, published by BSC Publishing Co. Pvt. Ltd.

4. Rajesh Verma, Fast Track Objective Arithmetic, published by Arihant Publications

E Resources:

1. NPTEL – Quantitative Aptitude & Logical Reasoning Courses
2. IndiaBIX – Quantitative and Logical Reasoning Practice
3. CareerRide – Aptitude Preparation Modules
4. PrepInsta / HackerEarth – Placement Aptitude Practice Platforms

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH216OE1.1	3	3	2	–	–	–	–	–	–	–	–	2	3	1
4SH216OE1.2	3	3	2	–	–	–	–	–	–	–	–	3	2	1
4SH216OE1.3	–	3	3	–	–	–	–	–	–	–	–	2	3	2
4SH216OE1.4	–	3	2	–	–	–	–	–	–	–	–	3	3	2
4SH216OE1.5	–	3	3	–	–	–	–	–	–	–	–	2	3	2
4SH216OE1.6	–	3	2	–	–	–	–	–	–	2	3	2	3	2
4SH216OE1 CO	1	3	3	–	–	–	–	–	–	1	1	2	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	4SH216OE2	Course Category:	OE
Course Name	**Critical Thinking & Decision Making**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**45 Hrs**
Total Credit Hours	**90 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4SH216OE2 Critical Thinking & Decision Making is a compulsory Open Elective Course forSecond Year B. Tech All Branch Students.

Course Objectives:

The objective of this course is to develop critical thinking and decision-making competencies by strengthening analytical reasoning and structured problem-solving skills applicable to professional and real-world situations.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE2.1	Apply critical thinking frameworks to analyze problems systematically.	C-3
4SH216OE2.2	Evaluate information, assumptions, and arguments for logical consistency and validity.	C-5
4SH216OE2.3	Analyze complex situations and identify feasible alternatives for decision making.	C-4
4SH216OE2.4	Design rational and ethical decision-making strategies under uncertainty to ensure sustainable organizational outcomes.	C-6 A-3
4SH216OE2.5	Apply quantitative and qualitative tools to support decision-making processes.	C-3
4SH216OE2.6	Demonstrate effective decision making in simulated professional and team-based scenarios to resolve workplace challenges effectively	C-3 P-3 A-3

Course Contents:

Unit 1	**Foundations of Critical Thinking:** Concept of critical thinking; elements of reasoning; logical vs illogical thinking; assumptions and inferences; inductive and deductive reasoning; common cognitive biases; barriers to critical thinking.	7Hrs
Unit 2	**Analytical Reasoning & Problem Framing:** Problem identification and structuring; root cause analysis; issue trees; questioning techniques; systems thinking; analytical reasoning models.	7 Hrs
Unit 3	**Decision Making Models & Techniques:** Rational decision-making model; intuitive decision making; bounded rationality; decision trees; cost–benefit analysis; risk and uncertainty; heuristics.	7 Hrs
Unit 4	**Data-Driven & Ethical Decision Making:** Use of data in decision making; qualitative vs. quantitative data; basic decision matrices; ethical frameworks; professional ethics; social and environmental considerations in decisions.	8Hrs
Unit 5	**Creativity, Innovation & Strategic Thinking:** Creative thinking techniques; lateral thinking; design thinking approach; scenario planning; strategic decision making; innovation in problem solving.	8 Hrs
Unit 6	**Applied Decision Making & Case Analysis:** Case studies from industry and management; individual and group decision simulations; conflict resolution through decision frameworks; decision-making under pressure; reflection and feedback	8 Hrs

Text Books:

1.Alec Fisher, Critical Thinking, published by Cambridge University Press.
2. John Adair, Decision Making and Problem Solving, published by Kogan Page.

Reference Books:

1Daniel Kahneman, Thinking, Fast and Slow published by Farrar, Straus and Giroux.
2. Rolf Dobelli, The Art of Thinking Clearly,published by Sceptre.
3. John S. Hammond, Ralph L. Keeney, Howard Raiffa, Smart Choices, published by Harvard Business School Press.
4. Ken Watanabe, Problem Solving 101, published by Portfolio.

E Resources:

1. NPTEL – Critical Thinking &Decision Making Courses
2. Coursera – Critical Thinking and Decision-Making Modules
3. Harvard Business Review – Decision Making Articles
4. MIT OpenCourseWare – Decision Analysis

Mapping of COs with POs & PSO

CO	**PO**											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4SH216OE2.1	2	3	2	–	–	–	–	–	–	–	–	3	2	2
4SH216OE2.2	–	3	3	–	–	–	–	–	–	–	–	3	2	2
4SH216OE2.3	–	3	2	–	–	–	–	–	–	–	–	3	3	2
4SH216OE2.4	–	3	3	–	–	2	3	–	–	–	–	2	3	3
4SH216OE2.5	–	2	2	–	2	–	–	–	–	–	–	3	3	2
4SH216OE2.6	–	2	2	–	–	2	–	2	2	–	2	3	3	3
4SH216OE2. CO	1	3	3	-	1	1	1	1	1	-	1	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4TX217PC1**	Course Category:	**PCC**	
Course Name	**Yarn Manufacturing-II Lab**					
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours		**--**
Total Credit Hours	**30 Hrs**					
SEE Marks	**--**	SEE Time	**--**	CIA Marks		**--**
EE Marks	**25**	PA Marks	**25**	Total Marks		**50**

Course Description:

Subject Code 4TX217PC1 Yarn Manufacturing-II Lab is a compulsory Program Core Course for Second Year B.Tech. Textile Engineering.

Course Objectives:

The objective of this course is to perform practicals on the various mechanisms of speed frame, fundamentals aspects of Ring Frame process and mechanisms of doubling machine in Yarn Manufacturing-II lab.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4TX217PC1.1	Demonstrate the various mechanisms of Speed frame machines.	C-3, P-5
4TX217PC1.2	Describe fundamentals aspects of Ring Frame process	C-2, P-4
4TX217PC1.3	Perform experiments to understand the significance of spinning geometry and Demonstrate the mechanisms of Doubling machines.	C-3, P-5, A-2

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. To study the passage of material through the Speed frame machine.
2. To study the Differential motion.
3. To study the drafting system of various machines.
4. To study the Building Mechanism of Speed Frame.
5. To study the passage of material through the Ring frame machine.
6. To study the Building mechanism of ring frame.
7. To study the passage of material through Doubling Machine.
8. To study geometrical aspects of yarn balloon in ring spinning
9. To study passage of material through two for one twister.
10. To determine the cot hardness of ring spinning machine.

E Resources:

1. Speed Frame in Yarn Spinning
   https://www.textileschool.com/444/speed-frame-in-yarn-spinning/
2. Ring Spinning Systems
   https://www.woolwise.com/wp-content/uploads/2017/07/Wool-482-582-08-T-14.pdf

Mapping of COs with POs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4TX217PC1.1	3	1	-	2	-	-	-	3	2	-	-	3	2	1
4TX217PC1.2	3	1	-	-	-	-	-	-	-	-	-	2	1	1
4TX217PC1.3	3	1	-	2	-	-	-	3	3	-	-	3	2	2
4TX217PC1CO	3	1	-	2	-	-	-	2	2	-	-	3	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.0**	Course Code: **4TX218PC1**			Course Category: **PCC**	
Course Name	**Fabric Manufacturing –II Lab**				
Credits	**01**	Total L:T:P Hours	0:0:2 **30 Hrs**	Total SL Hours	**-**
Total Credit Hours	**30 Hrs**				
SEE Marks		SEE Time		CIA Marks	
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 4TX218PC1 Fabric Manufacturing –II Lab. is a compulsory Professional core Course for Second Year B. Tech. Textile Engineering program.

Course Objectives:

The objective of this course is to provide fundamental knowledge of fabric formation through weaving processes including automatic weaving and dobby and jacquard shedding mechanism along with the understanding of various fabric and machine defects.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4TX218PC1.1	Comprehend how fabrics are created through the different mechanisms of a weaving machine for clear understanding of how weaving machines function to form fabrics,	C-2
4TX218PC1.2	Gain knowledge of automatic looms, the principles of dobby shedding, and the associated mechanisms for students to recognize modern loom technologies and understand the mechanical principles that control pattern formation in fabrics.	C-2
4TX218PC1.3	Analyze different warp and weft pathways along with potential loom defects for identifying the troubleshoot issues in weaving, ensuring quality and efficiency in fabric production	C-3, P-1, A-4

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Passage of warp sheet through shuttle loom during the process of fabric formation.
2. Driving of shuttle loom with the help of motion distribution system.
3. Identification of various faults of woven fabric produced on loom.
4. Study of Tappet Shedding mechanism of plain loom.
5. Working of Top reversing mechanism of plain loom.
6. Study of fast reed Warp protector mechanism.
7. The construction and working of over-pick mechanism of shuttle loom.
8. The construction and working of side lever under-pick mechanism of shuttle loom.
9. Study the construction and working loose reed mechanism warp protector mechanism of loom.
10. The construction and working of Climax dobby.

E- Resources

1. https://textilelearner.net/basic-weaving-mechanism-of-loom/
2. https://libcat.iitd.ac.in/bib/36515https://be-iitkgp.vlabs.ac.in/exp/voltage-regulator/
3. https://www.scribd.com/document/645849994/Dobby-Shedding

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4TX218PC1.1	3	2	2	-	2	-	-	2	2	-	-	3	2	1
4TX218PC1.2	3	2	2	-	3	-	-	2	-	-	-	2	3	1
4TX218PC1.3	2	2	2	-	2	-	-	2	3	-	2	2	3	2
4TX218PC1CO	3	2	2	-	2	2	-	2	3	-	2	2	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4TX219VS1**	Course Category:	**VSC**	
Course Name	**Garment Manufacturing Technology**					
Credits	**02**	Total L:T:P Hours	0:0:4 **60 Hrs**	Total SL Hours	--	
Total Credit Hours	**60 Hrs**					
SEE Marks	--	SEE Time	--	CIA Marks	--	
EE Marks		PA Marks	**50**	Total Marks	**50**	

Course Description:

Subject Code 4TX219VS1 Engineering a Vocational & Skill Enhancement Course for Second year B. Tech Textile Engineering.

Course Objectives:

The objective of this course is to perform practical's on the concepts of Vocational & Skill Enhancement is to develop technical skills related to the operation, handling of material, and maintenance of machinery and equipment.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4TX219VS1.1	Demonstrate garment manufacturing tools, measurement techniques, drafting methods, and sewing operations to complete foundational practical tasks	C-3
4TX219VS1.2	Demonstrate analyze fabric properties, identify suitable techniques for cutting, seam construction, and finishing, and select appropriate methods based on garment requirements.	C-3
4TX219VS1.3	create a complete basic garment by integrating pattern drafting, fabric cutting, sewing techniques, and finishing operations as per industry standards	C-6

List of Practical's:

Minimum eight practicals from the list mentioned below.

1. Study of Tools & Equipment Used in Garment Manufacturing.
2. Study of Taking Body Measurements (Direct & Standard System)

3. Drafting Basic Blocks (Bodice, Sleeve, Skirt).
4. Study of Pattern Alteration & Adaptation.
5. Study of Fabric Identification & GSM Calculation.
6. Study of Marker Planning & Fabric Estimation.
7. Study of Fabric Cutting Techniques.
8. Study of Industrial Sewing Machine Operation.
9. Study of Stitching & Seam Samples.
10. Study of Garment Construction Mini Project

E- Resource

1. Apparel Designing – Swayam
   https://onlinecourses.swayam2.ac.in/cec21_hs14/preview
2. Pattern Making Basics – University of Fashion (Free Lessons Section)
   https://www.universityoffashion.com/free-lessons/

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4TX219VS1.1	1	-	-	-	-	-	-	-	-	-	-	2	3	2
4TX219VS1.2	-	-	-	-	2	-	-	2	-	-	1	3	3	1
4TX219VS1.3	2	-	-	-	3	-	-	-	-	-	-	3	3	2
4TX219VS1	2	-	-	-	2	-	-	1	-	-	1	3	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code:	**4SH220AE1**	Course Category:	**AEC**
Course Name	**Technical Writing**			
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours	**15 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 4SH220AE1 Technical Writing is common Ability Enhancement Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to enhance students' ability to write effective technical documents, professional correspondence, and research-oriented content with clarity, accuracy, and ethical standards.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH220AE1.1	Apply principles of technical writing in engineering documents.	C-3 P-2 A-2
4SH220AE1.2	Apply technical writing skills to prepare professional documents.	C-4 P-2 A-2
4SH220AE1.3	Create ethical, well-structured technical and research documents using IEEE referencing for professional and academic communication.	C-3 P-3 A-3

Course Contents:

Unit 1	**Fundamentals of Technical Writing:** Nature and importance of technical communication, characteristics of technical writing, audience analysis, technical vocabulary, grammar and style, clarity and conciseness, paragraph structure, coherence, technical descriptions, instructions and manuals.	7 Hrs
Unit 2	**Professional and Research Writing:** Technical reports and documentation, structure of reports, abstracts and summaries, research papers, project proposals, resumes and cover letters, business emails, documentation ethics, plagiarism, referencing styles (IEEE), editing and proofreading.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Analysis of Technical Communication to Identify the nature, purpose of given technical documents and evaluate their effectiveness.
2. Editing technical text for clarity and brevity
3. Technical description of an engineering device/system
4. Writing step-by-step technical instructions
5. Preparation of structured technical reports
6. Resume and cover letter drafting
7. Technical report writing based on laboratory work, case study, or project work
8. Abstract and executive summary writing for technical documents
9. Referencing and citation using IEEE format
10. Editing, proofreading, and plagiarism check of technical documents

Text Books:

1. Rizvi A. M. & Patnaik P., Effective Technical Communication, McGraw Hill Education (India), New Delhi (Second Edition).
2. Verma S., Technical Communication for Engineers, Vikas Publishing House Pvt. Ltd., New Delhi (First Edition).
3. Misra P. & Tyagi K., Advanced Technical Communication, PHI Learning Pvt. Ltd., New Delhi (Second Edition).

Reference Books:

11. Chauhan G. S., Kashiramka S. & Thimmesha L., Technical Communication, Cengage Learning India Pvt. Ltd., New Delhi (First Edition).

12. Alred G. J., Brusaw C. T. & Oliu B., Handbook of Technical Communication, Oxford University Press, New Delhi (Second Edition).

13. IEEE Editorial Style Manual, IEEE Standards Association, IEEE, USA (Latest Edition).

14. Joseph G. & Joseph B., Grammar and Usage for Technical Communication, Cambridge University Press India, Delhi (First Edition).

E Resources :

1. NPTEL–SWAYAM, IIT Roorkee, Technical Communication for Engineers.
2. https://owl.purdue.edu
3. https://ieeeauthorcenter.ieee.org

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH220AE1.1	-	-	-	-	-	-	-	-		3	-	2	2	1
4SH220AE1.2	-	-	-	-	-	-	-	-	3	3	-	1	3	2
4SH220AE1.3	-	-	-	-	-	-	-	3		3	3	3	3	3
4SH220AE1 CO	-	-	-	-	-	-	-	1	1	3	1	2	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4SH221EM1**		Course Category: **EEM**		
Course Name	**Elements of Costing and Economics**				
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours	**15 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**--**	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 4SH221EM1 Elements of Costing and Economics is a compulsory Humanities Social Science and Management Course for Second Year B. Tech. Textile Engineering.

Course Objectives:

The objective of this course is to provide the basic knowledge of elements of cost and costing principles which can be used to determine the cost of any product or process of industry.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH221EM1.1	Explain costing principles and demonstrate the use of costing techniques.	C-2, C-3
4SH221EM1.2	Apply fundamental concepts of economics to analyse the market trends.	C-3,C-4,
4SH221EM1.3	Calculate the various cost using costing principles	C-3

Course Contents:

Unit 1	**Introduction to Costing:** Meaning and methods of costing; elements of cost, prime cost, factory overheads, factory cost, selling and distribution overheads, total cost. Concept of BEP, fixed and variable cost, CVP relationship, C/V ratio, desired sales volume for profit, effect of cost/selling price changes on BEP; numerical examples.	8 Hrs
Unit 2	**Introduction to Economics:** Definition and scope; characteristics and types of wants; demand and supply laws; elasticity; market types such as perfect competition, monopoly, oligopoly; money functions, inflation and price levels.	7 Hrs

List of Case-studies:

Minimum eight case-studies from the list mentioned below.

1. To prepare Cost Sheet for a Textile Manufacturing Unit.
2. To determine the prime cost
3. To determine the overhead cost.
4. To determine Break-Even Point.
5. To determine Break-Even Point for target profit.
6. To prepare Demand schedule and Demand curve.
7. To measure the Demand Elasticity.
8. To measure the Demand Elasticity.
9. To prepare price index.
10. Study of inflation level

Text Books

1. B. M. Lall Nigam & I. C. Jain, COST ACCOUNTING: Principles and Practice, Prentice Hall India Learning Private Limited.
2. K. K. Dewett & J. D. Varma, Elementary Economic Theory, Sultan Chand & Sons Pvt Ltd.

Reference Books

1. Maheshwari & Mittal, Cost Accounting: Theory & Problems, Mahavir Publications.

E- Resources

1. NPTEL – Economics and Cost Accounting Courses
2. eGyankosh – Indira Gandhi National Open University Repository
3. Swayam – Online Learning Platform
4. https://www.accountingtools.com/
5. https://www.economicsdiscussion.net/

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH221EM1.1	-	-	-	-	-	-	-	-	-	3	-			
4SH221EM1.2	-	-	-	-	-	2	-	-	-	-	-		3	
4SH221EM1.3	-	-	-	-	-	-	-	-	-	3	-		2	
4SH221EM1CO	-	-	-	-	-	1	-	-	-	2	-		2	

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4CE222VE1**		Course Category: **VEC**		
Course Name	**Environmental Science**				
Credits	**02**	Total L:T:P Hours	2:0:0 **30 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**--**	PA Marks	**--**	Total Marks	**50**

Course Description:

Subject Code 4CE222VE1 Environmental Science is a Value Education course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop understanding of environmental systems, natural resource management, ecological balance, and sustainable development practices to promote awareness and responsibility toward environmental protection and societal well-being.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE222VE1.1	Analyze renewable and non-renewable natural resources and associated problems to promote sustainable utilization for future generations.	C-4
4CE222VE1.2	Analyze food chains, webs, and ecological pyramids to evaluate ecological interactions and succession processes.	C-4
4CE222VE1.3	Examine shift from unsustainable to sustainable development to promote responsible resource planning for society.	C-3

Course Contents:

Unit 1	Renewable and non-renewable resources Environmental Science, Definition, scope and importance, Need for public awareness, Renewable and non-renewable resources, Natural resources and associated problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life styles.	10 hrs

Unit 2	**Ecosystem:** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem.	10 hrs
Unit 3	**Social Issues & Environment:** From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions, Environment Protection Act. Air (Prevention and Control of Pollution) Act., Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, public awareness.	10 hrs

Text Books:

1. Suresh K. Dhameja, Environmental Studies, Katson Books
2. Benny Joseph, Environmental Studies, McGraw Hill Education

Reference Books:

1. Masters & Wendell Ela, Introduction to Environmental Engineering and Science, Pearson Education
2. William Cunningham & Mary Cunningham, Environmental Science, McGraw Hill

E Recourses:

https://www.vlab.co.in/broad-area-civil-engineering

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE222VE1.1	3	2	-	-	-	2	2	-	-	-	-	-	-	-
4CE222VE1.2	3	2	-	-	-	3	2	-	-	-	-	-	1	-
4CE222VE1.3	3	2	-	-	-	3	3	-	-	-	-	-	1	-
4CE222VE1.CO	3	2	-	-	-	3	3	-	-	-	-	-	1	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5**	Course Code: **4TX223DH1**		Course Category: **DH1**		
Course Name	**Sensor and E Textiles**				
Credits	**04**	Total L:T:P etc. Hours	4:0:0 **60 Hrs**	Total SL Hours	**60 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4TX223DH1 Sensors and E Textiles is a double minor/honours course offered by the department of Textile Engineering for Second Year B. Tech of all Discipline.

Course Objectives:

The objective of this course is to provide knowledge of materials and integration techniques for developing conductive and functional electronic textiles and understanding of textile-based sensors, their types, materials, and production methods.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4TX223DH1.1	Explain the concept, properties, and types of E-textiles and their link with smart textiles and wearable systems for functionality inside fabric.	C-2
4TX223DH1.2	Explain the suitable materials such as conductive fibers, yarns, inks, and substrates for E-textile applications.	C-2
4TX223DH1.3	Understand various integration techniques (weaving, knitting, embroidery, and coating) for embedding sensors and conductive pathways in fabrics.	C-2
4TX223DH1.4	Understand the design of E-textiles by integrating conductive materials, programmable microcontrollers, and circuits for functional, comfortable wearable electronics.	C-2
4TX223DH1.5	Evaluate electrical performance (resistance, conductivity, signal quality) of E-textiles using techniques like four-point probe and impedance spectroscopy for electrical behavior of conductive fabrics and circuits.	C-5

4TX223DH1.6	Assess textile properties (mechanical, thermal, water repellency) and their effect on the functionality and durability of E-textiles.	C-5

Course Contents:

Unit 1	**Introduction to E-textiles:** Definition, relationship with smart textiles and wearable technology, Properties of E-textiles: electrical conductivity, flexibility, stretchability, and conformability, allowing for the integration of electronics into fabrics for sensing, Types of E-textiles: embedded E-textiles, laminated E-textiles.	10 hrs
Unit 2	**Materials for E Textiles:** Conductive fibers and yarns, Conductive inks and coatings, Substrates and textiles suitable for embedding sensors, Integration techniques: weaving, knitting, embroidery	10 hrs
Unit 3	**Manufacturing of E textiles:** Conductive Materials & Fabrication, Electronics Integration programmable microcontroller, Circuit Design & Prototyping	10 hrs
Unit 4	**Textile Based Sensors :** Introduction, Types of Textile Sensors: Pressure Sensors, humidity, temperature, or other environmental sensors integrated into fabrics, Materials and Manufacturing for sensors.	10 hrs
Unit 5	**Testing of electrical properties**: Measuring the flow of current and resistance through the e-textile system using technique like four-point probe or impedance spectroscopy, Evaluating the quality of electrical signals transmitted through the conductive threads or embedded components, Testing of electrical properties change after repeated use, washing, and other stresses.	10 hrs
Unit 6	**Testing of textile material properties:** Mechanical Properties: evaluating tensile strength, tear resistance, and flexibility of the base fabric, Thermal Properties: Measuring heat distribution and stability of the e-textile system, Water Repellency & Permeability: Assessing the e-textile's interaction with moisture affects its electronic functionality and user comfort.	10 hrs

Text Books

1. Kate Hartman Make, Wearable Electronics, Shroff publishers & distributors pvt ltd.
2. Xiaoming Tao, Wearable electronics and photonics , Woodhead Publishing Limited.
3. Vladan Koncar, Smart textiles and their applications, Wood head publishing.

Reference Books:

1. Matteo Stoppa and Alessandro Chiolerio, Wearable Electronics and Smart Textiles: A Critical Review.
2. P. Westbrock, G. Priniotakis and P.Kienkens, Analytical Electro Chemistry in textiles.
3. William C. Smith, Smart textile coatings and laminates.
4. M.K. Gupta & S.C. Jana, Advanced Functional Materials for Smart Textiles.

E- Resources:

1. https://www.mdpi.com/journal
2. https://nptel.ac.in/courses/116102006
3. https://ieeexplore.ieee.org

Mapping of COs with Pos & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4TX223DH1.1	3	2	1	-	1	2	-	-	-	-	2	2	1	3
4TX223DH1.2	3	2	1	-	2	-	-	-	-	-	1	3	1	2
4TX223DH1.3	3	3	2	1	2	-	-	-	-	-	1	3	2	2
4TX223DH1.4	3	2	1	2	3	1	-	-	-	-	2	2	2	3
4TX223DH1.5	3	2	2	3	3	-	-	-	-	-	1	2	2	3
4TX223DH1.6	2	3	1	2	2	3	1	-	-	-	2	3	2	3
4TX223DH1.CO	3	2	1	2	2	2	1	-	-	-	2	3	2	3

Correlation levels – 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	**5**	Course Code:	**4TX223DH2**	Course Category:	**DH2**
Course Name	**Industrial & Automotive Textiles**				
Credits	**04**	Total L:T:P Hours	4:0:0 **60 Hrs**	Total SL Hours	**60 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**60**	SEE Time	**3 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:

Subject Code 4TX223DH2 Industrial & Automotive Textiles is a double minor/honours course offered by the department of Textile Engineering for Second Year B. Tech of all Discipline.

Course Objectives:

The objective of this course is to understand the role of textiles in vehicle systems such as interior, exterior, safety and emerging functional applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4TX223DH2.1	Explain the concept, characteristics, and importance of industrial textiles and their role in various industries.	C-2
4TX223DH2.2	Describe the materials, manufacturing methods, properties, and applications of transport bags and sheets, oil spill control fabrics, protective covers, and packaging materials.	C-2
4TX223DH2.3	Understand an overview of the automotive industry and applications of textiles in automotive sectors	C-2
4TX223DH2.4	Explain suitable materials, manufacturing process and its specific requirements for automotive applications.	C-2
4TX223DH2.5	Explore the many applications of textiles in automotive sector.	C-5
4TX223DH2.6	Evaluate the mechanical, thermal, durability, and aging tests specific to automotive textiles.	C-6

Course Contents:

Unit 1	**Introduction to Industrial Textile Applications:** Paper making felt, Conveyor belts, Drive belts Industrial ropes and cordages, Industrial webbings and slings	10 hrs
Unit 2	**Industrial Textile Products:** Filtration fabrics, Battery separators, Transport Bags and sheets, Fabrics for oil spill control, Protective covers and packaging materials	10 hrs
Unit 3	**Introduction to Automotive Textiles:** Overview of automotive industry and applications of textiles, Classification of automotive textiles, functions of automotive textiles, properties of automotive textiles.	10 hrs
Unit 4	**Materials and Manufacturing Techniques:** Natural and synthetic fibers and their requirements for automotive application, Fabric formation: Weaving, knitting, nonwoven, Surface treatments and dyeing methods Lamination and coating techniques, Molding and shaping techniques, , Adhesion and bonding processes	10 hrs
Unit 5	**Applications of Automotive textiles:** Interior Applications: Seat covers, headliners, carpets, door liners, roof liners. Exterior Applications: Convertible tops, tyre cords: manufacturing process of tyre cord, body covers. Safety Applications : airbags, types of airbags, seat belts, insulation, sound-proofing Specialty Areas: Sensors, heating textiles, smart fabrics	10 hrs
Unit 6	**Testing of automotive textiles :** Tensile strength, tear strength, bursting strength, seam strength, flammability testing, UV and light fastness, Abrasion Resistance, Thermal Resistance and Heat Aging, Air Permeability & Porosity, Chemical Resistance, Sound Absorption & Acoustic, Moisture Management and Comfort Test, Aging and Weathering Tests.	10 hrs

Text Books

1. Horrocks & S. C. Anand, Handbook of Technical Textiles.
2. Walter Fung & J. M. Hardcastle, Textiles in Automotive Engineering.
3. Jeffrey F. L. Partridge & S. K. Mukhopadhyay, Automotive Textiles.
4. Sabit Adanur, Wellington Sears Handbook of Industrial Textiles.

Reference Books:

1. Senthil Kumar, Textiles for Industrial Applications
2. Don Taylor, Automotive Upholestery handbook.
3. Roshan Shishoo,Textile Advances in the Automotive Industry.

E- Resources:

1. https://www.researchgate.net/publication/363855148
2. https://www.ijirset.com

Mapping of COs with Pos & PSOs

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
4TX223DH2.1	3	1	-	-	-	2	-	-	1	-	1	3	1	2
4TX223DH2.2	3	2	2	1	1	1	-	-	-	-	1	3	2	2
4TX223DH2.3	3	2	1	-	-	2	-	-	1	-	1	3	2	2
4TX223DH2.4	3	3	3	1	2	3	2	1	1	-	1	3	2	3
4TX223DH2.5	3	2	2	3	2	2	1	-	1	-	1	3	2	3
4TX223DH2.6	2	2	3	2	3	3	2	1	1	1	3	2	2	3
4TX223DH2.CO	3	2	2	2	2	2	2	1	1	1	1	3	2	3

Correlation levels – 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.5**	Course Code: **5TX224EC1**		Course Category: **EC**		
Course Name	**Chemical Processing of Textile Materials**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**50**	Total Marks	**50**

Course Description:

Subject Code 5TX224EC1 Chemical Processing of Textile Materials is an optional exit course for under graduate diploma in Textile Engineering. This course introduces students to the fundamentals of textile wet processing, including fiber preparation, dyeing, printing, and finishing processes.

Course Objectives:

The objective of this course is impart knowledge of preparatory, dyeing, printing, and finishing processes used in textile chemical processing, to develop skills in handling wet processing machinery and executing chemical treatments.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5TX224EC11.1	Explain the sequence and purpose of various wet processing operations	C-2
5TX224EC11.2	Apply suitable dyeing and printing techniques to different textile materials	C-3, P-3
5TX224EC11.3	Evaluate color fastness and processing quality parameters	C-5, P-4

Course Contents:

Unit 1	**Introduction to Textile Chemical Processing:** Sequence of wet processing in the textile value chain. Preparatory Processes: Desizing, Purpose, methods, and chemicals used; Scouring, Removal of natural impurities; alkali treatment of cotton; Bleaching, Optical brighteners and whitening agents; Mercerization, Principle, process, and effects on properties of cotton fibers.	10 Hrs

Unit 2	**Dyeing of Textiles:** Classification of dyes, natural, synthetic, direct, reactive, disperse, vat, acid, and basic dyes. Dyeing of natural and synthetic fibers. Dyeing machinery: winch, jigger, jet, and beam dyeing machines. Colorfastness properties and testing.	10 Hrs
Unit 3	**Printing of Textiles:** Printing pastes and thickeners, Fixation of prints and after-treatments. Printing methods: block printing, screen printing (manual, flat-bed, rotary), transfer printing, and digital printing.	10 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. To study desizing process on cotton fabric.
2. To perform scouring of cotton.
3. To carry out bleaching of cotton by Hydrogen peroxide.
4. To study mercerization process of cotton fabric.
5. To dye cotton with direct dyes.
6. To dye cotton with reactive dyes.
2. To dye polyester with disperse dyes using high-temperature method.
3. Study of jigger dyeing machine operation.
4. To perform pigment printing using screen printing method.
5. To print cotton fabric with direct dye using direst style.
6. To measure color fastness to washing,
7. To measure color fastness to rubbing,

Text Books

1. V.A. Shenai, Technology of Textile Processing, Sevak Publications
2. E. R. Trotman, Textile Scouring & Bleaching, B. I. Publications.
3. S.R. Karmakar, Fundamentals of Textile Chemical Processing, Elsevier.

Reference Books

1. J.T. Marsh, Textile Finishing, Chapman & Hall ltd
2. Leslie W.C. Miles, Textile Printing, Society of Dyers and Colourists (SDC)

E- Resources

1. NPTEL: Textile Chemistry & Wet Processing Modules
2. Swayam – Textile Chemical Processing
3. eGyankosh – IGNOU Textile Resources
4. https://textilelearner.net
5. [https://wetprocessingoftextiles.com]

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
5TX224EC11.1	3	2	2	-	2	-	-	-	2	-	-	2		
5TX224EC11.2	3	2	2	-	3	2	-	-	-	-	-	3		3
5TX224EC11.3	2	2	2	-	2	2	-	-	3	-	-			
5TX224EC11CO	3	3	2	-	2	1	-	-	2	-	-	2		1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: **5.5**	Course Code: **5TX225EC1**		Course Category: **EC**		
Course Name	**Modern Yarn and Fabric Manufacturing Technology**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90 Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120 Hrs**				
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:

Subject Code 5TX225PC1 Modern Yarn and Fabric Manufacturing Technology is an optional exit course for undergraduate Diploma in Textile Engineering.

Course Objectives:

The objective of this course is to focuses on fundamental concepts related to advance yarn and fabric manufacturing processes. Through a series of lectures, students will be briefly introduced to key terms, principles, and modern techniques involved in yarn and fabric production.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5TX225EC1.1	Demonstrate the principle of rotor, friction spinning and constructional details of rotor and friction spinning machines.	C-3, P-4
5TX225EC1.2	Demonstrate the concept of air jet, air vortex spinning and constructional details of air jet and air vortex spinning machines.	C-4, P-4
5TX225EC1.3	Describe the technical features, design and working principle of projectile, rapier and airjet weaving machine.	C2, P-4

Course Contents:

Unit 1	**Rotor and Friction Spinning:** Rotor Spinning: Introduction, open end spinning principle, sequence of operations, Construction details of rotor spinning machines, Process parameters influencing yarn quality, Properties of rotor yarn, Applications of rotor yarn. Friction Spinning: Introduction, principle of friction spinning, sequence of operation in fiction spinning, Construction details of different friction spinning machines-dref-I, dref-II, dref-III,	10 Hrs

	dref-2000 and dref-3000, Process parameters influencing yarn quality, properties of friction yarn, Applications of friction yarn.	
Unit 2	**Air Jet & Air Vortex Spinning:** Air jet spinning: Introduction, principle of air jet spinning, Construction details of air jet spinning machines, Details of yarn structure, properties and applications of air jet yarn, Air vortex spinning- Introduction, principle of air vortex spinning, Construction details of air vortex spinning machine, Details of yarn structure, properties and application of air vortex yarn.	10 Hrs
Unit 3	**Projectile, Rapier and Airjet Weaving:** Projectile weaving : Introduction to shuttle-less weaving - Classification of shuttle-less weaving machines, weft accumulator, selvedges formation on shuttle-less weaving machines, Introduction, technical features, advantages, phases of weft insertion, projectile picking mechanism, Timing cycle of projectile weaving, weft tension variation. Rapier Weaving: Classification of rapier weaving machines, rigid and flexible rapiers, Methods of weft insertion viz. rapier driving mechanism, weft control mechanism, Weaving timings, shedding, take up, Selvedge formation and quick style change. Air jet weaving: principle of airjet weaving, phases of weft insertion, Air requirements and air jet nozzles.	10 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. To study passage of material through rotor spinning machine.
2. To produce yarn sample on pilot rotor spinning machine.
3. To compare unevenness & imperfection of ring & rotor yarn.
4. Analysis of physical properties of ring & rotor yarn.
5. Analysis of physical properties of ring & air jet yarn.
6. To study microscopic structure & physical properities, U% of air vortes & core spun yarn.
7. To study microscopic structure & physical properities, U% of air vortes & dref yarn.
8. To study the picking mechanism of rapier loom.
9. To study the picking mechanism of projectile weaving machine
10. To study the different phases of weft insertion in air jet loom.

Text Books

1. Klein W, Manual of New Spinning System Vol. I – III, The Textile Institute, UK.
2. Oxtoby E, Spun Yarn Technology, by Butterworth and Co. Ltd. publication, 1987.
3. Lord P R, Handbook of Yarn Production, The Textile Institute, Woodhead Publication Limited.

Reference Books

1. Allen Armord, Handbook of Weaving operations.
2. Sabit Adnur, Handbook of Weaving.
3. R. Marks, Principle of Weaving, A.T.C. Robinson,

E- Resources

1. New Spinning Technologies Link: http://www.digimat.in/nptel/courses/video/116102059/L11.html
2. Unconventional and New Spinning System and Technologies Link: textilelearner.net/modern-and-new-spinning-technologies/
3. Shuttle less Looms Link: https://ebooks.inflibnet.ac.in/hsp08/chapter/shuttleless-looms
4. Unconventional and new spinning systems and technologies Link:https://textilelearner.net/modern-and-new-spinning-technologies/#google_vignette

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
5TX225EC1.1	3	2	-	-	3	1	1	-	-	-	1	3	2	-
5TX225EC1.2	3	2	-	-	3	1	1	-	-	-	1	3	2	-
5TX225EC1.3	3	3	2	3	2	1	1	-	-	-	1	3	2	-
5TX225EC1CO	3	2	1	1	2	1	1	-	-	-	1	3	2	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)