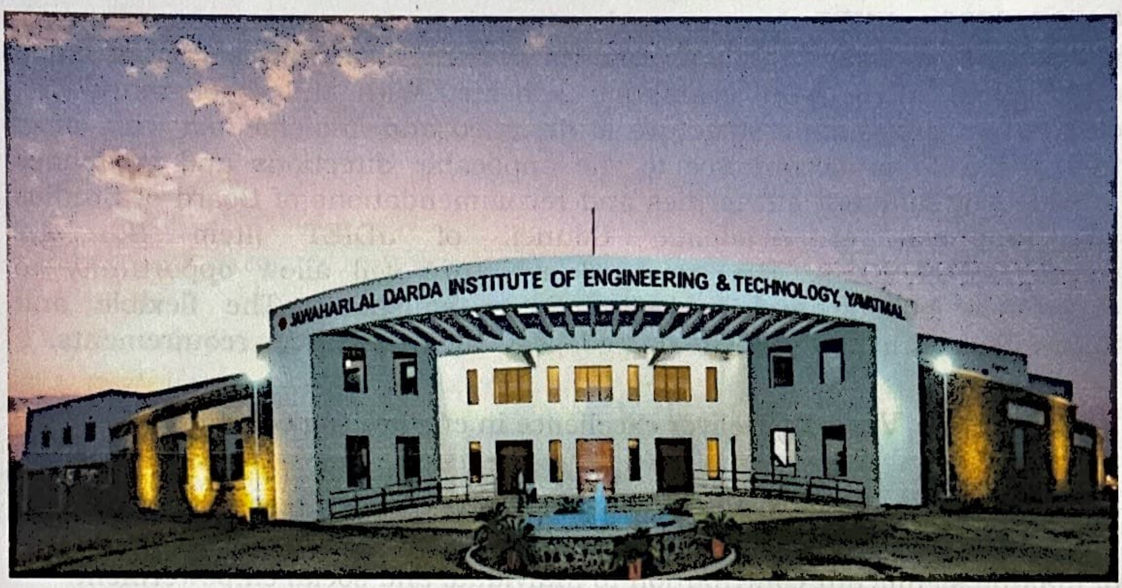
ANNEXURE –I & II

Curriculum Structure for Four Year Multidisciplinary Undergraduate B. Tech. Degree Programme

(In view of NEP-2020)

For students admitted in academic session 2025-26 and onwards



09/09/2025

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)

Member Secretary Academic Council	Dean Academics JDIET	Chairman of Academic Council & Principal, JDIET

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

Dean Academics Jawaharlal Darda Institute of Engineering & Technology, Yavatmal

Chairperson Academic Council Jawaharlal Darda Institute of Engineering & Technology, Yavatmal

1. Curriculum Programme Structure for JDIET:

The Foundation Society, Shri Jawaharlal Darda Education Society and Statuary Bodies of Jawaharlal Darda Institute of Engineering and Technology, Yavatmal has envisioned the future needs with respect to Technical Education. The NEP implementation plan and strategic development plan of JDIET has a milestone for conferment of autonomous status which is achieved vide UGC letter No.F.2-10/2023(AC-Policy) dated 24/04/2025 and SGB Amravati University Notification No. 60/2025 dated 16/05/2025. Accordingly with reference to Clause 3.1, 3.2, 3.3 of University Grants Commission (Conferment of Autonomous Status upon Colleges and Measures for Maintenance of Standards in Autonomous Colleges) Regulations, 2023, dated: 03/04/2023, section 122 of the Maharashtra Public Universities Act 2016 (Mah. Act No. VI of 2017), section (3)(i) of Govt. of Maharashtra prescribed uniform Statute No. 3 of 2019 dated 14 January 2019 and Gov. of Maharashtra GR. No. NEP-2022/(67/23)/TE-2, 04/07/2023, JDIET has to review existing courses/programmes and, restructure, redesign and prescribe its own courses/programmes of study and syllabi along with evaluation scheme. With this background the curriculum programme structure is designed and implemented with effect from 2025-26 in accordance to the applicable directions and guidelines provided by different authorities and recommendations of Board of Studies and approval of Academic Council of JDIET (Item No. 2.2 dated: 08/09/2025). The proposed structure will allow opportunity to experience holistic and multidisciplinary education. The flexible and innovative curricula will focus on pedagogy and competency requirements.

2. Institute Vision: Deliver excellence in engineering education

3. Institute Mission: Provide highest quality resources, learning processes and research to create Technically qualified professional capable of making significant contribution to individual and social empowerment.

4. Qualification and Credit Framework:

Considering the conferment of autonomous status to JDIET there will be change in nomenclature of award of qualification with respect to SGB Amravati University Notification No. 102/2025 dated 19/07/2025. The affiliating University will award Four Years Multidisciplinary B. Tech. Degree, Three Years Bachelors Degree in Vocation (B. Voc) or B.Sc. (Engg./Tech.), Two Years UG Diploma in Engg. /Tech. and One Year UG Certificate in Engg. /Tech based on student's exit.

The Four-year Multidisciplinary B. Tech. Degree Programme allows the students to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minors as per their choices and the feasibility of exploring learning with multiple entry and multiple exit options.

Subject to the conditions prescribed by the Admission Regulating Authority (ARA) and Government of Maharashtra from time to time, for admission in First Year of B. Tech. Degree Programme, the candidate shall be considered eligible after successful completion of HSC/Grade 12 (in 5+3+3+4)

Examination or after earning 160 credit points the student gets the qualification level 4.0 with mandatory subjects and minimum marks as prescribed by the ARA and CET Cell.

Table 1: Qualifications at different Levels and Credit Requirement

NHEQF/ NCrF Level	**Type of Qualification**	**Qualification Title**	**Programme Duration [Total Credits]**	**Additional Credits to be secured for Exit (Optional)**
1	**2**	**3**	**4**	**5**
4.5	Undergraduate Certificate	One Year UG Certificate in Engg./Tech	1-Year (2-Semester) [44]	08
5.0	Undergraduate Diploma	Two Year UG Diploma in Engg./Tech	2-Year (4-Semester) [88]	08
5.5	Bachelor's Degree	Three Year Bachelor's Degree in Vocation (B.Voc.) or B. Sc. (Engg./Tech.)	3-Year (6-Semester) [132]	08
6.0	Bachelor's Degree – Engineering / Technology	4-Years Bachelor's Degree (Engg./Tech. or Equivalent) in Engg./Tech. with Multidisciplinary Minor	4-Year (8-Semester) [174]	--
6.0	Bachelor's Degree – Engineering /Technology (Honours)	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech.- Honours and Multidisciplinary Minor	4-Year (8-Semester) [174]	18
6.0	Bachelor's Degree – Engineering / Technology (Honours with Research)	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech.- Honours with Research and Multidisciplinary Minor	4-Year (8-Semester) [174]	18
6.0	Bachelor's Degree – Engineering / Technology (Double Minor)	4-Years Bachelor's degree (B.E./ B.Tech. or Equivalent) in Engg./ Tech.- Major Engg. Discipline with Double Minors (Multidisciplinary and Specialization Minors)	4-Year (8-Semester) [174]	18

5. Credit Distribution for Four Year Multidisciplinary Undergraduate B. Tech. Degree Program at JDIET.

Table-2: Credit distribution in accordance to directions (GR)

Courses	Code	Semester wise Credits																Total		Corse wise Credits	
		I		II		III		IV		V		VI		VII		VIII					
		GR	**CJ**	GR	**CJ**	GR	**CJ**	GR	**CJ**	GR	**CJ**	GR	**CJ**	GR	**CJ**	GR	**CJ**	GR	**CJ**	GR	**CJ**
Basic / Engineering Science Courses	BSC	6 to 8	**7**	8 to 10	**7**													14 to 18	**14**	30	**30**
	ESC	10 to 8	**9**	6 to 4	**7**													16 to 12	**16**		
Program Courses*	PCC			2	**2**	8 to 10	**11**	8 to 10	**9**	10 to 12	**12**	8 to 10	**11**	4 to 6	**6**	4 to 6	**3**	44 to 56	**54**	64 to 76	**74**
	PEC									4	**4**	8	**7**	2	**6**	6	**3**	20	**20**		
Multidisciplinary Courses	MDM					2	**2**	2	**2**	4	**4**	2	**2**	2	**2**	2	**2**	14	**14**	22	**22**
	OE					41	**3**	2	**3**	2	**2**							8	**8**		
Skill Courses*	VSEC	2	**2**	2	**2**			2	**2**			2	**2**					8	**8**	8	**8**
Humanities Social Science and Management Courses	AEC	2	**2**					2	**2**									4	**4**	14	**14**
	HSSM/E					2	**2**	2	**2**									4	**4**		
	IKS			2	**2**													2	**2**		
	VEC					2	**2**	2	**2**									4	**4**		
Experiential Learning Courses*	RM														**4**	4		4	**4**	22	**22**
	FP/CEP					2	**2**											2	**2**		
	RP														**4**	4	**0**	4	**4**		
	OJT													12			**12**	12	**12**		
Co-curricular Courses	CC	2	**2**	2	**2**													4	**4**	4	**4**
Total Credits		20 to 22	**22**	20 to 22	**22**	20 to 22	**22**	20 to 22	**22**	20 to 22	**22**	20 to 22	**22**	20 to 22	**22**	20 to 22	**20**	160 to 176	**174**		**174**

GR - As per Maharashtra Government GR and SGBAU Directions **CJ** – Credit distribution in the Curriculum Structure of JDIET

***-Total Credits related to Major discipline = 100 (57.5%)**

Abbreviations: OE : Generic/ Open Elective; VSCE:Vocational and Skill Enhancement Course; SEC: Skill Enhancement Course; AEC: Ability Enhancement Course; IKS:IndianKnowledge System; VEC: Value Education Courses; OJT:On Job Training: Internship/ Apprenticeship; FP: Field projects; CEP:Community engagement project; CC:Co-curricular Course; RM: Research Methodology; RP: Research Project; HSSM:Courses on Humanities, Social Science, and anagement:HSSM.

6. Notional Learning Hours and Credits

Notional learning hours is the time required by the student for any kind of learning for assignment of credits. For purpose of calculations under the NCrF, in general, 30 notional learning hours will be counted as one credit. A course is measured in terms of credit hours based on the amount of workload (L:T:P) and learner-engaged time (SL). A credit framework indicates the time invested, and the workload for each of the credits earned by the individual. The credit framework will facilitate credit accumulation and transfer.

A credit is a unit by which the coursework is measured. One academic year is of two semesters. Each semester consists of 90 working days (15 weeks).

Total notional learning hours in a semester will be calculated as total Course plan hours (L:T:P:SL) per week multiplied by 15 weeks as indicated in curriculum scheme.

7. Enrolment of Students on Academic Bank of Credit (ABC)

Every student shall create Unique APAAR ID which is a unified digital identity for all their academic pursuits. Student shall submit the APAAR ID in the Institute while taking admission. This ID linked with DigiLocker, allows for secure storage, management, and transfer of academic credits earned from the Institute.

8. General Guidelines

1. Student admitted through Central Admission Process in JDIET for four-year multidisciplinary undergraduate B. Tech. Degree Programme in a certain discipline (like Chemical Engineering, Civil Engineering, Computer Science and Engineering, Electrical Engineering, Electronics and Telecommunication Engineering, Mechanical Engineering and Textile Engineering) then the admitted disciplined can be termed as Major or Core or Major Discipline leading to Major Degree. Since the Degree programme is Multidisciplinary the student will have to chose a discipline other than Major discipline for Multidisciplinary minor from 3rd semester. The multidisciplinary minor will have a set of seven courses/subject offered from semester III to semester VIII. After selecting Multidisciplinary minor course in semester III, student will not be able to change the same. Thus, Four Year Multidisciplinary Undergraduate B. Tech. Degree Programme comprises of Major Degree and one Multidisciplinary Minor.
2. In semester VIII, the students have to complete mandatory internship of one semester in the company/ organization approved by Training and Placement Cell.
3. In semester VIII, during internship the students have to complete the theory courses in online mode.
4. For Online courses offered through SWAYAM/ NPTEL or equivalent platform which provides Evaluation mechanism with the permission of Examination cell and respective Department. In this case, students can register and complete these online courses any time after beginning of third semester and complete the course and submit the score card/

certificate before declaration of result that semester in which such courses are offered. The evaluation for online courses offered by the Institute on recognized platforms will be carried out by the Institute.

5. In addition to program core courses, the students have to complete vocational skill courses, internship, field projects connected to major degree.
6. The exit option at the end of each year will be available to students after even semester. i.e. semester II, semester IV and semester VI and will commence from AY 2026-27 for UG Certificate, AY 2027-28 for UG Diploma, AY 2028-29 for B. Voc./B. Sc. Engineering degree.
7. Students opting for exit at any level (after odd semesters or even semester) will have to earn additional eight credits before exit in skill based vocational courses and internship/apprenticeship to make them eligible to get UG certificate / UG Diploma or B. Voc./B. Sc. Engineering degree as per eligibility.
8. Students opting for exit at any level after even semester will have the option to re-enter the programme from where they left off in odd semesters within four years of exit. There shall be a gap of at least one year between exit and re-entry to UG programme.
9. Students opting for exit after odd semester, i.e. semester I, III, V or VII will have the option to re-enter the programme from where they left off in even semesters only. There shall be a gap of at least one year between exit and re-entry to UG programme.
10. Maximum period for completion of B. Tech. programme: The student has to complete the degree programme within the stipulated maximum period of eight years from the date of admission to first year UG. The maximum duration of the programme includes the period of exit, withdrawal, absence and different kinds of leaves permissible to a student but it shall exclude the period of rustication of the student from the institute. However, genuine cases on confirmation of valid reasons may be referred to Academic Council for extending this limit by additional one year. For re-entry, an absorption scheme will be applied according to the duration of the gap.
11. Eligibility for admission to the Four Year Multidisciplinary Undergraduate B. Tech. Degree Programme with Honours/ Research/Double Minor: Students with minimum CGPA of 7.5 without backlog courses at the end of second semester and should have earned 44 credits are eligible for admission.
12. Eligibility for admission and continuation in Double Minor (DM) and Honours programmes shall be subject to successful completion of all prescribed credits of preceding semesters in a single attempt, without backlog or academic break. however, students admitted through lateral entry in the third or final year shall not be eligible.
13. For theory evaluation with SEE and CIA, the combined minimum marks (passing marks) will be considered only if student obtains non zero score in SEE. Also, for Practical / Term work evaluation with EE and PA, the combined minimum marks (passing marks) will be considered only if student obtains non zero score in EE.

9. Computation of SGPA and CGPA

1. Letter Grades and Grade Points:

Computation of SGPA and CGPA shall be on the basis of Credits prescribed to Courses and Grade Points obtained by the student based on scale as mentioned in Table –3.

Table-3: Letter Grades and Grade Points:

% of Marks	Alpha-Sign/ Letter Grade Result Grade	Grade Point
90.0-100	O (Outstanding)	10
80.0-<90.0	A+(Excellent)	9
70.0-<80.0	A(Very Good)	8
60.0-<70.0	B+ (Good)	7
55.0-<60.0	B(Above Average)	6
50.0-<55.0	C(Average)	5
40.0-<50.0	P (Pass)	4
Below 40.0	F (Fail)	0
Absent	Ab	0

2. Computation of SGPA and CGPA:

The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester. The SGPA is based on the grades of the current term, while the Cumulative Grade Point Average (CGPA) is based on the grades in all courses taken after joining the programme of study.

a) Semester Grade Point Average (SGPA): The SGPA is the ratio of the sum of the product of the number of Credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of Credits of all the courses undergone by a student, i.e.

$$\text{SGPA (Si)} = \Sigma(C_i \text{ x } G_i) \ / \ \Sigma C_i$$

Where C_i is the number of Credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

b) Cumulative Grade Point Average (CGPA)**:** The Cumulative Grade Point Average (CGPA) is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\text{CGPA} = \Sigma(C_i \text{ x } S_i) \ / \ \Sigma C_i$$

where Si is the SGPA of the i^{th} semester and C_i is the total number of Credits in that semester.

3. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
4. Equivalence of the conventional Division/Class

   Equivalence of the conventional division/ class to the corresponding CGPA in final semester shall be in accordance with the Table-4.

Table-4: Equivalence of Class/Division to CGPA

Sr.No.	SGPA/CGPA	Class/Division
1.	7.5 or more than 7.5	First Class with Distinction
2.	6.00 or more but less than or equal to 7.49	First Class
3.	5.00 or more but less than or equal to 5.99	Second Class
4.	4.00 or more but less than or equal to 4.99	Pass
5	Less than 3	Fail

10. Declaration of Result

1. Declaration of result is based on the Semester Grade Point Average (SGPA) earned towards the end of each semester or the Cumulative Grade Point Average (CGPA) earned at the completion of all eight semesters of the programme. If some candidates exit at the completion of the first, second or third year of the Four years Undergraduate Programmes, with Certificate, Diploma or Basic Degree, respectively, then the results of successful candidates at the end of the second, fourth, sixth and eighth semesters shall also be classified on the basis of the CGPA obtained in the two, four, six or eight semesters, respectively.
2. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination. Based on the above recommendations on Letter grades, grade points and SGPA and CGPA, the Institute will issue the transcript or statement of marks or grade card.

11. Progression to Higher Class

Allow To Keep Term (ATKT):

Eligibility for progression to higher classes shall be as per Table-5.

Table-5: Eligibility for progression to higher classes

Sr. No.	Admission to	Minimum Required Credits
1.	Semester III	28 Credits from all Verticals of Semester I and II
2.	Semester V	Successful completion of Semester I & II with all credits and 28 Credits from all Verticals of Semester III to IV
3.	Semester VII	Successful completion of Semester III & IV with all credits and 28 Credits from all Verticals of Semester V to VI

A student who could not complete a semester satisfactorily or did not keep term will be eligible for readmission to the same semester. However, readmission to the semester should be allowed only in regular session of that semester. In such case, the candidate will not be eligible to get admission in higher semester.

12. Coding of Courses

A unique identification code needs to be allotted to the courses offered by the Autonomous Institute so as to classify them in accordance to semester, major discipline/branch, Level and category/vertical. The length of course code can be alphanumeric (1AB234CD5) with eight characters.

1	AB	234	CD	5
Semester 1-8	Branch or Major Discipline	Course Level 000 – 499	Course Category / Vertical	Sr. No of Course

(i) Codification for Semester
The first character of the code will be numeric representing the semester in which the subject/course is offered*.

(ii) Codification of Major Discipline / Branch / Subject
In JDIET presently seven programmes of engineering and technology with major discipline / branches are offered. The allotted code for seven major disciplines and Science and Humanities will be two alphabets which are as follows.

a) Chemical Engineering: CH
b) Civil Engineering : CE
c) Computer Science and Engineering: CS
d) Electrical Engineering: EE
e) Electronics and Telecommunication Engineering: ET
f) Mechanical Engineering: ME
g) Textile Engineering : TX
h) Science and Humanities : SH

(iii)Codification for Course Level
The course level will be designated by the respective BoS as described under three numeric characters.

(iv) Codification for Category of Course
The category/vertical of courses will be the last two characters in alphabets. The designated code for the category or verticals is as follows.

Table-6: Category of Courses and its Code

Sr. No.	Course Category / Vertical	Code
1	Basic Science Course (BSC)	BS
2	Engineering Science Course (ESC)	ES
3	Programme Core Course (PCC)	PC
4	Programme Elective Course (PEC)	PE
5	Multidisciplinary Minor (MDM)	MD
6	Generic/Open Elective (OE)	OE
7	Vocational and Skill Enhancement Course (VSEC)	VS
8	Ability Enhancement Course (AEC)	AE
9	Entrepreneurship / Economics / Management Courses	EM
10	Indian Knowledge System (IKS)	IK
11	Value Education Courses (VEC)	VE

12	Research Methodology	RM
13	Community Engagement Project	CP
14	Field Projects	FP
15	Project (Final Year)	PR
16	Internship / On Job Training (OJT)	IN
17	Co-curricular Courses (CC)	CC
18	Double Minor / Honours Courses	DH
19	Honours with Research	RP
20	Exit Courses (EC)	EC
21	Exit Internship (EI)	EI
22	NPTEL/SWAYAM/MOOCs Online Courses	OC
23	Add-on / Advance courses	AD
24	Non-Credit Courses (000-099) / Audit Courses	NC
25	Experiential Learning (Other than RM, FP, PR & IN)	EL
26	Liberal Learning (Other than CC)	LL

(v) Serial Number of the course:
This number indicates the sub-division of the course. It is applicable if the course is revised or an elective course under the head of professional or open elective
* Description about First Year Scheme for all branches of Engineering & Technology with Group A & Group B subjects:

(i) The sanctioned intake and / or the number of the candidates admitted to first year B. Tech. shall be divided into two Groups as A & B in the multiples of 60 preferable at the institute level.
(ii) Group – A candidates shall register for Group – A subjects in first semester and Group – B candidates shall register for Group – B subjects in first semester.
(iii) The candidates shall be examined for their subjects from the respective groups in Semester I.
(iv) In Semester II, candidates who registered for and were examined in Group – B subjects in Semester I shall register for the Group – A subjects. Similarly, candidates who registered for and were examined in Group – A subjects in Semester I shall register for the Group – B subjects.
(v) The candidates shall be examined for their subjects from the other groups in Semester II.
(vi) Thus, at the end of the first year, all the subjects shall be studied by the candidates from both the groups.
(vii) The Mark list shall show only the group obtained in respective Semester, list first Semester Group – B, first Semester Group – A.
(viii) The exercise on the part of the First Year In-charge shall be to ensure that the candidates fill up the examination forms correctly according to the subject's group he / she has registered in both the Semesters.

13. Curriculum Structure (Scheme) and Syllabus for Semester I & II

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

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

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

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	Max	Max	Min	Max	Max	Max	Min		
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	VSC-I	VSC	1__109VS1	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]

Semester - I/II (First Year) [Group - 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	Max	Max	Min	Max	Max	Max	Min		
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	PCC - I	PCC	2__116PC1	1	0	2	1	4	2						50	50	25	50	
6	IKS-I	IKS	2__117IK1	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	EC-4.5 - I	EC	3__123EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	EC-4.5 - II	EC	3__124EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
OR																			
14	Internship / Apprenticeship in Industry	EI	3__125EI1	0	0	16	0	288	8					100	100	200	100	200	
OR																			
15	Two MOOC/NPTEL Courses	EC	3__126OC_	8	0	0	8	16	8										

SEE	Semester End Examination	L	Lecture
CIA	Continuous Internal Assessment	T	Tutorial
PA	Progressive Assessment	P	Practical
EE	External Examination	SL	Term Work and Self Learning

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

Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech 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.)
				L	T	P	SL	Total		SEE Max	CIA Max	Max	Min	EE Max	PA Max	Max	Min		
1	PCC - II	PCC	3__201PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	PCC - III	PCC	3__202PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	PCC - IV	PCC	3__203PC1	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	PCC - II - Lab	PCC	3__206PC1	0	0	2	0	2	1					25	25	50	25	50	
7	PCC - III - Lab	PCC	3__207PC1	0	0	2	0	2	1					25	25	50	25	50	
8	PCC - IV - Lab	PCC	3__208PC1	0	0	2	0	2	1					25	25	50	25	50	
9	EEM - I	EEM	3__209EM1	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	3__400FP1	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) 27x15 = 405 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.

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.)
				L	T	P	SL	Total		SEE Max	CIA Max	Max	Min	EE Max	PA Max	Max	Min		
1	PCC - V	PCC	4__212PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	PCC - VI	PCC	4__213PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	PCC - VII	PCC	4__214PC1	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	PCC - VI - Lab	PCC	4__217PC1	0	0	2	0	2	1					25	25	50	25	50	
7	PCC - VII - Lab	PCC	4__218PC1	0	0	2	0	2	1					25	25	50	25	50	
8	VSC - II (PCC-V - Lab if needed)	VSC	4__219VS1	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	EC - 5 - I	EC	5__224EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
14	EC - 5 - II	EC	5__225EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
								OR											
15	Internship / Apprenticeship in Industry	EI	5__226EI1	0	0	16	0	288	8					100	100	200	100	200	
								OR											
16	Two MOOC/NPTEL Courses	EC	5__227OC_	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 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	Max	Max	Min	Max	Max	Max	Min		
1	PCC - VIII	PCC	5__228PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	PCC - IX	PCC	5__229PC1	3	1	0	4	8	4	60	40	100	40					100	3 Hrs.
3	PCC - X	PCC	5__230PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - I	PEC	5__231PE_	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	PCC - VIII - Lab	PCC	5__234PC1	0	0	2	0	2	1					25	25	50	25	50	
8	PCC - X - Lab	PCC	5__235PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - I - Lab	PEC	5__236PE_	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.

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	Max	Max	Min	Max	Max	Max	Min		
1	PCC - XI	PCC	6__239PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	PCC - XII	PCC	6__240PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	PCC - XIII	PCC	6__241PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Programme Elective Course - II	PEC	6__242PE_	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
5	Programme Elective Course - III	PEC	6__243PE_	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	PCC - XI - Lab	PCC	6__245PC1	0	0	2	0	2	1					25	25	50	25	50	
8	PCC - XII - Lab	PCC	6__246PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Programme Elective Course - II - Lab	PEC	6__247PE_	0	0	2	0	2	1					25	25	50	25	50	
10	Professional 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	EC - 5.5 - I	EC	7__250EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
13	EC - 5.5 - II	EC	7__251EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
								OR											
14	Internship / Apprenticeship in Industry	EI	7__252EI1	0	0	16	0	288	8					100	100	200	100	200	
								OR											
15	Two MOOC/NPTEL Courses	EC	7__253OC_	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 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	Max	Max	Min	Max	Max	Max	Min		
1	PCC - XIV	PCC	7__301PC1	2	0	0	2	4	2	30	20	50	20					50	3 Hrs.
2	PCC - XV	PCC	7__302PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
3	Programme Elective Course - IV	PEC	7__303PE_	2	0	0	2	4	2	30	20	50	40					50	3 Hrs.
4	Programme Elective Course - V	PEC	7__304PE_	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	PCC - XIV - Lab	PCC	7__306PC1	0	0	2	0	2	1					25	25	50	25	50	
7	PEC - IV - Lab	PEC	7__307PE_	0	0	2	0	2	1					25	25	50	25	50	
8	Research Methodology	RM	7__401RM1	2	0	4	2	8	4	30	20	50	20		50	50	25	100	2 Hrs.
9	Project	PR	7__402PR1	0	0	8	0	8	4					50	100	150	75	150	
Total				**14**	**0**	**16**	**14**	**44**	**22**			**400**				**300**		**700**	
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	7__403RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

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	Max	Max	Min	Max	Max	Max	Min		
1	PCC - XVI	PCC	8__309PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Programme Elective Course - VI(Online)*	PEC	8__310PE_	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	8__404IN1	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	8__405RP1	0	0	18	0	18	9	0	0	0	0	100	100	200	100	200	

* - Can be considered for MOOCS/NPTEL courses. 8__310OC_

13.1 List of VSC/ IKS/ PCC

Following Courses are related to major discipline offered by respective programme.
Vocational & Skill Enhancement Courses offered in Semester I/II

Sr. No.	Courses Offered by	Course/ Subject Name	Course Code
1	Chemical Engineering	Chemical Engineering Processes	1CH109VS1
2	Civil Engineering	MS Excel for Civil Engineering	1CE109VS1
3	Computer Science Engineering	Introduction to Web Technology	1CS109VS1
4	Electrical Engineering	Electronics Technology	1EE109VS1
5	Electronics & Telecommunication Engineering	Electronic Workshop	1ET109VS1
6	Mechanical Engineering	Computer Aided Drafting with CATIA	1ME109VS1
7	Textile Engineering	Fashion Designing	1TX109VS1

Programme Core Courses offered in Semester I/II

Sr. No.	Courses Offered by	Course/ Subject Name	Course Code
1	Chemical Engineering	Elements of Chemical Engineering	2CH116PC1
2	Civil Engineering	Basics of Civil Engineering & Building Construction	2CE116PC1
3	Computer Science Engineering	AI Fundamentals	2CS116PC1
4	Electrical Engineering	Electrical Technology	2EE116PC1
5	Electronics & Telecommunication Engineering	Introduction to Digital Logic	2ET116PC1
6	Mechanical Engineering	Elements of Mechanical Engineering	2ME116PC1
7	Textile Engineering	Textile Materials and products	2TX116PC1

Indian Knowledge System Courses offered in Semester I/II

Sr. No.	Courses Offered by	Course/ Subject Name	Course Code
1	Chemical Engineering	Traditional Indian Chemical Engineering Practices	2CH117IK1
2	Civil Engineering	Fundamentals of Vastushastra	2CE117IK1
3	Computer Science Engineering	Indian Knowledge Systems for Computer Applications	2CS117IK1
4	Electrical Engineering	Origin and pioneers of *Vidyut Shastra*	2EE117IK1
5	Electronics & Telecommunication Engineering	Indian Knowledge System (IKS) in Electronics & Telecommunication	2ET117IK1
6	Mechanical Engineering	Indian heritage in Mechanical Engineering	2ME117IK1
7	Textile Engineering	Cultural Aesthetics in Indian Textile Design	2TX117IK1

Exit Option Courses offered after First Year

Sr. No.	Courses Offered by	Exit Option Course/Subject Name	Course Code
1	Chemical Engineering	Material and Energy Balances	3CH123EC1
2		Numerical Methods in Chemical Engineering	3CH124EC1
3	Civil Engineering	Site Supervision and Surveying	3CE123EC1
4		Bar Bending Schedule and material Testing	3CE124EC1
5	Computer Science Engineering	Digital Literacy and Office Automation	3CS123EC1
6		Hardware Maintenance & Networking	3CS124EC1
7	Electrical Engineering	Electrification of building	3EE123EC1
8		Repairing and maintenance of domestic applications	3EE124EC1
9	Electronics & Telecommunication Engineering	Electronics Servicing and Maintenance	3ET123EC1
10		Assembly & Maintenance of Personal Computer	3ET124EC1
11	Mechanical Engineering	Hands on Training on Welding & Joining Technology	3ME123EC1

12		Hands on Training on Forming Processes	3ME124EC1
13	Textile Engineering	Testing of Textile Materials	3TX123EC1
14		Fabric and Garment inspection	3TX124EC1

13.2 List of courses for Multidisciplinary Minor(14 Credits)

Multidisciplinary Minor of 14 credits is an integral part of four-year multidisciplinary undergraduate B. Tech. Degree Programme. Student has to decide a discipline for Multidisciplinary minor from other than Major Discipline in which student has take admission and will have to undergo track of department specific courses offered as follows.

Sr. No.	Multidisciplinary Minor in	Semester	Course/Subjects Name	Course Code
1	Chemical Engineering	III	Environmental Pollution: Policies and Regulations	3CH204MD1
2		IV	Air Pollution and Control	4CH215MD1
3		V	Chemical Processes For Liquid Waste Management	5CH232MD1
4			Chemical Processes For Liquid Waste Management Lab.	5CH237MD1
5		VI	Chemical Processes For Solid Waste Management	6CH244MD1
6		VII	Environmental Impact & Risk Assessment	7CH305MD1
7		VIII	Advance Methods of Industrial Waste Treatment	8CH311MD1

Sr. No.	Multidisciplinary Minor in	Semester	Course/Subjects Name	Course Code
1	Civil Engineering	III	Basic Civil Engineering	3CE204MD1
2		IV	Surveying	4CE215MD1
3		V	Building Construction & Materials	5CE232MD1
4			Building Construction & Materials - Lab	5CE237MD1
5		VI	Building Planning & Drawing	6CE244MD1
6		VII	Estimating and Costing	7CE305MD1
7		VIII	Land & Building Documents	8CE311MD1

Sr. No.	Multidisciplinary Minor in	Semester	Course/Subjects Name	Course Code
1	Computer Science Engineering	III	Operating System	3CS204MD1
2		IV	Computer Architecture & Organization	4CS215MD1
3		V	Database Management System	5CS232MD1
4			Database Management System Lab	5CS237MD1
5		VI	IoT Systems Design & Development	6CS244MD1
6		VII	Basics of Software Engineering	7CS305MD1
7		VIII	AI Systems & Applications	8CS311MD1

Sr. No.	Multidisciplinary Minor in	Semester	Course/Subjects Name	Course Code
1	Electrical Engineering	III	Electrical Energy Generation	3EE204MD1
2		IV	Renewable Energy Systems	4EE215MD1
3		V	Electrical Machines	5EE232MD1
4			Electrical Machines- Lab	5EE237MD1
5		VI	Introduction to Electric Vehicle	6EE244MD1
6		VII	Energy Audit and its Management	7EE305MD1
7		VIII	Power System Protection	8EE311MD1

Sr. No.	Multidisciplinary Minor in	Semester	Course/Subjects Name	Course Code
1	Electronics & Telecommunication Engineering	III	Principles of Electronics	3ET204MD1
2		IV	Digital Electronics	4ET215MD1
3		V	Microcontroller & Applications	5ET232MD1
4			Microcontroller & Applications Lab	5ET237MD1
5		VI	Analog Communication	6ET244MD1
6		VII	Digital Communication	7ET305MD1
7		VIII	Wireless Communication	8ET311MD1

Sr. No.	Multidisciplinary Minor in	Semester	Course/Subjects Name	Course Code
1	Mechanical Engineering	III	Foundation of Mechanical Engineering	3ME204MD1
2		IV	Green Power Technologies	4ME215MD1
3		V	Fluid Dynamics	5ME232MD1
4			Fluid Dynamics- Lab	5ME237MD1
5		VI	Project Design & Implementation Strategies	6ME244MD1
6		VII	Energy Conservation in Thermal Equipments	7ME305MD1
7		VIII	Computer Integrated Manufacturing	8ME311MD1

Sr. No.	Multidisciplinary Minor in	Semester	Course/Subjects Name	Course Code
1	Textile Engineering	III	Introduction to Fashion Designing	3TX204MD1
2		IV	Garment Pattern Designing	4TX215MD1
3		V	Apparel Manufacturing Technology	5TX232MD1
4			Appeal Manufacturing Technology- Lab	5TX237MD1
5		VI	Fashion Marketing	6TX244MD1
6		VII	Fashion Forecasting and Management	7TX305MD1
7		VIII	Sustainable Practices In Fashion Industry	8TX311MD1

13.3 Baskets for Open Elective Courses

The Open Elective courses will be offered by different faculty. Student will have an option to choose Open Elective courses offered by other than Major Discipline in the respective semester mentioned in the curriculum structure.

Open Elective Courses offered

Sr. No.	Courses Offered by	Open Elective Course/Subjects Name	Course Code
1	Humanities	Soft Skills & Profile Building	3SH205OE1
2		Team Building & Management	3SH205OE2
3		Quantitative and Logical Reasoning	4SH216OE1
4		Critical Thinking & Decision Making	4SH216OE2
5		Advance Business Communication	5SH233OE1
6		Corporate Social Responsibility	5SH233OE2

13.4 List of Double Minor / Honours

A. Following Double Minor and Honours will be offered in emerging / multidisciplinary areas.

Sr. No.	Double Minor / Honours	To be offered as Hons., Only for following Major Disciplines (For any other Major Disciplines which is not mentioned, it may be offered as Double Minor)
1	Smart Cities	Civil Engineering
		Electronics and Telecommunication Engineering
2	Mechanical, Electrical & Plumbing (MEP)	Civil Engineering
		Mechanical Engineering
		Electrical Engineering
3	Biofuels Technology	Chemical Engineering
4	Chemical Process Safety	Chemical Engineering
5	Cyber Security	Computer Science & Engineering
		Electronics & Telecommunication Engineering
6	Software Engineering	Computer Science & Engineering
7	Microgrid Technologies	Electrical Engineering
8	Electrical Vehicle	Electrical Engineering
		Mechanical Engineering
9	AI & Machine Learning	Electronics & Telecommunication Engineering
		Computer Science & Engineering
10	VLSI Design & Technology	Electronics & Telecommunication Engineering
11	Robotics	Mechanical Engineering
12	Energy Engineering	Mechanical Engineering
13	Smart Textile and Wearable Technologies	Textile Engineering
14	Technical Textiles	Textile Engineering

B. List of Courses offered under Double Minor and Honors Degree

Sr. No.	Double Minor / Honours	Semester	Course/Subjects Name	Course Code
1	Biofuels Technology	III	Biofuels- Types and Applications	3CH211DH1
2		IV	Biogas- Production Process Engineering	4CH223DH1
3		V	Biodiesel- Production Process Engineering	5CH238DH1
4		VI	Hydrogen- Production Process Engineering	6CH249DH1
5		VII	Biofuels – Indian and Global Scenario	7CH308DH1

Sr. No.	Double Minor / Honours	Semester	Course/Subjects Name	Course Code
1	Chemical Process Safety	III	Industrial Hygiene and Occupational Health	3CH211DH2
2		IV	Fire Safety and Explosion Control	4CH223DH2
3		V	EHS Management and Control	5CH238DH2
4		VI	Safety in Petroleum Industry	6CH249DH2
5		VII	Chemical and Process Safety Management	7CH308DH2

Sr. No.	Double Minor / Honours	Semester	Course/Subjects Name	Course Code
1	Smart Cities	III	Smart Cities and Urban innovation	3CE211DH1
2		IV	Smart city Infrastructure & Digital Integration	4CE223DH1
3		V	Smart Mobility and Transportation System	5CE238DH1
4		VI	Green Technology	6CE249DH1
5		VII	Management & Policies for Smart City	7CE308DH1

Sr. No.	Double Minor / Honours	Semester	Course/Subjects Name	Course Code
1	Mechanical, Electrical & Plumbing (MEP)	III	Basics of HVAC System	3CE211DH2
2		IV	Electrical System in Building	4CE223DH2
3		V	Plumbing & Water Supply System	5CE238DH2
4		VI	Application of BIM in MEP	6CE249DH2
5		VII	Building Management System	7CE308DH2

Sr. No.	Double Minor / Honours	Semester	Course/Subjects Name	Course Code
1	Cyber Security	III	Network Security	3CS211DH1
2		IV	Intrusion Detection & Prevention System	4CS223DH1
3		V	Basics of Ethical Hacking	5CS238DH1
4		VI	Vulnerability Assessment &Penetration Testing	6CS249DH1
5		VII	Cyber Security: Risk Management	7CS308DH1

Sr. No.	Double Minor / Honours	Semester	Course/Subjects Name	Course Code
1	Software Engineering	III	System Design	3CS211DH2
2		IV	Software Testing	4CS223DH2
3		V	Information Retrieval	5CS238DH2
4		VI	Computer Vision	6CS249DH2
5		VII	Bio-inspired Intelligent System	7CS308DH2

Sr. No.	Double Minor /Honours	Semester	Course/Subjects Name	Course Code
1	Microgrid Technologies	III	Futuristic Power Systems	3EE211DH1
2		IV	Microgrid Engineering	4EE223DH1
3		V	Microgrid Power and Control Architecture	5EE238DH1
4		VI	Power Electronic Converters for Energy Sources	6EE249DH1
5		VII	Microgrid System Design	7EE308DH1

Sr. No.	Double Minor /Honours	Semester	Course/Subjects Name	Course Code
1	Electrical Vehicle	III	Fundamentals of EV's: Technology & Economics	3EE211DH2
2		IV	Automotive Engineering and Electric Vehicle Systems	4EE223DH2
3		V	Battery Management Systems	5EE238DH2
4		VI	EV Drive and Energy Sources	6EE249DH2
5		VII	Electric Vehicle System Design	7EE308DH2

Sr. No.	Double Minor / Honours	Semester	Course/Subjects Name	Course Code
1	AI & Machine Learning	III	Fundamentals of Artificial Intelligence	3ET211DH1
2		IV	Introduction to Machine Learning	4ET223DH1
3		V	Artificial Neural Networks and Deep Learning Basics	5ET238DH1
4		VI	AI Applications in Electronics & Daily Life	6ET249DH1
5		VII	Generative AI, Ethics and Emerging Technologies	7ET308DH1

Sr. No.	Double Minor/ Honours	Semester	Course/Subjects Name	Course Code
1	VLSI Design & Technology	III	Solid State Electronics for VLSI	3ET211DH2
2		IV	VLSI Design Fundamentals	4ET223DH2
3		V	VLSI Technology & Fabrication	5ET238DH2
4		VI	FPGA Based System design Using Verilog	6ET249DH2
5		VII	Analog IC design	7ET308DH2

Sr. No.	Double Minor/ Honours	Semester	Course/Subjects Name	Course Code
1	Robotics	III	Principles of Robotics	3ME211DH1
2		IV	Robotics and Automation	4ME223DH1
3		V	Industrial Automation	5ME238DH1
4		VI	Robot Programming and Simulation	6ME249DH1
5		VII	Advance Applications of Robotics	7ME308DH1

Sr. No.	Double Minor/ Honours	Semester	Course/Subjects Name	Course Code
1	Energy Engineering	III	Energy Resource, Environment and Economics	3ME211DH2
2		IV	Fuels and Combustion	4ME223DH2
3		V	Power Generation and Systems Planning	5ME238DH2
4		VI	Energy Management	6ME249DH2
5		VII	Steam and Gas Turbines	7ME308DH2

Sr. No.	Double Minor / Honours	Semester	Course/Subjects Name	Course Code
1	Smart Textile and Wearable Technologies	III	Introduction to Smart Textiles	3TX211DH1
2		IV	Sensors and E-Textiles	4TX223DH1
3		V	Wearable Devices	5TX238DH1
4		VI	Advanced Materials for Smart Textiles	6TX249DH1
5		VII	Textile IoT and Industry 5.0 Applications	7TX308DH1

Sr. No.	Double Minor / Honours	Semester	Course/Subjects Name	Course Code
1	Technical Textiles	III	Geo and Agro Textiles	3TX211DH2
2		IV	Industrial Automotive Textiles	4TX223DH2
3		V	Sports & Performance Textiles	5TX238DH2
4		VI	Medical Textiles	6TX249DH2
5		VII	Smart & E-Textiles	7TX308DH2

14. Syllabus for First Year

14.1 Syllabus for compulsory basic science and engineering science

Level: **4.5**	Course Code: **1SH101BS1**		Course Category: **BSC**		
Course Name	**Mathematics-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 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 1SH101BS1 Mathematics-I is a compulsory Basic Science Course for First Year B. Tech. and common for all branches.

Course Objectives:
The objective of this course is to identify algebraic problems and differential equations of different types and applying these concepts to formulate and solve engineering problems.

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

CO	Course Outcome	Domain Level
1SH101BS1.1	Apply successive differentiation and series expansion techniques to evaluate single-variable functions.	C-3
1SH101BS1.2	Determine partial derivatives and apply Euler's theorem to multivariable functions.	C-3
1SH101BS1.3	Apply concept of Maxima and Minima to get the solution of various engineering problems.	C-3
1SH101BS1.4	Solve first-order, first-degree DEs using separable, homogeneous, and substitution methods.	C-3
1SH101BS1.5	Solve differential equations (Exact, Linear and Clairaut's DE) relating to various engineering problems.	C-3
1SH101BS1.6	Examine the convergence or divergence of series using standard convergence tests.	C-3

Course Contents:

Unit 1	**Ordinary Differentiation:** Successive differentiation, Leibnitz's Theorem, Taylor's and Maclaurin's series for a function of single variable.	7 Hrs
Unit 2	**Partial Differentiation:** Functions of several variables, First and higher order partial derivatives, Homogeneous Functions, Euler's Theorem and it's	7 Hrs

	deductions, Total differential coefficient.	
Unit 3	**Applications of Differentiation:** Maxima and minima for a function of two variables, Maxima and minima for a function of several variables (Lagrange's method of un-determined multipliers).	7 Hrs
Unit 4	**Ordinary Differential Equation of 1st order & 1st Degree:** Separable differential equation, Homogeneous and reducible to Homogeneous differential equation, Method of Substitution.	8 Hrs
Unit 5	**Ordinary Differential Equation of 1st order & 1st Degree:** Exact and Non-Exact differential equation, Linear and reducible to Linear differential equation, Clairaut's equation and equations reducible to Clairaut's form.	8 Hrs
Unit 6	**Sequence and Series:** Convergence and divergence of series by P-series test, Comparison test, D'Alembert's Ratio test, Raabe's test, Cauchy's root test.	8 Hrs

Text Books:
1. Wartikar P.N. ,Wartikar J.N., A text of applied Mathematics, Volume I, II, V.G. Prakashan, Pune.
2. Grewal B. S., Higher Engineering Mathematics, (latest Edition), Khanna Publishers.
3. Ramana B. V., Higher Engineering Mathematics, (TMH).
4. Singh R.R. and Bhatt M., Higher Engineering Mathematics, (TMH).

Reference Books:
1. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
2. H. K. Das, Advanced Engineering Mathematics (S. Chand Publication).
3. Veera Rajan T., Engineering mathematics for first year, (TMH).

E-Resources:
1. https://archive.nptel.ac.in/courses/111/105/111105121/
2. https://archive.nptel.ac.in/courses/122/104/122104017/
3. https://en.wikipedia.org/wiki/Differential_equation
4. https://en.wikipedia.org/wiki/Series_ (mathematics)

Mapping of COs with POs:

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1SH101BS1.1	3	2	-	-	-	-	-	-	-	-	-
1SH101BS1.2	3	3	-	-	-	-	-	-	-	-	-
1SH101BS1.3	3	3	-	1	-	-	-	-	-	-	-
1SH101BS1.4	3	3	-	1	-	-	-	-	-	-	-
1SH101BS1.5	3	3	-	1	-	-	-	-	-	-	-
1SH101BS1.6	3	3	-	-	-	-	-	-	-	-	-

1SH101BSCO	3	3	-	1	-	-	-	-	-	-	-	-

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

Level: **4.5**	Course Code: **1SH102BS1**		Course Category: **BSC**		
Course Name	**Applied Physics**				
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 1SH102BS1 Applied Physics is a compulsory Basic Science Course for First Year B. Tech. and common for all branches.

Course Objectives:
The objective of this course is to enable the students to correlate the theoretical principles & fundamentals of modern aspects in physics with application-oriented studies of engineering.

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

CO	Course Outcome	Domain Level
1SH102BS1.1	Apply the solid state theory to semiconductor devices for study V-I Characteristics & applications.	C-3
1SH102BS1.2	Apply concepts of quantum physics in various quantum effects.	C-3
1SH102BS1.3	Examine the effect of electron motion in electric & magnetic fields for solving problems related electronics circuits & electromagnetic interface.	C-4
1SH102BS1.4	Apply the principles of interference, diffraction and grating to solve optics problems.	C-3
1SH102BS1.5	Apply the principle of optical fibre & laser in optical communication.	C-3
1SH102BS1.6	Examine the concept of fluid flow, ultrasonics wave generation and acoustics principle in computational fluid dynamics.	C-4

Course Contents:

Unit 1	**Solid State Physics:** Classification of solids on the basis of energy band structure, Femi-Dirac distribution function, Fermi level in intrinsic & extrinsic semiconductor, P-N junction diode, Zener diode, Light emitting diode, Hall effect.	8 Hrs
Unit 2	**Modern Physics:** Compton effect & Compton shift derivation, debroglie hyphothesis of matter waves, Heisenbergs uncertainty principle & its applications, time-energy uncertainty relation	7 Hrs
Unit 3	**Electric and Magnetic Fields:** Motion of electron in uniform transverse electric field and transverse magnetic fields, positive rays, Bainbridge mass spectrograph, Cathode ray oscilloscope: block diagram and working of each block.	7 Hrs
Unit 4	**Optics:** Thin film interference due to reflected light, Newton's ring; equation for radius of bright and dark rings, determination of wavelength, R.I. of medium using Newton's ring. Fresnel and Fraunhoffer class of diffraction, plane transmission grating; construction and determination of wavelength of light using grating.	8 Hrs
Unit 5	**Fiber Optics and LASER:** Principle, construction & applications of optical fiber, acceptance angle and acceptance cone numerical aperture, attenuation in optical fiber, different mechanisms of attenuation. **LASER**: Characteristics, principle & applications of LASER, Ruby LASER (Construction and Working	7 Hrs
Unit 6	**Fluid dynamics, Ultrasonic and Acoustics:** Streamline and turbulent flow, Viscosity, Continuity equation, Bernoulli's theorem (derivation) Stokes law, Production of Ultrasonic waves (piezo-electric and magnetostriction methods), applications of ultrasonic waves, Factors affecting architectural acoustics, Sabine formula for reverberation of time.	8 Hrs

Text Books:

1. M. N. Avadhannulu & P. G. Kshirsagar, A textbook of Engineering Physics, S. Chand Publication.
2. Dattu R. Joshi, A Textbook of Engineering Physics, Mc Graw Hill publication.
3. Dr.(Mrs.) S. D. Wakde,& J. S. Bakare, A Textbook of Engineering Physics SSGMCE publication.

Reference Books:

1. R. K. Gaur & S. L. Gupta , A Textbook of Engineering Physics Dhanpat Rai & Sons.
2. Hitendra K. Malik & A. K. Singh, A Textbook of Engineering Physics Tata McGraw Hill Education private Limited.
3. Beiser, A Textbook of Modern Physics, Tata McGraw Hill.
4. Mani & Mehta, A Textbook of Modern Physics, Affiliated
5. East-West Press
6. N. Subrahmanyam, Brijlal, M. N. Avadhanulu, A Textbook of Optics S.Chand & Company Ltd.

E- Resources:

1. nptel.ac.in/courses/115102014https://share.google/NPrU7YSaYJ2Q vrnx
2. nptel.ac.in/courses/115101639https://share.google/uxm3ItCIjgYlgdwMP
3. nptel.ac.in/courses/115103134https://share.google/iIoBahXkmgfH0WE5
4. nptel.ac.in/courses/115104109https://share.google/ozvtMIi5BzXDLJdZD

Mapping of COs with POs:

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1SH102BS1.1	3	3	-	3	-	-	-	-	-	-	-
1SH102BS1.2	3	1	-	1	-	-	-	-	-	-	-
1SH102BS1.3	3	3	-	3	-	-	-	-	-	-	-
1SH102BS1.4	3	3	-	2	-	-	-	-	-	-	-
1SH102BS1.5	3	2	-	2	-	-	-	-	-	-	-
1SH102BS1.6	3	1	-	1	-	-	-	-	-	-	-
1SH102BS1CO	3	2	-	2	-	-	-	-	-	-	-

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

Level:	**4.5**	Course Code:	**1SH105BS1**	Course Category:	**BSC**
Course Name	**Applied Physics 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 1SH105BS1 Applied Physics Lab is a compulsory Basic Science Course for First Year B. Tech. and common for all branches.

Course Objectives:
The course objective is to demonstrate practical knowledge of basics and applications oriented studies of applied physics.

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

CO	Course Outcome	Domain Level
1SH105BS1.1	Apply the principles of optics, semiconductor and electromagnetism through hands on experiment to understand fundamental physics concept.	C-3
1SH105BS1.2	Participate & demonstrate efficiency as an individual or in a team to perform experiment maintain scientific record and calculate findings clearly in lab manual.	C-3, P-4 & A-2
1SH105BS1.3	Demonstrate the ability to use modern instruments such as Laser, CRO, Spectrometer & semiconductor devices for experimental investigation.	C-3 & P-5

List of Practical:
Minimum Eight Practical from the list mentioned below.
1. Determination of Band gap energy of semiconductor.
2. To study the forward and reverse characteristics of P-N junction diode.
3. To study the forward and reverse characteristics of Zener diode.
4. To study the forward characteristics of Light Emitting Diode.
5. To determine the wavelength of monochromatic light by Newton's Ring experiment.
6. Determination of wavelength of spectral lines using plane diffraction grating.
7. Determination of grating element of a diffraction grating using LASER beam.

8. Study of Hall Effect.
9. Study of CRO.
10. Determination of Planck's constant using photocell

E-resources:

1. https://be-iitkgp.vlabs.ac.in/exp/characteristics-diode/index.html
2. https://be-iitkgp.vlabs.ac.in/exp/voltage-regulator/procedure.html
3. https://oc-iitr.vlabs.ac.in/exp/characterization-led/index.html

Mapping of COs with POs:

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1SH105BS1.1	3	2	-	2	-	-	2	2	2	-	-
1SH105BS1.2	3	3	-	2	-	-	3	3	2	-	-
1SH105BS1.3	3	2	-	2	-	-	2	3	2	-	-
1SH105BS1CO	3	2	-	2	-	-	2	3	2	-	-

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

Level: **4.5**	Course Code: **1CS103ES1**			Course Category: **ESC**	
Course Name	**Programming for Problem Solving**				
Credits	**03**	Total L:T:P Hours	3:0:0 **45 Hrs**	Total SL Hours	**03** **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 1CS103ES1 Programming for Problem Solving is a compulsory Engineering Science Course for First Year B. Tech and common for all branches.

Course Objectives:
To introduce the fundamentals of computers and programming languages with emphasis on structured and procedural programming, to develop algorithmic thinking and logical reasoning for solving computational problems, to familiarize students with basic programming constructs.

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

CO	Course Outcome	Domain Level
1CS103ES1.1	Explain the proficiency in basic c programming to develop user friendly applications.	C-2
1CS103ES1.2	Use the control structures for decision making and looping	C-3
1CS103ES1.3	Illustrate arrays effectively for handing data structures.	C-3
1CS103ES1.4	Use handle strings in programming effectively for sorting & searching algorithms.	C-3
1CS103ES1.5	Debug and resolve performance bottlenecks in a program by applying principles of function and pointer optimization.	C-3
1CS103ES1.6	Apply structures to organize data and perform file operations effectively.	C-3

Course Contents:

Unit 1	**Fundamentals of Programming in C:** Introduction, Importance of C, Basic Structure of C Program, Executing a C Program, Character Set, C Tokens, Keywords, Identifiers, Constants and Variables, Data Types, Operators, Basic Input and Output Operations, Expressions and Precedence of Operators, In-built Functions	7 Hrs
Unit 2	**Decision Making, Branching, and Looping:** Introduction, Decision Making with If Statement, Simple If Statement, Nesting of If...Else Statements, Else If Ladder, ?: Operator, Goto Statement, While Statement, Do Statement,	7 Hrs

	For Statement, Jumps in Loops, Concise Test Expressions	
Unit 3	**Arrays:** Introduction to Arrays, One-Dimensional Arrays, Two-Dimensional Arrays, Multi-Dimensional Arrays, Example Programs Using Arrays	7 Hrs
Unit 4	**Strings:** Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, String-handling Functions, Example Programs (with and without using built-in string functions)	8 Hrs
Unit 5	**Functions & Pointers:** Introduction to Functions, Need for User-Defined Functions, A Multi-Function Program, Elements of User-Defined Functions, Definition of Functions, Return Values and their Types, Function Calls, Function Declaration, Category of Functions, Recursion, Introduction to Pointers, Declaring Pointer Variables, Initialization of Pointer Variables, Accessing a Variable through its Pointer, Pointer Expressions, Pointer Increments, and Scale Factor	8 Hrs
Unit 6	**Structures, Unions, and File Management:** Defining a Structure, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Arrays of Structures, Unions and Structures, Introduction to Files, Defining and Opening a File, Closing a File, Input / output and Error Handling on Files.	8 Hrs

Text Books:

1. Programming in ANSI C E. Balaguruswamy, McGraw-Hill
2. Mastering C - K R Venugopal, S R Prasad Publisher: McGraw Hill

Reference Books:

1. The ABC of C - Demystify C: Scan Code Learn - Harkut, Kasat & Shah, Publisher: Notion Press, India.
2. The C Programming Language, Kernighan , Ritchie Prentice Hall of India
3. Computer Fundamentals & Programming in C- Pradeep Dey and Manas Ghosh Oxford University Press, 2006

E Resources :

1. The C Programming Language – 2nd Edition by Brian Kernighan & Dennis Ritchie
   Link:https://seriouscomputerist.atariverse.com/media/pdf/book/C%20Programming%20Language%20-202nd%20Edition%20%28OCR%29.pdf?utm_source=chatgpt.com
2. Computer Fundamentals and Programming in C by Reema Thareja (Internet Archive) Link:
   https://archive.org/details/cp_20230112?utm_source=chatgpt.com

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1CS103ES1.1	3	2	2	-	2	-	-	-	1	-	-
1CS103ES1.2	3	3	2	-	2	-	-	-	-	-	-
1CS103ES1.3	3	2	2	-	2	-	-	-	-	-	-
1CS103ES1.4	3	3	2	2	3	-	-	-	-	-	-
1CS103ES1.5	3	3	2	2	3	-	-	-	1	-	-
1CS103ES1.6	3	3	2	2	3	1	-	-	1	-	-
1CS103ES1CO	3	3	2	1	3	0	-	-	1	-	-

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

Level: **4.5**	Course Code: **1CS106ES1**			Course Category: **ESC**	
Course Name	**Programming For Problem Solving 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 1CS106ES1 Programming for Problem Solving Lab is a compulsory Program Core Course for First Year B.Tech. and common to all branches.

Course Objectives:
The objective of the course is to develop problem-solving skills through the design and implementation of algorithms using a programming language (typically C), to provide hands-on experience with writing, compiling, debugging, and executing basic programs.

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

CO	**Course Outcome**	**Domain Level**
1CS106ES1.1	Apply fundamental programming concepts and control structures , respond to coding skills through simple problem-solving tasks and discuss confidence and curiosity toward structured programming .	C-3, P-3, A-2
1CS106ES1.2	Apply arrays, strings, and pointers to develop programs, perform debugging, and ensure precision and consistency in program design.	C-3, P-3
1CS106ES1.3	Apply functions, structures and file operations, to develop modular programs, perform testing and documentation and demonstrate responsibly, teamwork, and professional ethics in solving computational problems.	C-3, P-4, A-3

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

1. Write a program to convert temperature from degree Celsius to Fahrenheit.
2. Write a program to display sum of 4 digit numbers using while, do-while and for loop.
3. Write a program to display transpose of 3*3 matrix.
4. Write a program to find factorial of a number using function.
5. Write a program to find the square root of a number using sqrt() function.
6. Write a program to implement string handling functions.
7. Write a program to accept five student details and print the same using structure.
8. Write a program to implement File handling functions.
9. Execute program on Control flow for all looping statements using virtual lab.
10. Execute program on basic Control flow using virtual lab.
11. Execute program using Functions on virtual lab.
12. Execute program on Pointer using virtual lab.

E Resources:
1. Introduction to Programming in C By Prof. Satyadev Nandakumar, IIT Kanpur, Link: https://onlinecourses.nptel.ac.in/noc25_cs119/preview
2. C Programming and Assembly Language – Swayam (IIT Madras, Prof. Janakiraman Viraraghavan) Link: https://nptel.ac.in/courses/106106210
3. Virtual Lab IIIT Hydrabad, Link: https:// https://cse02-iiith.vlabs.ac.in

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1CS106ES1.1	3	3	2	2	2	1	-	-	-	1	1
1CS106ES1.2	3	3	3	2	2	1	-	-	-	1	1
1CS106ES1.3	3	3	3	2	2	1	-	1	1	1	-
1CS106ES1CO	3	3	3	2	2	1	-	0	0	1	1

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

Level: **4.5**	Course Code: **1CE104ES1**			Course Category: **ESC**	
Course Name	**Engineering Mechanics**				
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 1CE104ES1 Engineering Mechanics is a compulsory Engineering Science Course for First Year B. Tech and common for all branches.

Course Objectives:
The objective of this course is to present the basic principles of static and dynamics and help develop proficiency in applying these principles to formulate and solve problems.

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

CO	Course Outcome	Domain Level
1CE104ES1.1	Apply law of mechanics to resolve and analyse forces acting on particle and rigid bodies	C-3
1CE104ES1.2	Determine support reactions, internal forces, and equilibrium conditions for trusses and beams.	C-3
1CE104ES1.3	Calculate frictional forces for simple contact, wedges and belt friction.	C-3
1CE104ES1.4	Calculate centroid and moment of inertia of a plane figure	C-3
1CE104ES1.5	Solve problems in kinematics of particles and rigid bodies using displacement, velocity and acceleration relation	C-3
1CE104ES1.6	Apply Newton's Law, Work Energy and impulse-momentum principles to solve problems in kinetics of particles.	C-3

Course Contents:

Unit 1	**Resultant:** Concept of a force, force systems, moment, couple, resolution and compositions of coplanar force system.	9 Hrs

	Equilibrium: Free-body diagrams, equations of equilibrium, problems of equilibrium involving co-planar force system acting on a particle, rigid body and system of rigid bodies.	
Unit 2	**Beams:** Types of beams, supports, loads and support reactions. **Trusses:** Definitions, assumptions, types, Analysis of simple plane perfect trusses by method of joints and method of section.	7 Hrs
Unit 3	**Friction:** Definitions of friction, types, angle of friction, angle of repose, cone of friction, Coulomb's laws of friction, wedge friction and belt friction.	7 Hrs
Unit 4	**Centroid and Moment of Inertia:** Centroid, First Moment of Area, Problem on Centroid of composite sections, Second Moment of Area, Radius of Gyration, product of inertia, perpendicular and parallel axis theorem, polar moment of inertia, radius of gyration, Definition of principal axes and principal moment of inertia.	8 Hrs
Unit 5	**Kinematics:** Definitions of displacement, velocity and acceleration and their relations, rectilinear motion under variable & constant accelerations, curvilinear motion using rectangular coordinates, normal and tangential components.	7 Hrs
Unit 6	**Kinetics:** Application of D'Alembert's Principle, concept of dynamic equilibrium, Work-Energy Equation, Impulse-Momentum Equation to the bodies in motion.	7 Hrs

Text Books:

1. Bhattacharyya Basudeb, Engineering Mechanics, Oxford University Press.
2. Bhavikatti, S. S. and Rajashekarappa, K. G., Engineering Mechanics, New Age International Publishers, New Delhi.

Reference Books:

1. Singer, F. L., Engineering Mechanics, Harper Collins Pub., Singapore
2. Timoshenko, S. P. and Young, D. H., Engineering Mechanics, McGraw-Hill International C., Auckland.
3. Beer, F. P. and Johnston, E. R., Vector Mechanics for Engineers, McGraw-Hill International C., Auckland.
4. Shames, I. H., Engineering Mechanics, P.H.I. Pvt. Ltd., New Delhi.

E Resources:

1. NPTEL Course on Mechanics By Prof. Anjani Kumar Tiwari IIT Roorkee https://onlinecourses.nptel.ac.in/noc24_me148

2. NPTEL Course on Engineering Mechanics by Prof. K. Ramesh IIT Madras https://onlinecourses.nptel.ac.in/noc21_me70
3. Engineering Mechanics: Statics https://www.udemy.com/course/engineering-mechanics-statics/?couponCode=MT180825C

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1CE104ES1.1	3	2	-	-	-	-	-	-	-	-	-
1CE104ES1.2	3	1	-	-	-	-	-	-	-	-	-
1CE104ES1.3	3	1	-	-	-	-	-	-	-	-	-
1CE104ES1.4	3	1	-	-	-	-	-	-	-	-	-
1CE104ES1.5	3	1	-	-	-	-	-	-	-	-	-
1CE104ES1.6	3	1	-	-	-	-	-	-	-	-	-
1CE104ES1CO	3	1	-	-	-	-	-	-	-	-	-

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

Level: **4.5**	Course Code: **1CE107ES1**			Course Category: **ESC**	
Course Name	**Engineering Mechanics 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 1CE107ES1 Engineering Mechanics Lab is a compulsory Engineering Science Course for First Year B. Tech and common for all branches.

Course Objectives:
The objective of this course is to perform practicals on the concepts of Engineering Mechanics and working of Lifting Machines.

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

CO	Course Outcome	Domain Level
1CE107ES1.1	Demonstrate ability to perform experiments related to equilibrium of forces, friction and simple machines.	C-3 & P-5
1CE107ES1.2	Demonstrate the proper use of laboratory equipment to gather experimental data related to theoretical concepts in engineering mechanics	C-3
1CE107ES1.3	Participate in a team to demonstrate, perform and present laboratory experiments with appropriate documentation.	C-3, P-4 & A-2

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Study of two graphical solutions to the problems of statics.
2. Study of Polygon Law of forces
3. Determination of reactions at the supports of simple beam.
4. Study of forces in members of Jib crane.
5. Determination of coefficient of friction on inclined plane.
6. Determination of Coefficient of coil friction.
7. Determination of law of machine for screw jack/differential axle wheel /single and double purchase crab (for any two machines).
8. Determination of mass moment of inertia of fly wheel.
9. Determination of gravitational acceleration by compound pendulum.

E Resources:

1. LearnChemE Simulations: Browser-based statics modules for vector and truss analysis. https://learncheme.com/simulations/statics-simulations/
2. VLSM: Ideal for statics—including force systems, truss analysis, and friction. https://www.ae.msstate.edu/vlsm

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1CE107ES1.1	3	1	-	2	-	-	-	3	2	-	-
1CE107ES1.2	3	1	-	-	-	-	-	-	-	-	-
1CE107ES1.3	3	1	-	1	-	-	-	3	3	-	-
1CE107ES1CO	3	1	-	1	-	-	-	2	2	-	-

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

Level: **4.5**	Course Code: **1ME108ES1**		Course Category: **ESC**		
Course Name	**Workshop**				
Credits	**1**	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 1ME108ES1 Workshop is a compulsory Engineering Science Course for First Year B. Tech and common for all branches.

Course Objectives:
To provide students with foundational knowledge and hands-on experience in various workshop trades, including carpentry, fitting, welding,

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

CO	Course Outcome	Domain Level
1ME108ES1.1	Apply practical skills in basic machining operations such as turning, drilling, and molding to prepare jobs.	C-3, P-5, A-2
1ME108ES1.2	Apply workshop techniques to construct simple Jobs/objects, demonstrating the ability to execute tasks and develop practical skills.	C-3, P-5, A-2
1ME108ES1.3	Apply knowledge of material properties and use appropriate materials for performing workshop operations.	C-3

List of Practicals:

Minimum Eight practicals from the list mentioned below.

1. Perform cutting, drilling and tapping operation on given M.S. Flat.
2. Prepare 'T' Joint by using an electric welding.
3. Prepare Sheet Metal Scoop.
4. Prepare Cross Lap Joint.
5. Prepare the mould cavity in the mould box using single piece pattern.
6. Demonstration of Plastic Injection Moulding.
7. Demonstration of Lathe Machine (Machine Tool and Processes).
8. Demonstration of Foundry Shop.
9. Demonstration of Black-Smithy Shop.

E-Resources:

1. https://nkn.gov.in/en/services-lt-en/community-services-lt-en/e-foundry-lt-en
2. https://iitg.ac.in/mech/academics/pg-courses electives/latest/mechanics-of-sheet-metal-forming/
3. http://vlabs.iitkgp.ac.in/vamm/

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1ME108ES1.1	3	2	3	-	3	-	-	3	-	-	-
1ME108ES1.2	3	2	3	-	3	-	-	3	-	-	-
1ME108ES1.3	3	3	2	-	2	-	-	2	-	-	-
1ME108ES1	3	2	3	-	3	-	-	3	-	-	-

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

Level: **4.5**	Course Code: **1SH110AE1**		Course Category: **AEC**		
Course Name	**Communication Skills**				
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	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject Code 1SH110AE1 English Communication is a compulsory Ability Enhancement Course for First Year B. Tech. and common for all branches.

Course Objectives:
The objective of this course is to enable students to develop essential communication skills required for academic, social, and professional success by actively engaging them in reading, writing, listening, and speaking tasks.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
1SH110AE1.1	Apply fundamentals of communication (listening, reading, interpretation, and non-verbal cues) to contribute to ideas clearly and overcome barriers in academic, social, and professional contexts.	C-3, A-2
1SH110AE1.2	Apply professional writing and presentation skills, perform workplace communication tasks effectively, and express confidence in professional contexts.	C-3, P-3, A-3
1SH110AE1.3	Apply critical thinking and interpersonal communication, demonstrate teamwork in group discussions and interviews, and integrate collaboration and leadership skills in professional contexts.	C-3, P-5, A-4

Course Contents:

Unit 1	**Communication Fundamentals:** Basics of communication, 7Cs of Effective Communication, Barriers to communication, Listening & Reading Skills, Interpretation & Non-verbal Cues, Speaking and Conversations, Public Speaking, Academic and Technical Writing.	8 Hrs
Unit 2	**Professional & Career Communication:** Resume & Cover Letter Writing, Report Writing, Presentation Skills, Digital Presence, Interview Skills, Group Discussion, Integration of Skills.	7 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Decoding messages by identifying communication types, barriers, and clarity.
2. Practicing active listening and summarize spoken content effectively.
3. Improving reading speed and comprehension through Reading Race & Presentation.
4. Delivering a persuasive Elevator Pitch with confidence under time pressure.
5. Enhancing fluency through Walk & Talk role-play conversations
6. Participating in group discussions with peer moderation for critical thinking.
7. Writing professional emails and notices following academic and workplace norms.
8. Developing resumes and cover letters aligned with industry standards.
9. Demonstrating confident public speaking in a Mini TEDx Talk/Presentation.
10. Preparing for real-world interviews through Mock Interview Simulation.

Text Books:

1. Meenakshi Raman, Sangeeta Sharma, Technical Communication: Principles and Practice, Oxford University Press.
2. Sanjay Kumar, Pushp Lata, Communication Skills, Oxford University Press.

Reference Books:

1. M. K. Sehgal, Vandana Khetarpal, Business Communication, Excel Books.
2. Dr. K. Alex, Soft Skills, S. Chand & Company Ltd.

E-Resources:

1. LinkedIn Learning Courses- https://www.linkedin.com/learning/
2. TEDx Talks- https://www.ted.com/watch/tedx-talks
3. Toastmasters International- https://www.toastmasters.org/
4. Grammerly- https://www.grammarly.com/

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1SH110AE1.1	-	-	-	-	-	-	-	3	2	1	1
1SH110AE1.2	-	-	-	-	-	-	-	2	1	1	2
1SH110AE1.3	-	-	-	-	-	-	-	3	3	1	2
1SH110AE1CO	-	-	-	-	-	-	-	3	2	1	2

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

Level: 4.5		Course Code: **1SH111CC1**		Course Category: **CC**	
Course Name	**Sports & Yoga**				
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 1SH111CC1 Sports & Yoga is a compulsory Engineering Science Course for First Year B. Tech. and common for all branches.

Course Objectives:
The objective of this course is to build physical fitness, flexibility and endurance through sports and yoga, promote teamwork, leadership and discipline in group activities, embrace a healthy lifestyle through movement, mindfulness and balance.

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

CO	**Course Outcome**	**Domain Level**
1SH111CC1.1	Demonstrate strategies and techniques in indoor (Chess) and outdoor (Shot Put) games for effective performance.	C-3 & P-5
1SH111CC1.2	Apply fundamental strategies and practice techniques in Volleyball and Cricket for effective game performance.	C-3 & P-3
1SH111CC1.3	Associate fundamental yoga postures with better flexibility and practice breathing techniques for contributing to better physical and mental well-being.	C-3, P-4 & A-2

List of Practicals:

1. Chess.
2. Volleyball.
3. Shot Put.
4. Cricket.
5. Yoga.

E-Resources:

1. https://play.google.com/store/apps/details?id=com.chess
2. https://play.google.com/store/apps/details?id=com.giraffegames.realvol leyballhttps://
3. https://play.google.com/store/apps/details?id=com.Fitness.Flexibility. Workout.How.to.Play.Shot.Put
4. https://play.google.com/store/apps/details?id=com.nextwave.wcc2
5. https://play.google.com/store/apps/details?id=yogaworkouts.dailyyoga. yogafitness

Mapping of COs with POs:

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1SH111CC1.1	-	-	-	-	-	-	2	2	1	-	2
1SH111CC1.2	-	-	-	-	-	-	2	3	2	-	2
1SH111CC1.3	-	-	-	-	-	-	2	1	1	-	3
1SH111CC1CO	-	-	-	-	-	-	2	2	1	-	2

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

Level: 4.5	Course Code: 2SH112BS1		Course Category:	BSC	
Course Name	**Mathematics-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 2SH112BS1 Mathematics-II is a compulsory Basic Science Course for First Year B. Tech. and common for all branches.

Course Objectives:
The objective of this course is to develop fundamental understanding of matrices also provide techniques of integral calculus, and build concepts of vector calculus.

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

CO	Course Outcome	Domain Level
2SH112BS1.1	Apply matrix concepts for solving a system of linear equations and Eigen value problems.	C-3
2SH112BS1.2	Use Beta and Gamma functions and their properties in evaluation of integrals.	C-3
2SH112BS1.3	Apply tracing methods to illustrate reduction formulae and curves.	C-3
2SH112BS1.4	Solve Double Integrals and their usage to the solution of various engineering problems.	C-3
2SH112BS1.5	Apply the concept of triple integrals to Determine volume, mean and RMS	C-3
2SH112BS1.6	Apply gradient, divergence, curl, and directional derivatives to illustrate vector fields.	C-3

Course Contents:

Unit 1	**Matrices:** Rank of a matrix, System of linear equations, Eigen values and Eigen vectors, Inverse of a matrix by Cayley-Hamilton Theorem.	7 Hrs
Unit 2	**Integral Calculus:** Beta and Gamma functions and their properties.	7 Hrs
Unit 3	**Reduction formulae:** Definition and standard results **Tracing of curves**	7 Hrs
Unit 4	**Double Integration:** Evaluation of Double integrals, Change of order of integration, Transformation of double integrals to polar coordinates, Areas	8 Hrs

	by double integration.	
Unit 5	**Triple Integration:** Evaluation of Triple integrals, Triple integrals in spherical polar coordinates, Volume by triple integration. Mean and RMS value.	8 Hrs
Unit 6	**Vector Calculus:** Scalar and Vector point functions, Gradient, Curl and Divergence, Irrotational and Solenoidal vector fields and Directional derivatives.	8 Hrs

Text Books:

1. Wartikar P.N. ,Wartikar J.N., A text of applied Mathematics, Volume I, II, V.G. Prakashan, Pune.
2. Grewal B. S., Higher Engineering Mathematics, (latest Edition), Khanna Publishers.
3. Ramana B. V., Higher Engineering Mathematics, (TMH).
4. Singh R.R. and Bhatt M., Higher Engineering Mathematics, (TMH).

Reference Books:

1. N.P.Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications.
2. H.K. Das, Advanced Engineering Mathematics (S. Chand Publication).
3. Veera Rajan T., Engineering mathematics for first year, (TMH).

E-Resources:

1. https://nptel.ac.in/courses/122104018
2. https://onlinecourses.nptel.ac.in/noc21_ma11/preview
3. https://archive.nptel.ac.in/courses/111/105/111105122/
4. https://en.wikipedia.org/wiki/Matrix_(mathematics)
5. https://en.wikipedia.org/wiki/Multiple_integral

Mapping of COs with Pos:

CO	**PO**										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1SH101BS1.1	3	3	-	-	-	-	-	-	-	-	-
1SH101BS1.2	3	3	-	-	-	-	-	-	-	-	-
1SH101BS1.3	3	3	-	-	-	-	-	-	-	-	-
1SH101BS1.4	3	3	-	2	-	-	-	-	-	-	-
1SH101BS1.5	3	3	-	1	-	-	-	-	-	-	-
1SH101BS1.6	3	2	-	1	-	-	-	-	-	-	-
1SH101BSCO	3	3	-	1	-	-	-	-	-	-	-

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

<table>
<tr><td>Level: 4.5</td><td colspan="2">Course Code: 2SH113BS1</td><td colspan="3">Course Category: BSC</td></tr>
<tr><td>Course Name</td><td colspan="5">Applied Chemistry</td></tr>
<tr><td>Credits</td><td>03</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">3:0:0
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">45 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>90 Hrs</td></tr>
<tr><td>SEE Marks</td><td>60</td><td>SEE Time</td><td>3 Hrs</td><td>CIA Marks</td><td>40</td></tr>
<tr><td>EE Marks</td><td>--</td><td>PA Marks</td><td>--</td><td>Total Marks</td><td>100</td></tr>
</table>

Course Description:
Subject Code 2SH113BS1 Applied Chemistry is a compulsory Basic Science Course for First Year B. Tech. and common for all branches.

Course Objectives:
The objective of this course is to impart the knowledge on the basic principles of chemistry involving different application and help develop proficiency in applying these principles to address environmental challenges & industrial step-up.

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

CO	Course Outcome	Domain Level
2SH113BS1.1	Classify the impurities present in water and apply appropriate methodologies to remove them for sustainable water treatment.	C-3
2SH113BS1.2	Apply various types of corrosion methods, properties & application of nanomaterials for protection of metal.	C-3
2SH113BS1.3	Apply the principles, practices, and applications of green Computing and green chemistry for sustainable environment.	C-3
2SH113BS1.4	Apply the knowledge about energy science, fuel for the generation of power.	C-3
2SH113BS1.5	Apply and understand energy storage technologies and lubricants for improved system efficiency and reliability.	C-3
2SH113BS1.6	Apply the knowledge of various polymeric materials, their synthesis and application to solve real world engineering problem.	C-3

Course Contents:

Unit 1	**Water Treatment & Analysis:** Hardness of water & their types, Units of Hardness, Estimation of Hardness by EDTA method, Softening of water by Ion exchange, Zeolite process. Boiler troubles: Scale and Sludge formation, Priming & Foaming, Boiler corrosion. Numerical problems based on Zeolite process and Hardness calculations.	8 Hrs
Unit 2	**Nanomaterials, Corrosion and Corrosion control:** **Nanomaterials** : Basics of Nanochemistry, Properties of Nanomaterials, Applications of nanomaterials, Synthesis methods: Sol -gel and chemical vapour deposition, Carbon nanotubes. **Corrosion and Corrosion control:** Corrosion: Introduction, Dry & Wet corrosion and their mechanism, Types of corrosion: Pitting corrosion, waterline corrosion, inter-granular corrosion and Stress corrosion. Corrosion Control by Hot Dipping (Galvanizing and Tinning).	7 Hrs
Unit 3	**E-Waste ,Recycling and Green Computing:** Metal extraction from E-wastes: Constraints and opportunities, Chemical exposure (Lead, Mercury, Cadmium, Chromium) and contamination, Definition and concept of green chemistry, Twelve principles of green chemistry, Green Computing, Role of Green Computing in Environment and Research, Green devices and Green data Server.	7 Hrs
Unit 4	**Energy Science:** Introduction, Classification, Characteristic of Good fuel, Calorific value, HCV & LCV. Analysis of Coal: Proximate, Ultimate analysis and their significance. Cracking of petroleum fractions, Types of cracking, Fixed bed and Moving bed cracking. Knocking in IC engine, Octane number, Cetane Number	7 Hrs
Unit 5	**Energy Storage Systems and Lubricants:** **Energy Storage Systems:** Introduction, Classification of batteries, Lithium-ion battery, Ni-Cd Battery, Photovoltaic cells, Fuel cell (H_2-O_2), H_2 as a green fuel: Introduction, production, storage, and utilization. **Lubricants:** Introduction, Classification of lubricant, Properties of liquid lubricants (Definition)–Viscosity and viscosity index, Flash and fire point, Cloud and pour point, Acid value.	8 Hrs

Unit 6	**Polymer chemistry:** Introduction and Classification of polymers, Methods of polymerization, Preparation, properties and uses of Polyethylene, Poly vinyl chloride, Teflon. Condensation polymerization: Preparation, properties and uses of Bakelite. Thermosetting & Thermoplastic, Rubber: Natural rubber, Drawbacks of natural rubber & Vulcanization. Synthetic rubbers: Preparation, Properties & Applications of - Styrene rubber, Nitrile rubber, Butyl rubber. Biodegradable polymers: properties and applications.	8 Hrs

Text Books:

1. S.S.Dara, A textbook of Engineering Chemistry S. Chand & Co. New Delhi. Eleventh edition.
2. P.C.Jain and Monica Jain, Engineering Chemistry, Dhanpat Rai & Sons New Delhi, sixteenth Edition
3. M Afshar alam Sapna Jain,Hena Parveen, Green computing approach towards sustainable development, Wiley interscience publication.
4. A.K.Das and M.Das, An introduction to nanomaterials & nanoscience, CBS publishers and distributors.

Reference Books:

1. Sunita Rattan, Textbook of Engineering Chemistry, S.K.Kataria & Sons.
2. Rajaram & Kuriacose, Textbook of Engineering & Technology, Vol I & II
3. Manasi Karkare, Nanotechnology Fundamentals and Applications, IK International Publishers.
4. V. Gowarikar.A Text Book of Polymer Science & Tech.

E- Resources:

1. file:///C:/Users/Administrator/Downloads/DIP121EN_Applied%20Chemistry_AICTE.pdf

Mapping of COs with Pos:

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2SH113BS1.1	3	3	-	3	-	3	-	-	-	-	-
2SH113BS1.2	3	1	-	1	-	2	-	-	-	-	-
2SH113BS1.3	3	2	-	2	-	3	-	-	-	-	-
2SH113BS1.4	3	1	-	1	-	2	-	-	-	-	-
2SH113BS1.5	3	2	-	1	-	3	-	-	-	-	-
2SH113BS1.6	3	1	-	-	-	1	-	-	-	-	-
2SH113BS1CO	3	2	-	1	-	2	-	-	-	-	-

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

Level: **4.5**	Course Code: **2EE114ES1**		Course Category: **ESC**		
Course Name	**Basic Electrical Engineering**				
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 2EE114ES1 Basic Electrical Engineering is a compulsory Engineering Science Course for First Year B. Tech and common for all branches.

Course Objectives:
The objective of this course is to present the fundamental knowledge and principles of electrical and magnetic circuits, AC circuits, transformers which helps them in applying these principles to formulate and solve problems.

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

CO	Course Outcome	Domain Level
2EE114ES1.1	Apply the fundamental concepts of electric circuit using Ohm's law, Kirchhoff's laws including star-delta transformation.	C-3
2EE114ES1.2	Apply laws of electromagnetic induction to study flux behaviour, magnetization characteristics, and related rules.	C-3
2EE114ES1.3	Illustrate alternating quantities using mathematical and phasor representation to study the behaviour of pure resistive, inductive, and capacitive AC circuits.	C-3
2EE114ES1.4	Apply the concepts of alternating voltage and current with phasor representation to analyse pure resistive, inductive and capacitive AC circuits.	C-3
2EE114ES1.5	Determine phase–line relationships in three phase system with star and delta connections for balanced and unbalanced loads.	C-3
2EE114ES1.6	Determine the performance of single-phase transformers by applying EMF equation, transformation ratio, and analysing losses, efficiency, and voltage regulation.	C-3

Course Contents:

Unit 1	**DC Circuits:** Basic concepts of Voltage, Current, Power, Energy and relationship between them. Resistance, Resistivity, Conductivity, Temperature effect on resistance and temperature coefficient of resistance. **Introduction to Circuit Analysis:** Series and parallel circuits, Ohm's law, types of sources, current division and voltage division rule, Kirchoff's laws, Star-Delta Transformation.	10 Hrs
Unit 2	**Magnetic Circuits:** Terminologies of Magnetic Circuits, Fleming's left hand and right-hand rule, Leakage and fringing of flux, Magnetisation curve, Composite magnetic circuits. Faraday's laws of Electromagnetic induction.	9 Hrs
Unit 3	**AC Fundamentals:** Generation of alternating voltage, Mathematical and graphical representation of sinusoidal voltage and current, Terminologies related to AC circuits, Phasor representation and its types, Study of AC circuits of pure resistance, inductance and capacitance.	8 Hrs
Unit 4	**AC Single Phase Circuits:** Study of series R-L, R-C, R-L-C circuits, concept of impedance and admittance, waveform and phasor diagrams. Concept of active, reactive, apparent power and power factor. R-L-C parallel circuit.	6 Hrs
Unit 5	**Three Phase Circuits:** Generation of three phase voltages, phase sequence, Balanced and unbalanced circuits, Star and Delta connections. Relationship between phase and line quantities for star and delta circuits. Star and Delta balanced load, power in three phase circuits.	6 Hrs
Unit 6	**Single Phase Transformer:** Construction and working principle, classification, types based on construction, Transformation ratio, EMF equation, losses, efficiency and voltage regulation of transformer.	6 Hrs

Text Books:

1. B. L. Theraja, Electrical Technology Volume I, S. Chand & Co. Publication.
2. Kulshreshtha D.C., Basic Electrical Engineering, First Ed., TMH.
3. Mulukutla S. Sarma, Introduction to Electrical Engineering (Oxford University Press)

Reference Books:

1. D. P. Kothari & I. J. Nagrath, Basic Electrical Engineering, TMH Pub. Co. Ltd., New Delhi, 4th Edition.
2. V. N. Mittle, Basic Electrical Engineering, TMH Publishing company Ltd.
3. Fidzgerald A.E.,Basic Electrical Engineering, Fifth Edition, TMH -2006, MCGRAW-HILL series in Electrical Engineering.
4. R. Anand Natarajan & P. Ramesh,Basic Electrical Engineering, First ed., Scitech Publication (India) Pvt Ltd.
5. Del Toro V., Principle of Electrical Engineering, 4th Edition, PHI 2005
6. T. K. Nagsarkar, Basic Electrical Engineering First ed., OXFORD University Press 2005.

E- Resources:

1) https://ekumbh.aicte-india.org/allbook.php#
2) https://nptel.ac.in/courses/108105112
3) https://nptel.ac.in/courses/117106108
4) http://www.digimat.in/nptel/courses/video/108105112/L01
5) http://kcl.digimat.in/nptel/courses/video/108108076/L16.html

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2EE114ES1.1	3	1	2	-	-	-	-	-	-	-	-
2EE114ES1.2	2	3	2	-	-	-	-	-	-	-	-
2EE114ES1.3	3	2	2	-	-	-	-	-	-	-	-
2EE114ES1.4	2	3	2	-	-	-	-	-	-	-	-
2EE114ES1.5	2	3	3	-	-	-	-	-	-	-	-
2EE114ES1.6	3	2	2	-	-	-	-	-	-	-	-
2EE114ES1CO	3	2	2	-	-	-	-	-	-	-	-

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

Level: **4.5**	Course Code:	**2EE119ES1**		Course Category:	**ESC**
Course Name	**Basic Electrical 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 2EE119ES1 Basic Electrical Engineering Lab is a compulsory Engineering Science Course for First Year B. Tech and common for all branches.

Course Objectives:

The objective of this course is to strengthen students concept of Basic Electrical Engineering through laboratory experiments and to build expertise in electrical instruments and measurement methods.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
2EE119ES1.1	Demonstrate experimental skills in electric circuits, magnetic circuits, and AC circuits to develop theoretical concepts and practical competency.	C-3 & P-5
2EE119ES1.2	Apply experimental methods to validate theoretical concepts in electrical engineering.	C-3
2EE119ES1.3	Participate collaboratively in planning, executing, and presenting laboratory experiments for appropriate data collection, and analysis	C-3, P-4 & A-2

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Verification of Kirchoff's Current Law
2. Verification of Kirchoff's Voltage Law
3. Plot the B-H curve of a given magnetic material and study its magnetic characteristics.
4. Analyse Star Connected three phase AC circuit
5. Analyse Delta Connected three phase AC circuit
6. Determine active, reactive and apparent power for RLC Series Circuit.
7. Verify the relationship between voltage and current in RL series circuit.
8. Verify the relationship between voltage and current in RC series circuit.
9. Perform load test on Single Phase Transformer.
10. Perform polarity test on single phase transformer.

List of Virtual Labs:

1. https://bes-iitr.vlabs.ac.in/exp/kirchhoff-law/
2. https://bes-iitr.vlabs.ac.in/exp/series-rlc-circuit/
3. https://bes-iitr.vlabs.ac.in/exp/power-factor/
4. https://bes-iitr.vlabs.ac.in/exp/parallel-rlc-circuit/
5. https://bes-iitr.vlabs.ac.in/exp/resonance-series-rlc/
6. https://bes-iitr.vlabs.ac.in/exp/single-phase-transformer/

Mapping of COs with POs

CO	**PO**										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2EE119ES1.1	3	1	-	-	3	-	-	2	-	-	-
2EE119ES1.2	3	1	-	2	3	-	-	2	2	-	-
2EE119ES1.3	3	1	-	1	3	-	-	2	1	-	-
2EE119ES1CO	3	1	-	1	3	-	-	2	1	-	-

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

Level: **4.5**	Course Code: 2ME115ES1			Course Category: **ESC**	
Course Name	**Engineering Graphics**				
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	**4 Hrs**	CIA Marks	**40**
EE Marks	**--**	PA Marks	**--**	Total Marks	**100**

Course Description:
Subject Code 2ME115ES1 Engineering Graphics is a compulsory Engineering Science Course for First Year B. Tech. Engineering and common for all branches.

Course Objectives:
The objective of this course is to acquire and apply knowledge of engineering graphics for communicating ideas, information, and instructions, and to understand the representation of orthographic and isometric projections.

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

CO	Course Outcome	Domain Level
2ME115ES1.1	Explain the language of engineering graphics to communicate ideas and disseminate information through a structured pedagogy for creating drawings.	C-2
2ME115ES1.2	Interpret the procedures of projectional representation of 2D planes/ objects to develop the imagination.	C-2
2ME115ES1.3	Interpret the procedure to understand projectional representation of 3D objects.	C-2
2ME115ES1.4	Illustrate the sectional views of 3D objects to reveal the internal details of an object.	C-3
2ME115ES1.5	Apply the concept of conversion of pictorial views of an object into orthographic projections for creating 2D drawing.	C-4
2ME115ES1.6	Demonstrate the correct process for projecting points and lines from two-dimensional (2D) orthographic views to create a three-dimensional (3D) isometric drawing.	C-3

Course Contents:

Unit 1	**Introduction to Engineering Graphics:** Projection of points in all possible positions w.r.t. reference planes. Projection of lines when line is inclined to one and parallel other reference plane.	5 Hrs
Unit 2	**Projection of Planes:** Projection of planes parallel to one and perpendicular to other reference plane inclined to one reference Plane and inclined to both the reference planes.	5 Hrs
Unit 3	**Projection of Right regular Solids:** Solids with Axis Perpendicular to One Reference Plane and Parallel to the Other: Projection of Cube, Projection of Right Regular Prisms, Projection of Right Regular Pyramids, Projection of Right Regular Cylinder, Projection of Right Circular Cone, Projection of Tetrahedron. Solids with Axis Inclined to One Reference Plane and Parallel to the Other: Projection of Cube, Projection of Right Regular Prisms, Projection of Right Regular Pyramids, Projection of Right Regular Cylinder, Projection of Right Circular Cone, and Projection of Tetrahedron.	5 Hrs
Unit 4	**Section of Solids:** Section of right regular solids including cube, right regular prisms, right regular pyramids, tetrahedron, right regular cylinder and right circular cone in simple position.	5 Hrs
Unit 5	**Orthographic Projection:** Principles of Orthographic Projection, Conventions, Multi View Orthographic Projections for parts with isometric and non isometric surfaces and circular features.	5 Hrs
Unit 6	**Isometric view and Projection:** Principle of isometric projection, isometric scale, isometric view, isometric view of simple solids. Conversion of Orthographic views to Isometric views and Isometric Projection.	5 Hrs

Text Books:

1. Bhatt N.D. , Panchal V.M. , Engineering Drawing Charotar publishing house
2. Jolhe D.A. Engineering Drawing with an Introduction to Auto CAD , Tata McGraw Hill Publishing Co. Ltd. , New Delhi .
3. Shah P.J. Engineering Drawing , S. Chand Publication

Reference Books:

1. Narayan K.L, Kannaiah P Enginering Drawing.
2. Dhawan R.K. Engineering Drawing S. Chand Publication

E-Resources:

1. https://soaneemrana.com/onewebmedia/ENGINEERING%20DRAWING%20BY%20N.D%20BHATT.pdf
2. https://www.amazon.com/Manual-Engineering-Drawing-Specification-Documentation/dp/0750689854
3. https://www.amazon.com/Technical-Drawing-Engineering-Graphics-Giesecke/dp/013430641X
4. https://ocw.mit.edu/courses/2-007-design-and-manufacturing-i-spring-2009/pages/related-resources/drawing_and_sketching/
5. https://www.mcgill.ca/engineeringdesign/step-step-design-process/basics-graphics-communication/principles-dimensioning

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2ME115ES1.1	2	-	-	-	-	1	-	-	1	-	-
2ME115ES1.2	2	-	-	-	1	2	-	-	2	-	-
2ME115ES1.3	3	-	-	-	1	2	-	-	1	-	-
2ME115ES1.4	3	-	-	-	2	2	-	-	1	-	-
2ME115ES1.5	3	3	3	-	2	2	-	-	2	-	-
2ME115ES1.6	2	3	3	-	-	2	-	-	1	-	-
2ME115ES1	3	1	1	-	1	2	-	-	1	-	-

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

Level: **4.5**	Course Code: **2ME120ES1**			Course Category: **ESC**	
Course Name	**Engineering Graphics 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 2ME120ES1 Engineering Graphics/CAD Lab is a compulsory Engineering Science Course for First Year B. Tech Engineering and common for all branches.

Course Objectives:
The objective of this course is to understand the basic principles of engineering graphics and their role in technical communication. Also to develop the ability to visualize and represent the 2D drawings & 3D objects.

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

CO	Course Outcome	Domain Level
2ME120ES1.1	Demonstrate and practice projections of lines, planes, and solids in various positions relative to the principal planes, including sectional views to reveal internal features.	C-3, P-3
2ME120ES1.2	Determine and reproduce orthographic projections from given isometric views and vice versa, ensuring accuracy in visualization, scale, and proportion using first- and third-angle projection methods for understanding 2D and 3D drawings.	C-3, P-3
2ME120ES1.3	Show and adapt the ability to visualize, analyze, and accurately represent 2D and 3D geometries using appropriate drawing instruments and projection techniques and to relate them with the real world applications.	C-3, P-2 & A-4

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Projection of Straight Lines
2. Projection of Planes
3. Projection of Solids
4. Section of Solids
5. Orthographic Projection
6. Isometric view and Projection
7. Construct 2D geometrical shapes using CAD tool
8. Construct the problems of Projection of Lines/Planes using CAD tool.
9. Free hand sketches of simple machine elements

E-Resources:

1. https://eg-nitk.vlabs.ac.in/exp/engineering-drawing/theory.html
2. https://virtual-labs.github.io/exp-introduction-engineering-drawing-nitk/
3. https://kdm-iitkgp.vlabs.ac.in/exp/simple-drawing-board/theory.html
4. https://www.vlab.co.in/broad-area-mechanical-engineering
5. https://virtuallabs.merlot.org/vl_engineering.html

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
2ME120ES1.1	3	2	-	-	-	-	-	-	2	-	-
2ME120ES1.2	3	2	-	-	2	1	-	-	2	-	-
2ME120ES1.3	3	2	1	-	2	2	-	1	2	-	-
2ME120ES1CO	3	2	1	-	1	1	-	-	2	-	-

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

<table>
<tr><td>Level: 4.5</td><td colspan="2">Course Code: 2ME116PC1</td><td colspan="3">Course Category: PCC</td></tr>
<tr><td>Course Name</td><td colspan="5">Elements of Mechanical Engineering</td></tr>
<tr><td>Credits</td><td>02</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60 Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>--</td><td>CIA Marks</td><td>--</td></tr>
<tr><td>EE Marks</td><td>--</td><td>PA Marks</td><td>50</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:
Subject Code 2ME116PC1 Elements of Mechanical Engineering is a compulsory Program Core Course for First Year B. Tech Mechanical Engineering branch.

Course Objectives:
The objective of the course is to present the essential aspects of Engineering Materials and Power Plants, and to develop knowledge related to Manufacturing Prcesses and Industrial Engineering.

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

CO	Course Outcome	Domain Level
2ME116PC1.1	Demonstrate the working of CNC and ASRS machines for understanding the Flexible manufacturing systems.	C-3
2ME116PC1.2	Apply the acquired knowledge to select suitable energy systems and manufacturing technologies for real-life engineering problems.	C-3
2ME116PC1.3	Participate in a team to plan and present practical knowledge with appropriate documentation.	C-3 & A-2

Course Contents:

Unit 1	**Engineering Materials**: Introduction to Engineering Materials, Classification and Properties. Alloy steel and their applications, Stress-Strain diagram, Hooks law and modulus of elasticity. **Power Plants:** Introduction, working principle of hydroelectric power plant and steam power plant, Alternate sources of energy – solar, wind and tidal power.	7 Hrs
Unit 2	**Manufacturing Processes:** Subtractive, Confirmative and Additive Manufacturing, Machine Tools classification, working principle, surface finishing processes, Introduction to CAM and FMS. Industrial Engineering**:** Introduction to work study, CPM and PERT. Industry-4.0 principles and concepts, Introduction to Robotics.	8 Hrs

List of Practicals:

Minimum Eight practicals from the list mentioned below.

1. Study construction and working of Fire Tube Boiler.
2. Study construction and working of Water Tube Boiler.
3. Study construction and working of Boiler Mountings and Accessories.
4. Study construction and working of Solar Still.
5. Demonstration of Hydraulic Turbine.
6. Demonstration of Robotic Arm.
7. Demonstration of 3d Printer.
8. Demonstration of CNC Lathe Machine.
9. Demonstration of CNC Milling Machine.

Text Books:

1. G.S. Sawhney, Fundamentals of Mechanical Engineering, PHI Learning.
2. Basic Mechanical Engineering – Mark's Standard Handbook for Mechanical Engineers, McGraw-Hill.

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://abanoori.itch.io/fire-tube-boiler-vr.
2. https://3dp-dei.vlabs.ac.in/?utm.
3. https://fab-coep.vlabs.ac.in/exp/3d-machining/?utm.
4. https://www.wipropari.com/virtual-commissioning/?utm.

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2ME116PC1.1	3	1	-	-	-	-	-	3	2	-	-
2ME116PC1.2	3	1	-	-	-	-	-	-	-	-	-
2ME116PC1.3	3	1	-	-	-	-	-	3	3	-	-
2ME116PC1	3	1	-	-	-	-	-	2	2	-	-

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

Level: **4.5**	Course Code: **2SH118BS1**		Course Category: **BSC**		
Course Name	**Applied chemistry 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 2SH118BS1 Applied Chemistry Lab is a compulsory Basic Science Course for First Year B. Tech. and common for all branches.

Course Objectives:
The objective of this course is to demonstrate practical knowledge of basic and advanced technique in applied chemistry.

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

CO	Course Outcome	Domain Level
2SH118BS1.1	Apply concept of applied chemistry to solve engineering problems related to materials, water quality, and corrosion.	C-3
2SH118BS1.2	Demonstrate the ability to use knowledge of chemistry for sustainable engineering practices	C-3 & P-5
2SH118BS1.3	Participate to work effectively in team to plan, perform and examine chemical experiment.	C-3, P-4 & A-2

List of Practicals:
Minimum eight practicals from the list mentioned below.
1. Estimation of temporary, permanent and total hardness present in the water sample by EDTA Method.
2. Determination of chloride content of water by Mohr's method.
3. Determination of Dissolved oxygen from water sample.
4. Determination of p^H of given samples.
5. Preparation of nanomaterial.
6. Preparation of a chemical compound using green chemistry pathway.
7. Determination of viscosity of lubricating oil by Redwood Viscometer I or II.
8. Preparation of urea formaldehyde resin.
9. To measure conductivity of solution by conductivity meter.
10. Determination of Flash point by Abel’s or Pensky Martin Apparatus.

E-Resources:
1. https://ee1-nitk.vlabs.ac.in/exp/determination-of-hardness/
2. https://ee1-nitk.vlabs.ac.in/exp/determination-of-chloride/
3. https://ee2-nitk.vlabs.ac.in/exp/oxygen-in-water/
4. https://ee1-nitk.vlabs.ac.in/exp/determination-of-ph/

Mapping of COs with Pos:

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2SH118BS1.1	3	2	-	2	-	-	-	3	2	-	-
2SH118BS1.2	3	2	-	-	-	-	-	1	1	-	-
2SH118BS1.3	3	1	-	1	-	-	-	3	3	-	-
2SH118BS1CO	3	2	-	1	-	-	-	2	2	-	-

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

<table>
<tr><td>Level: 4.5</td><td colspan="2">Course Code: 2SH122CC1</td><td colspan="3">Course Category: AEC</td></tr>
<tr><td>Course Name</td><td colspan="5">Digital Wellness</td></tr>
<tr><td>Credits</td><td>02</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60 Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>--</td><td>CIA Marks</td><td>--</td></tr>
<tr><td>EE Marks</td><td>25</td><td>PA Marks</td><td>25</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:
Subject Code 2SH122CC1 Digital Wellness is a compulsory Co-curricular Course for First Year B. Tech. and common for all branches.

Course Objectives:
The objective of the course is to guide students towards self awareness and responsible digital behavior by helping them understand the physical, mental, and emotional effects of device usage in long-term digital well-being practices.

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

CO	Course Outcome	Domain Level
2SH122CC1.1	Apply mindful digital practices, practice reducing non-essential screen time, and express appreciation for healthier offline alternatives.	C-3, P-3, A-3
2SH122CC1.2	Apply digital etiquette principles, perform mindful presence, and integrate balanced emotional, social, and physical well-being to sustain positive offline interactions.	C-3, P-4, A-4
2SH122CC1.3	Demonstrate proficient control in adopting digital behaviors, and formulate a long-term wellness plan for sustained well-being.	C-3, P-5, A-4

Course Contents:

Unit 1	**Mastering Mindful Tech Habits:** Introduction to Digital Wellness and Digital Habit Awareness, Screen Time Patterns and Dopamine Loops, Mindful Technology Use and Self-Regulation Strategies, Time and Focus Management including Pomodoro and Time Blocking, Social Media and Self-Image covering Comparison, FOMO and Validation Loops, Digital Decluttering and Feed Curation Techniques.	8 Hrs
Unit 2	**Building Sustainable Digital Well-Being:** Physical and Mental Effects of Technology Overuse including Sleep, Eyes and Posture, Sleep Hygiene and Evening Tech Boundaries, Emotional Wellness and Mindfulness Practices including Journaling and Breathing, Healthy Digital Communication and Etiquette, Offline Relationship Building and Presence, Sustainable Tech-Free Habits and Campaign Planning.	7 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below,

1. Recognizing digital addiction through the Temptation Box.
2. Mapping screen time awareness and digital behaviours with Digital Mirror Mapping.
3. Practicing real interaction via Offline Social Simulation.
4. Substituting unhealthy habits using a Habit Substitution Chart.
5. Balancing tech-life with the Analog Bucket Challenge.
6. Experiencing mindful presence during the Mindful Eating Circle.
7. Testing attention span with the Memory Race Game.
8. Building focus through Mind Gym Relax activities.
9. Showcasing creativity and offline entertainment in an Offline Talent Show.
10. Reflecting on long-term wellness by writing a Digital Legacy Letter.

Text Books:

1. Dr. Sajith Cyriac, Digital Wellness: Taking Control of Your Online Life, Better Yourself Books and Media Pvt. Ltd.
2. Andrew Danyadi, Digital Balance: Mastering Wellness in a Screen-Centric World, Evergreen Pages
3. Cristin Finch & Kristen Killion, Digital Wellness, Pressbooks (Open Educational Resource, SUNY)

Reference Books:

1. Cal Newport, Digital Minimalism, Portfolio/Penguin.
2. James Clear, Atomic Habits, Avery Publishing.
3. Nir Eyal, Indistractable, Benbella Books Inc.
4. Catherine Price, How to Break Up with Your Phone, Ten Speed Press.

E-Resources:

1. Forest (Free Basic Version) (Mobile Application)
2. Focus To-Do (Mobile Application)
3. Insight Timer (Mobile Application)
4. Digital Wellness Lab: https://digitalwellnesslab.org/
5. Teach Digital Wellness: Mental Wellbeing Online: https://banzai.org/units/digital-wellness
6. SEL & Digital Citizenship Lessons: https://nearpod.com/blog/digital-wellness-21st-century-curriculum-program-common-sense/

Mapping of COs with Pos:

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
2SH122CC1.1	-	-	-	-	1	2	2	1	2	-	3
2SH122CC1.2	-	-	-	-	1	2	2	2	2	-	3
2SH122CC1.3	-	-	-	-	1	2	2	1	2	-	3
2SH122CC1CO	-	-	-	-	1	2	2	1	2	-	3

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

14.2 Syllabus for vocational and skill enhancement courses

Level: **4.5**	Course Code: **1CH109VS1**			Course Category: **VSC**	
Course Name	**Chemical Engineering Processes**				
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 1CH109VS1 Chemical Engineering Processes is a compulsory Chemical Engineering Course for First Year B. Tech.

Course Objectives:
The objective of this course is to present the basic concept, Defining key terms in Chemical engineering like process, flow diagrams, unit operations and system boundaries and help develop develop problem-solving skills related to chemical engineering.

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

CO	Course Outcome	Domain Level
1CH109VS1.1	Explain basic concepts of chemical engineering and apply them to analyze water and solution properties in the lab.	C-2
1CH109VS1.2	Use unit operations and processes in chemical industries and demonstrate their applications through experiments.	C-3,P-5
1CH109VS1.3	Perform experiments, record observations accurately, and demonstrate the connection between theoretical principles and practical outcomes.	C-3,P-4

Course Contents:

Unit 1	**Chemical Processes:** History, scope of chemical engineering. Introduction to various chemical Industries. Basic method of measurements, properties of fluids or liquids, basic terms Normality, Molarity, Molality, Mass concentration and basic of Material balance used in chemical engineering.	7 Hrs
Unit 2	**Unit Operations:** Information of basic unit operation and unit processes used in chemical engineering like Distillation, Evaporation, Crystallization, Filtration, Extraction, Drying, Absorption, Adsorption, Humidification and its Industrial application.	8 Hrs

List of Practicals:

Minimum eight practicals from the list below:

1. Determination of PH, TDS & Conductivity of given water sample
2. Determination of Acidity of given water sample.
3. Determine alkalinity of given water sample.
4. Determine free chlorine in water sample.
5. Preparation of Phenol formaldehyde resin.
6. Preparation of Urea formaldehyde resin.
7. Determination of free chlorine in water.
8. Determination of total hardness of water by complexometric method.
9. Determination of temporary hardness of water by Hehners method.
10. To verify elevation in boiling point of urea solution.

Text Books:

1. K. A. Gavhane, Fundamentals of Chemical Engineering and Materials, 1st Edition (2024).
2. S. D. Dawande, Introduction to Heat & Mass Transfer, 4th Edition (2021).
3. D. M. Himmelblau & J. B. Riggs, Basic Principles and Calculations in Chemical Engineering, 9th Edition (2023).
4. W. L. Badger & J. T. Banchero, Introduction to Chemical Engineering.
5. W. L. McCabe, J. C. Smith & P. Harriott, Unit Operations of Chemical Engineering, 7th Edition (2004).

Reference Books:

1. J. Sudhakar & S. Sharmila, Introduction to Chemical Engineering
2. R. M. Felder & R. W. Rousseau, Elementary Principles of Chemical Processes, 4th Edition (2020).
3. J. F. Richardson, J. H. Harker & J. R. Backhurst, Chemical Engineering Volume 2: Particle Technology and Separation Processes, 4th Edition (1990).

E-Resources:

1. https://www.youtube.com/watch?v=XL2IqiImLO4&list=PLwdnzlV3ogoXpDif2e93GJKoojj0SgvV0
2. https://www.youtube.com/watch?v=8xKCtJ0f-gY

Mapping of COs with Pos:

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1CH109VS1.1	2	-	-	-	2	-	-	-	1	-	-
1CH109VS1.2	2	-	2	-	3	-	-	-	2	-	-
1CH109VS1.3	1	-	2	-	3	-	-	2	3	-	-
1CH109VS1 CO	2	-	1	-	3	-	-	1	2	-	-

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

Level: **4.5**		Course Code: **1CE109VS1**		Course Category: **VSC**	
Course Name	**MS Excel for Civil Engineering**				
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 1CE109VS1 MS Excel in Civil Engineering is a compulsory Vocational Skill Course for First Year B.Tech. in Civil Engineering.

Course Objectives:

The course objective is to develop fundamental Excel skills for civil engineering applications, enabling students to manage data, estimate materials, analyze costs, and perform basic project monitoring and analysis.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
1CE109VS1.1	Illustrate basic Excel functions and data handling techniques to organize and visualize civil engineering data.	C-3
1CE109VS1.2	Apply logical, conditional, and lookup functions to perform material quantity and cost estimations through structured sheets.	C-3&P-4
1CE109VS1.3	Illustrate civil engineering datasets using Excel tools, and demonstrate data presentation techniques to support project-based decision-making.	C-3, P-5&A-3

Course Contents:

Unit 1	**Excel Basics & Civil Engineering Data Handling:** Introduction to MS Excel interface, Data Entry and Formatting, basic formulae and functions, arithmetic functions, sorting and filtering data sets (soil types, materials inventory, grades of materials, Creating and customizing bar charts, line graphs, pie charts, scatter plots	7 Hrs
Unit 2	**Analytical Tools and Engineering Applications:** Logical and Conditional Functions, VLOOKUP and HLOOKUP basics Retrieving values from rate lists or standard data sheets, Working with Tables and Named Ranges, Using Excel for material quantity estimation, Simple cost estimation models for small projects, Basic Data Analysis Tools	8 Hrs

List of Practicals:

Minimum eight practicals from the list below:

1. Study and prepare a formatted inventory sheet of construction materials.
2. Determine area of slabs and walls using Excel formulas.
3. Determine volume of beams and columns on Excel sheet of given data.
4. Study and prepare Material Quantities sheet for a Residential Unit.
5. Determine costs of material using lookup functions.
6. Study of soil test data using descriptive statistics.
7. Study and prepare Measurement sheet on excel for cement, sand, and aggregate requirements for given data.
8. Study and prepare a report on pass/fail status of cube compressive strength.
9. Study and Compare supplier material rates and select economical option.
10. Study and Monitor construction project progress in Excel.

Text Books:

1. An Introduction to Excel for Civil Engineers: From Engineering Theory to Excel Practice, Gunthar Pangaribuan

Reference Books:

1. Excel for Engineers and Scientists, Sylvan Charles Bloch
2. Estimation and Costing, B. N. Datta & B. S. Patil
3. Excel: Quick start Guide from Beginner to Expert (Excel, Microsoft Office7, William Fischer.
4. Excel 2016 Bible-John Walkenbach.

E Resources:

1. Microsoft Excel Functions and Formulas by Bernd Held https://books.google.co.in/books?id=WDjdSSbFJKcC&lpg=PR2&pg=PA39#v=twopage&q&f=false
2. https://corporatefinanceinstitute.com/resources/excel/basic-excel-formulas-beginners/
3. https://www.simplilearn.com/tutorials/excel-tutorial/excel-formulas
4. https://www.smartsheet.com/how-to-make-charts-in-excel
5. https://www.w3schools.com/excel/excel_formulas.php
6. https://www.datacamp.com/tutorial/basic-excel-formulas-for-everyone

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1CE109VS1.1	3	2	-	-	3	-	-	-	-	-	2
1CE109VS1.2	3	3	-	3	3	-	-	-	-	-	-
1CE109VS1.3	3	2	-	-	3	-	-	3	-	-	3
1CE109VS1CO	3	3	-	1	3	-	-	1	-	-	2

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

<table>
<tr><td>Level: 4.5</td><td colspan="3">Course Code: 1CS109VS1</td><td colspan="2">Course Category: VSC</td></tr>
<tr><td>Course Name</td><td colspan="5">Introduction to Web Technology</td></tr>
<tr><td>Credits</td><td>02</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60 Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>-</td><td>CIA Marks</td><td>-</td></tr>
<tr><td>EE Marks</td><td>25</td><td>PA Marks</td><td>25</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:
Subject Code 1CS109VS1 Introduction to Web Technology is a compulsory Vocational Program Course for First Year Computer Science and Engineering.

Course Objectives:
The objective of the course is to introduce the fundamental concepts of the Web, internet protocols, and web architecture; to familiarize students with front-end web development technologies such as HTML, CSS, and JavaScript; to provide hands-on experience in designing and developing interactive web pages using scripting and styling techniques.

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

CO	Course Outcome	Domain Level
1CS109VS1.1	Apply the fundamental structure of HTML and CSS, prepare static web pages using basic tags and styles to recognize the importance of semantic coding and accessibility in web development.	C-3, P-2, A-1
1CS109VS1.2	Apply the role of web browsers and servers in delivering web content, prepare navigation through hyperlinks and forms using HTML and CSS, to express a responsible attitude towards ethical web design and user experience.	C-3 , P-2 A-3
1CS109VS1.3	Apply JavaScript concepts to manipulate the DOM and handle events, execute interactive web pages with animations and responsive layouts, to practice continuous learning and innovation in front-end technologies.	C-3, P-5, A-2

Course Contents:

Unit 1	**Introduction to Web Technologies** Overview of the Internet and Web: Understanding the internet, web browsers, and web servers.HTML Basics: Introduction, structure of an HTML document, commonly used tags (headings, paragraphs, links, images, lists, tables, forms).CSS Basics: Introduction, inline, internal, and external CSS, selectors, properties, and values. Advanced HTML and CSS: HTML5 Features: Semantic elements (header, footer, article, section), multimedia (audio, video), forms and form elements.CSS3 Features: Box model, flexbox, grid layout, CSS transitions and animations. Responsive Web Design: Media queries, mobile-first design, responsive frameworks eg. Bootstrap.	9Hrs
Unit 2	**Introduction to JavaScript and Web Development Tools** JavaScript Basics: Variables, data types, operators, control structures (if, switch, loops), functions. DOM Manipulation: Selecting and manipulating HTML elements, event handling. Web Development Tools: Introduction to code editors (eg.VSCode), browser developer tools, version control (Git basics).	6Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below:

1. Introduction to HTML.
2. Write a HTML program for demonstration of (a)Unordered List, (b)Ordered List
3. Write a HTML program for demonstrating Hyperlinks (a)Navigation from one page to other (b)Navigation within page
4. Write a HTML program to create table.
5. Write a HTML program to develop a static Registration form.
6. Write a HTML program to style webpage using external, inline and internal CSS.
7. Write a HTML program to embed audio element in a web page.
8. Write a HTML program to embed video element in a web page.
9. Write a HTML program to implement event handling in JavaScript.
10. Write a HTML program to implement Z-index property in CSS Layout.
11. Write a HTML program to create responsive image gallery using CSS
12. Write a HTML program to implement JavaScript, HTML, and DOM animation.

Text Books:

1. HTML & CSS: Design and Build Web Sites,Jon Duckett.
2. Eloquent JavaScript, Marijn Haverbeke.

Reference Books:

1. HTML & CSS: The Complete Reference, Thomas A. Powell
2. Internet and Web Technologies, Raj Kamal

3. Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP,IvanBayross.

E-Resources:
1. MDN Web Docs (by Mozilla) – Free, trusted source for HTML, CSS, and
2. JavaScript documentation. https://developer.mozilla.org
3. Visual Studio Code Docs – Official guide for using VSCode. https://code.visualstudio.com/doc
4. w3schools https://www.w3schools.com w3schools online web tutorials
5. https://codepen.io

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1CS109VS1.1	3	2	3	-	3	2	-	2	2	-	-
1CS109VS1.2	3	2	3	-	3	2	-	2	1	1	-
1CS109VS1.3	3	3	3	-	3	1	-	2	1	1	-
1CE104ES1CO	3	2	3	-	3	2	-	2	1	1	-

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

<table>
<tr><td>Level: 4.5</td><td colspan="3">Course Code: 1EE109VS1</td><td colspan="2">Course Category: VSC</td></tr>
<tr><td>Course Name</td><td colspan="5">Electronics Technology</td></tr>
<tr><td>Credits</td><td>02</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60 Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>--</td><td>CIA Marks</td><td>--</td></tr>
<tr><td>EE Marks</td><td>25</td><td>PA Marks</td><td>25</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:

Subject Code 1EE109VS1 Electronics technology is a Vocational & Skill Enhancement Course for First Year B. Tech. Electrical Engineering.

Course Objectives:

The objective of this course is to enables learners with different terminologies, fundamental knowledge of electronics components, devices.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
1EE109VS1.1	Identify basic electronic components and analyse the characteristics of PN junction diodes and transistors for their applications in electronic circuits.	C-3
1EE109VS1.2	Demonstrate the use of basic electronic components and prototyping tools by identifying their structure, connections, and characteristics to understand their applications in electronic circuits.	C-3, P-1
1EE109VS1.3	Practice basic electronic circuits, measure voltage using CRO, and develop a regulated power supply through soldering techniques.	C-3, P-3

Course Contents:

Unit 1	**Introduction to electronics component:** Overview of electronics components, diodes, transistors and ICs. **Measuring Instruments and Equipment's**: Digital Multimeter (DMM), Oscilloscope, Function Generator, and Power Supply.	7 Hrs
Unit 2	**Circuit Designing Techniques:** Breadboard fundamentals, Design different circuit on breadboard. **Soldering Techniques:** Soldering tools and materials. PCB design and Fabrication, Introduction to PCB design software, PCB layout and design principle, PCB fabrication process.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

3. Identify various electronics components.
4. Verify & plot the characteristics of P N junction diode.
5. Verify & plot the characteristics of transistor.
6. Verify & plot the characteristics of Zener diode.
7. Construct a circuit on breadboard by using electronics components.
8. Build a simple circuit on breadboard i) LED blinking circuit.
9. Measure AC & DC voltage using CRO.
10. Construct simple 5v regulated power supply by soldering techniques.
11. Performance Analysis of Half Wave Rectifier using Diode.
12. Perform Charging of an RC Circuit with DC Excitation.

Text-Books:

1. D.P. Kothari & I. J. Nagrath, Basic Electronics, McGraw Hill Education publication.
2. V.K. Mehta & Rohit Mehta, Principles of Electronics, S Chand publication.
3. Muhammad H. Rashid, Power Electronics Circuits, Devices and Applications, Pearson Education publication.

Reference Books:

1. A.K. Sahney, Electrical & Electronic Measurement and Instrumentation, DhanpatRai publication.
2. SantiramKal, Basic Electronics: Devices, Circuits and IT Fundamentals, Prentice Hall India publication.
3. Thomas L. Floyd, Electronic Devices (Conventional Current Version), Pearson Education publication
4. H. S. Kalsi, Electronic Instrumentation, McGraw Hill Education publication

E-Resources:

1. https://be-iitkgp.vlabs.ac.in/exp/characteristics-diode/
2. https://be-iitkgp.vlabs.ac.in/exp/voltage-regulator/
3. https://be-iitkgp.vlabs.ac.in/exp/half-wave-rectification/
4. https://be-iitkgp.vlabs.ac.in/exp/differentiator-integrator/
5. https://www.nietanugul.edu.in/files/4th%20Sem_Etc%20Engg_AEC_Lecture%20Note.pdf
6. https://elearn.nptel.ac.in/shop/nptel/basic-electronics/?v=c86ee0d9d7ed

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1EE109VS1.1	3	2	-	-	-	-	-	-	-	-	-
1EE109VS1.2	2	3	-	-	-	-	-	-	-	-	-
1EE109VS1.3	2	2	-	3	-	-	-	2	2	-	-
1EE109VS1CO	2	2	-	1	-	-	-	1	1	-	-

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

Level: **4.5**	Course Code: **1ET109VS1**			Course Category: **VSC**	
Course Name	**Electronic Workshop**				
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 1ET109VS1 Electronic Workshop is a compulsory Vocational and Skill Enhancement Course for First Year B.Tech. Electronics and Telecommunication Engineering program.

Course Objectives:
The course aims to deepen students' understanding of passive and active electronic components, their applications in fundamental circuits, and to equip them with practical skills to assemble and test simple electronic circuits using PCB layouts.

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

CO	Course Outcome	Domain Level
1ET109VS1.1	Identify passive and active components and their measurements using appropriate tools and techniques.	C-1,P-4
1ET109VS1.2	Apply the knowledge of PCB design rules to prepare PCB layout.	C-3
1ET109VS1.3	Apply assembly and soldering techniques to verify functioning of PCB circuits.	C-3,P-4

Course Contents:

Unit 1	**Introduction to basic Electronic Components:** Identification and classification of passive components: Resistance, Capacitor, Inductor, Active components: Diode, Zener Diode, Transistor, LEDs. Testing of Passive and Active components.	7 Hrs
Unit 2	**PCB Manufacturing Process**: Introduction, Preparation of single sided PCB, PCB layout, soldering techniques, etching, cleaning, drying and drilling. Introduction to layout designing tools, Assembling and testing of circuits using basic components with PCB.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Identification of electronic active & passive components.
2. Identification and Measurement of resistor by color code.
3. Identification of different inductors, capacitors and measurement using LCR meter.
4. Testing of active & passive components by CRO.
5. Verification of characteristics of P N junction diode.
6. Verification of characteristics of transistor.
7. Verification of characteristics of Zener diode.
8. Construction of basic electronic circuits on breadboard using active & passive components.
9. Prepare circuit artwork & layout using PCB layout software.
10. Soldering techniques in PCB manufacturing.
11. Developing a single-sided PCB for electronic circuit.
12. Construct simple 5v regulated power supply by soldering techniques.

Text Books

1. R. S. Khandpur, Printed Circuit Boards: Design, Fabrication, and Assembly, McGraw-Hill, 1st Edition.
2. David A. Bell, Electronic Devices and Circuits, Oxford University Press, 5th Edition.
3. A.K. Sawhney, Puneet Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, DHANPAT RAI & Co. (PVT.) Ltd. 19th Edition.

Reference Books

1. Thomas L. Floyd, Electronic Devices, Pearson Education, 10th Edition.
2. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson Education, 11th Edition.
3. IPC Standards for PCB Design, IPC International, Inc.

E- Resources

1. https://everycircuit.com/
2. https://www.circuitlab.com/
3. https://be-iitkgp.vlabs.ac.in/List%20of%20experiments.html
4. https://be-iitkgp.vlabs.ac.in/exp/characteristics-diode/
5. https://be-iitkgp.vlabs.ac.in/exp/voltage-regulator/
6. https://elearn.nptel.ac.in/shop/nptel/basic-electronics/?v=c86ee0d9d7ed

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1ET109VS1.1	3	2	2	-	2	-	-	2	2	-	-
1ET109VS1.2	3	2	2	-	3	-	-	2	-	-	-
1ET109VS1.3	2	2	2	-	2	-	-	2	3	-	-
1ET109VS1CO	3	3	2	-	2	-	-	2	2	-	-

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

Level: **4.5**	Course Code: **1ME109VS1**			Course Category: **VSC**	
Course Name	**Computer Aided Drafting with CATIA**				
Credits	**2**	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 1ME109VS1 Computer Aided Drafting with CATIA is a compulsory Vocational Skill Course for First Year B. Tech. Mechanical Engineering students.

Course Objectives:
To provide fundamental knowledge of a Computer Aided Drafting (CAD) and get acquainted with the concept of CAD with CATIA software.

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

CO	Course Outcome	Domain Level
1ME109VS1.1	Demonstrate User Interface layout to navigate effectively across different CATIA workbenches.	C-3
1ME109VS1.2	Apply foundational skills in 2D profile creation for various design applications	C-3, P-5
1ME109VS1.3	Examine fully constrained profiles for advanced CAD modeling tasks.	C-3

Course Contents:

Unit 1	**Computer Aided Drafting (CAD):** Need and importance of a CAD technology in Mechanical Engineering, Core function, benefits, limitations and applications. Introduction to various CAD software and its user interface. Overview of CATIA and types of core workbenches. Study of view manipulation tools and drawing tree in user interface. Definition and importance of drafting, Various types of drafting.	7 Hrs
Unit 2	**Sketcher Workbench of CATIA software**: Various types of Toolbars in Sketcher Workbench. Simple geometrical profiles and different operations performed in Sketcher module. Types and techniques of constraints. Introduction to tool bars and different operations in Part Modeling.	8 Hrs

List of Practicals:
Minimum Eight practicals from the list mentioned below.
1. Study and explore User Interface of CATIA Software
2. Study and overview of different workbenches in CATIA Software
4. Study of View Tools and Drawing Tree in CATIA Software
5. Drawing Geometrical Shapes in Sketcher Workbench
6. Use of Standard Toolbars in Sketcher Workbench.
7. Create sketches using Geometric and Dimensional Constraints.
8. Perform various operations such as Trim, Offset and Mirror.
9. Create a Fully Constrained Sketch of any Mechanical Part.
10. Demonstration of Part Modeling.

Text Books:
1. Prof. Sham Tickoo, CATIA V5-6R2015.
2. M. Groover and E. Zimmers, Computer Aided Design and Manufacturing.
3. P. N. Rao, A Textbook of Computer Aided Design (CAD).

Reference Books:
1. Nader G. Zamani, CATIA V5 Tutorials.
2. Randy H. Shih, Parametric Modeling with CATIA V5.

E-Resources:
1. https://www.everettcc.edu/ccec/catia
2. http://vlabs.iitkgp.ac.in/vlt/

Mapping of COs with Pos

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1ME109VS1.1	3	-	-	-	3	-	-	2	2	-	-
1ME109VS1.2	3	2	-	-	3	-	-	2	2	-	-
1ME109VS1.3	3	3	3	-	3	-	-	2	2	-	-
1ME109VS1	3	2	1	-	3	-	-	2	2	-	-

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

Level: **4.5**	Course Code: **1TX109VS1**			Course Category: **VSC**	
Course Name	**Fashion Designing**				
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	**25**	PA Marks	**25**	Total Marks	**50**

Course Description:
Subject 1TX109VS1 Fashion Designing is a Vocational & Skill Enhancement Course for First year B. Tech. Textile Engineering program.

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 (COs)
After completing the course students will be able to:

CO	Course Outcomes	Domain Level
CO1	Illustrate fundamental research and design techniques to explore historical, contemporary and client-based fashion concepts for holistic understanding of the fashion industry.	C-2
CO2	Demonstrate technical skills in fashion visualization, mood/storyboard creation and flat garment drawing to communicate design ideas.	C-3 & P-5
CO3	Apply and executive foundational skills in drawing fashion figures, color theory to prepare flats	C-3 & P-5

Course Contents:

Unit 1	**Fashion Research, Concept Development, and Client-based Design** History of fashion and blending of historical aesthetics with Contemporary changes Influence of social, cultural, and economical factors on consumer behaviour, Fashion forecasting, market survey, creating era based fashion board's, Visual communication of design, Understanding client briefs.	8 Hrs
Unit 2	**Fashion Illustration, color Theory, and Technical Drawing of Garments** Mechanical Drawing of figure, Fashion Illustration, of mail, female and kids. Elements and Principles of design, Colour theory and its applications in fashion designing, Garment Flats and Technical Drawing of pattern.	7 Hrs

List of Practical Experiments

1. Study of Fashion History and Current Fashion Trends
2. Study of Market and Analye current fashion trends
3. Study of Creating Fashion Board of Era with Contemporary Changes
4. Study of Illustration of Mechanical and Fashion Figure
5. Study of Creating Mood Board and Storyboard.
6. Study of Portfolio Designing for Client
7. Study of the Illustration Using Elements of Design: Line, Shape, and Silhouette and color harmony
8. Prepare Flats of Garment with detailing.
9. Prepare technical drawing and specification of garment.

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. Creation
5. Bina Abling, Fashion Sketchbook

Reference Books:

1. Anna Kiper, Fashion Illustration: Inspiration and Technique
2. JoenWolfrom,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
2. boards, and portfolio preparation.)
   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										
	1	2	3	4	5	6	7	8	9	10	11
1TX109VS1.1	1	-	-	-	2	-	-		2	-	-
1TX109VS1.2	-	-	-	-	2	-	-	-	3	-	-
1TX109VS1.3	3	-	-	-	3	-	-	-	-	-	-
1TX109VS 1CO	2	-	-	-	2	-	-	-	2	-	-

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

14.3 Syllabus for compulsory programme core courses

<table>
<tr><td>Level: 4.5</td><td colspan="3">Course Code: 2CH116PC1</td><td colspan="2">Course Category: PC</td></tr>
<tr><td>Course Name</td><td colspan="5">Elements of Chemical Engineering</td></tr>
<tr><td>Credits</td><td>02</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60 Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>--</td><td>CIA Marks</td><td>--</td></tr>
<tr><td>EE Marks</td><td>--</td><td>PA Marks</td><td>50</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:
Subject Code 2CH116PC1 Chemical Engineering Processes is a compulsory Chemical Engineering Course for First Year B. Tech.

Course Objectives:
The objective of this course is to acquaint students with core principles of chemical engineering, develop practical understanding of transport operations, familiarize them with process equipment, and build skills in analyzing experimental data through design-thinking.

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

CO	Course Outcome	Domain Level
2CH116PC1.1	Explain the fundamental principles of fluid flow, heat transfer, and mass transfer operations along with the working of associated equipment.	C-2
2CH116PC1.2	Experiments on fluid flow, heat transfer, and separation processes to measure, and validate theoretical principles using laboratory apparatus.	C-3, P-7
2CH116PC1.3	Examine experimental results and process data to identify efficiency, operational limitations, and show improvements in transport and separation operations considering safety and sustainability.	C-3, P-2

Course Contents:

Unit 1	**Fundamentals of Chemical Engineering** Scope and role of chemical engineering in the process industry, Laboratory safety protocols, ethics, and sustainable practices, Basic chemical process calculations: Units and dimensions, Concept of unit operations and unit processes, Flow of fluids: Types of fluids, flow regimes, Bernoulli's equation (statement and significance), Measurement of flow: Orifice meter, Venturi meter, Rotameter (principles & applications), Practical integration: Mini-task to identify potential safety and design improvements in flow measurement setups.	7 Hrs
Unit 2	**Introduction to Transport and Separation Operations** Heat transfer mechanisms: Conduction, convection, radiation – basics with examples, Types of heat exchangers and their applications, Mass transfer basics: Diffusion, absorption, distillation – introduction to equipment (packed/tray columns, dryers, crystallizers), Drying and crystallization: Industrial relevance and operational concepts, Practical integration: Mini-design task to propose modifications for improved efficiency, sustainability, or cost-effectiveness.	8 Hrs

List of Practicals:

Minimum eight practical's from the list below:

1. Verification of Bernoulli's Theorem.
2. Calibration of Orifice Meter.
3. Calibration of Venturi Meter.
4. Calibration and Flow Rate Measurement using Rotameter.
5. Heat Transfer Coefficient – Natural Convection Apparatus
6. Heat Transfer Coefficient – Forced Convection Setup
7. Heat Transfer via Conduction, Convection & Radiation
8. Study of Simple Distillation Operation
9. Drying Rate Study using Tray Dryer
10. Crystallization – Crystal Growth and Yield Calculation

Text Books:

1. Introduction to Chemical Engineering, W.L. Badger and J.T. Banchero, McGraw-Hill.
2. Basic Principles and Calculations in Chemical Engineering, D.M. Himmelblau, Prentice Hall.
3. Fundamentals of Chemical Engineering, K.A. Gavhane.
4. Introduction to Heat & Mass Transfer, S.D. Dawande.

Reference Books:

1. Introduction to Chemical Engineering, Ghosal, Sanyal and Datta, TMH.
2. Unit Operations of Chemical Engineering, McCabe, Smith, Harriott, McGraw-Hill.
3. Process Instrumentation and Control, A.P. Kulkarni.

E-Resources:

1. https://uta.pressbooks.pub/appliedfluidmechanics/chapter/experiment-2/
2. https://www.philadelphia.edu.jo/academics/waraydah/uploads/Flow%20Measurements.pdf
3. https://fm-nitk.vlabs.ac.in/exp/venturimeter/theory.html
4. https://uorepc-nitk.vlabs.ac.in/exp/flow-through-venturi-meter/theory.html

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
2CH116PC1.1	3	2	1	-	2	1	-	-	-	-	-
2CH116PC1.2	2	2	-	3	3	-	-	2	2	-	-
2CH116PC1.3	-	3	-	3	2	3	1	-	-	-	-
2CH116PC1 CO	2	2	-	2	2	1	-	1	1	-	-

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

<table>
<tr><td colspan="2">Level: 4.5</td><td colspan="2">Course Code: 2CE116PC1</td><td colspan="2">Course Category: PCC</td></tr>
<tr><td>Course Name</td><td colspan="5">Basics of Civil Engineering & Building Construction</td></tr>
<tr><td>Credits</td><td>02</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60 Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>--</td><td>CIA Marks</td><td>--</td></tr>
<tr><td>EE Marks</td><td>--</td><td>PA Marks</td><td>50</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:

Subject Code 2CE116PC1Basics of Civil Engineering and Building Construction is a compulsory Profession Core Course for First Year B.Tech. in Civil Engineering.

Course Objectives:

The objective of this course is to introduce fundamental concepts of civil engineering, building components, structural loads, and sustainable practices, enabling students to identify materials, interpret codes, and conceptualize basic structures.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
2CE116PC1.1	Explain the scope of civil engineering, various building components, types of structures, and relevant IS codes for infrastructure development.	C-2
2CE116PC1.2	Determine construction materials, building types, and components as per NBC/IS codes, and reproduce them through basic models or sketches to ensure code-compliant construction practices.	C-3 & P-3
2CE116PC1.3	Demonstrate skills to perform the laboratory experiments individually or in teams while showing concern towards sustainable building practices.	C-3, P-4 & A-3

Course Contents:

Unit 1	**Scope of Civil Engineering:** Various disciplines of Civil engineering, Importance of Civil engineering in infrastructure development of the country. Introduction to types of buildings as per NBC	7 Hrs
Unit 2	**Components of a Building:** Substructure: foundation, Superstructure: walls, slabs, beams, columns, roof, windows, doors (with diagrams), Framed Structures, Load Bearing structures, Introduction to types of loads: dead load, live load, wind load, IS Codes	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below:

1. Study of basic construction materials (Cement, aggregates, bricks, steel)
2. Study of types of buildings as per National Building Code.
3. Study and representation of building components (drawings or models of foundation, column, beam,)
4. Study of relevant IS Codes in construction (IS 456, IS 875, and other applicable codes)
5. Study of load-bearing and framed structures (using diagrams or models)
6. Study of structural loads and their effects (dead load, live load, wind load – demonstrations and calculations)
7. Study of conceptual planning of residential buildings (sketches, layouts, or presentations)
8. Study of basic building components and structural systems through model making and visualization techniques
9. Study of sustainable and innovative building techniques (case studies or poster presentations on green roofs, prefabricated walls,)

Text Books:

1. Basic Civil Engineering, Bhavikatti, S. S., New Age.
2. Building Construction, B.C. Punmia

Reference Books:

1. Basic Civil Engineering, Gopi, S., Pearson Publication
2. National Building Code of India (NBC 2016), Part 3 – Classification of buildings
3. Building Construction, P. C. Verghese PHI Learning Pvt. Ltd.
4. Building Materials and Construction, S.C. Rangwala
5. IS 875 (Part 1–3):1987, Dead Load, Live Load, Wind Load
6. NBC 2016, Building component terminology and structure types

E Resources:

1. NPTEL Course: Introduction to Civil Engineering Profession, by Prof. Ravindra Gettu, Prof. Koshy Varghese, IIT Madras. https://onlinecourses.nptel.ac.in/noc25_ce35/preview
2. NPTEL Course - Building Materials and Construction by Dr. B. Bhattacharjee IIT Delhi https://nptel.ac.in/courses/105102088

Mapping of COs with Pos

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
2CE116PC1.1	3	1	-	-	-	-	-	-	-	-	-
2CE116PC1.2	3	1	-	-	-	-	-	2	3	-	-
2CE116PC1.3	3	1	-	-	-	2	2	3	3	-	-
2CE116PC1CO	3	1	-	-	-	1	1	2	2	-	-

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

<table>
<tr><td>Level: 4.5</td><td colspan="3">Course Code: 2CS116PC1</td><td colspan="2">Course Category: PCC</td></tr>
<tr><td>Course Name</td><td colspan="5">AI Fundamentals</td></tr>
<tr><td>Credits</td><td>02</td><td rowspan="2">Total L: T:P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60 Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>--</td><td>CIA Marks</td><td>--</td></tr>
<tr><td>EE Marks</td><td>--</td><td>PA Marks</td><td>50</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:
Subject Code 2CS116PC1AI Fundamentals is a compulsory Program Core Course for First Year B.Tech. Computer Science And Engineering.

Course Objectives:
This course covers AI fundamentals concepts, history, principles, benefits, and risks highlighting its role in automation, decision-making, and intelligent behavior. Students gain skills in search strategies, intelligent agents, and knowledge representation, with practical learning through PROLOG programming.

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

CO	Course Outcome	Domain Level
2CS116PC1.1	Demonstrate writing and executing PROLOG programs using related facts, rules, and arithmetic to solve logical and mathematical problems.	C-3, P-5, A-4
2CS116PC1.2	Examine PROLOG programs to execute recursive algorithms and search strategies for combinatorial and optimization problems for enabling real-world applications in AI-based problem solving.	C-3, P-5, A-5
2CS116PC1.3	Solve complex AI problems in PROLOG by adapting heuristic and search-based approaches, expressing applications in intelligent systems, optimization, NLP, and decision support.	C-3, P-6, A-3

Course Contents:

Unit 1	**Introduction to AI**, **Problem Solving through AI** What is AI Foundations of Artificial Intelligence, History of Artificial Intelligence, Risks and Benefits of AI Problem Solving through AI Intelligent Agents: Agents and Environments, Search Strategies for Problem Solving, Uninformed Search Strategies: Breadth-First Search, Depth-First Search, Bidirectional Search, Iterative Deepening Depth-First Search Informed Search Strategies: Basic Concept of Heuristic Search, Generate-And-Test, Best-First Search, Means-Ends Analysis.	8 Hrs
Unit 2	**Knowledge Systems and Knowledge Representation** Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management Basic Concepts of Knowledge Engineering	7 Hrs

List of Practicals:

Minimum 8 practicals from the list mentioned below.

1. Study of PROLOG Programming language and its Functions.
2. Write simple facts and rules.
3. Write a program in PROLOG to implement simple arithmetic
4. Write a program to implement Factorial, of a given number
5. Write a program to Implement Depth First Search using PROLOG
6. Write a program to solve the Monkey Banana problem
7. Write a program to Implement Breadth First Search for Tic-Tac-Toe problem.
8. Write a program to solve N-Queen problem.
9. Write a program to solve 8-puzzle problem using Best First Search.
10. Write a program to implement Fibonacci of a given number

Text Books:

1. Artificial Intelligence: Stuart Russell & Peter Norvig A Modern Approach (Pearson - 4th Ed.)
2. Bratko's Prolog Programming for AI -direct focus on PROLOG in AI.

Reference Books:

1. Artificial Intelligence by Elaine Rich and Kevin Knight (Tata McGraw Hill – 3rd Ed.)
2. A First Course in Artificial Intelligence by Deepak Khemani (Tata McGraw Hill - 1st Ed.)
3. Artificial Intelligence and Expert Systems by Patterson (PHI)
4. Artificial Intelligence by Ela Kumar (IK International Publishing House Pvt. Ltd.)

E-Resources:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2020/
2. SWISH: SWI-Prolog Online Tutorials point Prolog Compiler

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2CS116PC1.1	3	2	2	1	2	-	-	2	1	-	-
2CS116PC1.2	3	3	3	2	3	-	-	2	2	-	-
2CS116PC1.3	3	3	3	3	3	2	-	3	2	-	-
2CS116PC1CO	3	3	3	2	3	1	-	2	2	-	-

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

Level: **4.5**	Course Code: **2EE116PC1**			Course Category: **PCC**	
Course Name	**Electrical Technology**				
Credits	**02**	Total L:T:P Hours	1:0:2 **45 Hrs**	Total SL Hours	**15Hrs**
Total Credit Hours	**60 Hrs**				
SEE Marks	**--**	SEE Time	**--**	CIA Marks	**--**
EE Marks	**--**	PA Marks	**50**	Total Marks	**50**

Course Description:
Subject Code 2EE116PC1Electrical Technology is a program core course for First Year B. Tech. Electrical Engineering.

Course Objectives:
The objective of this course is to enable learners with practical hands on experience and essential skill in electrical system.

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

CO	Course Outcome	Domain Level
2EE116PC1.1	Demonstrate the experiments involving Resistance, Inductance, Capacitance, and fundamental Electrical Engineering concepts.	C-3 &P-5
2EE116PC1.2	Analyze experimental results to verify and validate theoretical principles of Electrical Engineering.	C-3
2EE116PC1.3	Demonstrate appropriate electrical materials, tools, and protective devices for electrical installations.	C-3, P-1

Course Contents:

Unit 1	**Introduction to electrical component and its measurement:** Electrical Symbols and abbreviations, Colour coding of Resistor, Inductor, Capacitor, Measurement of these elements by using Digital multimeter (DMM), Ammeter, Voltmeter and Wattmeter.	8 Hrs
Unit 2	**Electrical Materials:** Types of wires and cables, Switches, Fuses, Holders, Sockets, Plugs, MCBs, Insulating materials, Different types of domestic wiring diagram, Switch Board and Panel board.	7 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Identify various electrical components.
2. Determine colour code and value of resistor.
3. Determine the value of capacitor using capacitor identification code
4. Verify capacitor charging and discharging.
5. Measure the unknown value of resistance using ammeter and voltmeter.
6. Identify different electrical wiring accessories.
7. Verify the operation of fuse and MCB under overload and short circuit condition.
8. Develop staircase wiring by two way switch.
9. Design a 12 Module switch board.

Text books :

1) C S Indulkar,An Introduction to Electrical Engineering Materials, S. Chand.
2) Charles K.Alexander, Mattew N.O.Saidiku, Fundamentals of Electrical Circuits, Tata. McGraw Hill Company.

Reference Books:

1) SurjitSingh, Electrical design estimating and costing,Publisher, DhanpatRai& Company (P) Limited, 1998.
2) J.B.GuptaElectrical Measurements and Measuring Instruments Publication S.K. Kataria& Sons, Edition : 6th 2016.

E-Resources:

1. https://be-iitkgp.vlabs.ac.in/exp/familiarisation-resistor/
2. https://be-iitkgp.vlabs.ac.in/exp/familiarisation-capacitor/
3. https://bes-iitr.vlabs.ac.in/exp/electrical-equipments/
4. https://bes-iitr.vlabs.ac.in/exp/power-factor/
5. https://pdfcoffee.com/-electrical-estimating-and-costing-pdf-free.html

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
2EE116PC1.1	3	1	-	-	2	-	-	3		-	-
2EE116PC1.2	3	1	-	-	-	-	-	-		-	-
2EE116PC1.3	3	1	-	-	2	-	-	3		-	-
2EE116PC1CO	3	1	-	-	2	-	-	2		-	-

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

Level: **4.5**	Course Code: **2ET116PC1**			Course Category: **PCC**	
Course Name	**Introduction to Digital Logic**				
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 2ET116PC1 Introduction to Digital Logic is a compulsory Program Core Course for First Year B. Tech. Electronics & Telecommunication Engineering program.

Course Objectives:
The objective of the course is to provide the basic knowledge of digital circuits to implement various digital systems. It includes simplification of Boolean expressions; logic gates based implementation of basic combinational and sequential logic circuits.

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

CO	Course Outcome	Domain Level
2ET121VS1.1	Identify different logic gate ICs and demonstrate its use to implement Boolean expressions.	C-3 & P-5
2ET121VS1.2	Use logic gate ICs to demonstrate combinational logic circuits.	C-3 & P-5
2ET121VS1.3	Apply the concept of flip flops to implement asynchronous counters using flip flops.	C-3 & P-5

Course Contents:

Unit 1	**Boolean Algebra and Logic Gates:** Boolean Algebra, Boolean Laws, De-Morgan's Theorem, Simplifications of logic expression using Boolean Algebra, Logic gates and their truth table, Universal Gates, Realization of logic gate using Universal gates, SOP and POS form of logic expression, Realization of logic expression using basic and universal gates.	7 Hrs
Unit 2	**Karnaugh Map and Introduction to Combinational & Sequential Logic Circuits:** Simplifications of logic expressions using Karnaugh-Map upto 4 variables, Introduction to combinational logic circuits such as Adder, Subtractor, Multiplexer, Demultiplexer, Introduction to Flip Flops, Asynchronous counters using flip flops.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Verification of the truth table of logic gates.
2. Realization of basic gates using universal gates.
3. Realization of logic expression using logic gates.
4. Implementation of half adder and full adder using logic gates.
5. Implementation of half subtractor and full subtractor using logic gates.
6. Implementation of 2:1 Multiplexer using logic gates.
7. Implementation of 1:2 Demultiplexer using logic gates.
8. Verify the operation of Flip Flops.
9. Verify the operation of 4 bit asynchronous up counter.
10. Verify the operation of 4 bit asynchronous down counter.

Text Books

4. M. Morrios Mano, Digital Design, Prentice-Hall India
5. Anand Kumar, Switching Theory and Logic Design,Prentice-Hall India
6. R. P. Jain, Modern Digital Electronics,TMH

Reference Books

4. Samuel C. Lee, Digital Circuits and Logic Design,PHI
5. Charles H. Roth, Fundamentals of Logic Design, Jaico Publication
6. G. K. Kharate, Digital Electronics, Oxford University Press

E- Resources

1. SWAYAM online course on Digital Electronics (4 Week Course)
2. E Book: "Digital Electronics Principals, Devices and Applications' by A. K. Maini
3. Virtual Lab on Digital Electronics: https://de-iitr.vlabs.ac.in

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2ET121VS1.1	3	1	-	-	-	-	-	1	2	-	-
2ET121VS1.1	3	2	1	-	-	-	-	1	2	-	-
2ET121VS1.1	3	2	1	-	-	-	-	1	2	-	-
2ET121VS1CO	3	2	1	-	-	-	-	1	2	-	-

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

Level: **4.5**	Course Code: **2ME116PC1**			Course Category: **PCC**	
Course Name	**Elements of Mechanical Engineering**				
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 2ME116PC1 Elements of Mechanical Engineering is a compulsory Program Core Course for First Year B. Tech. Mechanical Engineering branch.

Course Objectives:
The objective of the course is to present the essential aspects of Engineering Materials and Power Plants, and to develop knowledge related to Manufacturing Processes and Industrial Engineering.

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

CO	Course Outcome	Domain Level
2ME116PC1.1	Demonstrate the working of CNC and ASRS machines for understanding the Flexible manufacturing systems.	C-3
2ME116PC1.2	Apply the acquired knowledge to select suitable energy systems and manufacturing technologies for real-life engineering problems.	C-3
2ME116PC1.3	Participate in a team to plan and present practical knowledge with appropriate documentation.	C-3 & A-2

Course Contents:

Unit 1	**Engineering Materials**: Introduction to Engineering Materials, Classification and Properties. Alloy steel and their applications, Stress-Strain diagram, Hooks law and modulus of elasticity. **Power Plants:** Introduction, working principle of hydroelectric power plant and steam power plant, Alternate sources of energy – solar, wind and tidal power.	7 Hrs

Unit 2	**Manufacturing Processes:** Subtractive, Confirmative and Additive Manufacturing, Machine Tools classification, working principle, surface finishing processes, Introduction to CAM and FMS. **Industrial Engineering:** Introduction to work study, CPM and PERT. Industry-4.0 principles and concepts, Introduction to Robotics.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Study construction and working of Fire Tube Boiler.
2. Study construction and working of Water Tube Boiler.
3. Study construction and working of Boiler Mountings and Accessories.
4. Study construction and working of Solar Still.
5. Demonstration of Hydraulic Turbine.
6. Demonstration of Robotic Arm.
7. Demonstration of 3d Printer.
8. Demonstration of CNC Lathe Machine.
9. Demonstration of CNC Milling Machine.

Text Books:

1. G.S. Sawhney, Fundamentals of Mechanical Engineering, PHI Learning.
2. Basic Mechanical Engineering – Mark's Standard Handbook for Mechanical Engineers, McGraw-Hill.

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://abanoori.itch.io/fire-tube-boiler-vr
2. https://3dp-dei.vlabs.ac.in/?utm
3. https://fab-coep.vlabs.ac.in/exp/3d-machining/?utm
4. https://www.wipropari.com/virtual-commissioning/?utm

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2ME116PC1.1	3	1	-	-	-	-	-	3	2	-	-
2ME116PC1.2	3	1	-	-	-	-	-	-	-	-	-
2ME116PC1.3	3	1	-	-	-	-	-	3	3	-	-
2ME116PC1	3	1	-	-	-	-	-	2	2	-	-

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

<table>
<tr><td>Level: 4.5</td><td colspan="2">Course Code: 2TX116PC1</td><td colspan="3">Course Category: PCC</td></tr>
<tr><td>Course Name</td><td colspan="5">Textile Materials and Products</td></tr>
<tr><td>Credits</td><td>02</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>--</td><td>CIA Marks</td><td>--</td></tr>
<tr><td>EE Marks</td><td>--</td><td>PA Marks</td><td>50</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:

Subject Code 2TX116PC1 Textile Materials and Products is a compulsory Program Core Course for First Year B. Tech. Textile Engineering program.

Course Objectives:

The objective of this course is to present the basic understanding about fiber, yarn types and fabric varieties, and help to identify end-use applications along with practical identification and classification techniques.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
2TX116PC1.1	Demonstrate textile fibers, yarns, and fabrics to understand the various textile materials.	C-3
2TX116PC1.2	Classify textile materials and apply suitable ones for specific end use.	C-3, P-1
2TX116PC1.3	Examine and prepare documentation in standard format for product descriptions.	C-3, P-2

Course Contents:

Unit 1	**Textile Raw Materials and Their Properties :** Diverse textile sectors their interconnectivity and growth potential, Classification of textile fibers (natural, regenerated, synthetic, specialty fibers) Key properties; physical, chemical, and performance aspects, Yarn classification; spun, filament, textured, novelty yarns, Basic tests for fiber and yarn identification	8 Hrs
Unit 2	**Textile Products and Their Applications**: Classification of textile products: apparel, home textiles, industrial textiles, technical textiles, Characteristics and uses of woven, knitted, nonwoven and technical Textiles, Overview of product properties and related performance requirements, Sustainable and eco-friendly textile product trends	7 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Visual identification of textile fibers.
2. Burn test for fiber identification.
3. Microscopic examination of natural and synthetic fibers.
4. Microscopic study of different yarn types.
5. Determination of yarn parameters viz. count, twist using instruments
6. Identification of weave type of woven fabrics.
7. Identification of knit structure of knitted fabrics.
8. Study of home textile products (bed linen, towels, curtains,).
9. Classification of fabrics by end-use performance.
10. Preparation of a textile material and product classification chart.

Text Books

1. Corbman, B.P., Textiles: Fiber to Fabric, McGraw-Hill.
2. Kadolph, S.J., Textiles, Pearson Education.
3. Kothari, V.K., Textile Fibres: Developments and Innovations, IAFL Publications.

Reference Books:

1. Parthasarathi, G., Textile Raw Materials, NCUTE Publication.
2. Sinclair, R., Textiles and Fashion: Materials, Design and Technology, Woodhead Publishing.

E- Resources:

1. NPTEL Course on Textile Fibres and Textile Testing (https://nptel.ac.in)
2. Textile Engineering Labs (https://vlab.co.in)

Mapping of COs with POs

CO	**PO**										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2TX116PC1.1	3	2	-	-	-	-	-	-	-	-	-
2TX116PC1.2	3	2	-	-	-	-	-	-	-	-	-
2TX116PC1.3	3	1	-	-	-	-	-	-	3	-	-
2TX116PC1CO	3	2	-	-	-	-	-	-	1	-	-

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

Level: **4.5**	Course Code: **2CH117IK1**		Course Category: **IKS**		
Course Name	**Traditional Indian Chemical Engineering Practices**				
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 2CH117IK1 Traditional Indian Chemical Engineering Practices is a compulsory Chemical Engineering Course for First Year B. Tech.

Course Objectives:
The objective of this course is to present the introduction to ancient history & historiography of science & Technology to recent era and help to understand Indian knowledge system for future research & social application.

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

CO	**Course Outcome**	**Domain Level**
2CH117IK1.1	Explain the role of ancient civilizations and Indian knowledge systems in chemical engineering, including food, dyes, metallurgy, medicine, and sustainability.	C-2
2CH117IK1.2	Demonstrate traditional techniques for preparing medicines, dyes, perfumes, adhesives, cosmetics, and water purification.	C-3,P-2
2CH117IK1.3	Differentiate the relevance of ancient chemical practices and acknowledge modern times with focus on sustainability, environment, and ethics.	C-2,A-1

Course Contents:

Unit 1	**History and Significance:** Overview of ancient civilizations and their contributions to chemical engineering, Introduction to ancient chemical engineering knowledge, Introduction to ancient Indian techniques such as food culture and practices, origin and making of colors, fuel technology, writing dyes and tools, clothing. Indus civilization, contribution of various personalities in chemical engineering and technology.	7 Hrs
Unit 2	**Preparation of Medicines and Pharmacology: :** Introduction to Ayurveda and Rasashastra: Principles and practices of ancient Indian medicine. Techniques for extracting, processing, and compounding herbal medicines: Study of ancient texts on medicinal properties and applications Environmental. **Sustainable Practices:** Ancient methods of waste management and environmental protection. Environmental conservation. Preservation and revival of traditional chemical knowledge such as fermentation, metallurgy and pottery, Lime mortar, natural resin and adhesives & water purification, perfumes and cosmetics.	8 Hrs

List of Practicals:

Minimum eight practicals from the list below:

1. Water Purification Using Traditional Methods
2. Making Natural Perfumes Using Flower Essences.
3. Making Natural Adhesives from Plant Resins and Gums.
4. To explore ancient techniques of extracting colours from natural sources.
5. Preparation of Ayurvedic Herbal Medicines.
6. Steam Distillation of Essential Oils from Flowers (e.g., Rose, Jasmine).
7. To study the traditional methods of fermentation used for food preservation and other applications.
8. Extraction of Natural Dyes from Plants and Minerals.
9. To prepare simple herbal medicines based on ancient practices.
10. To demonstrate the use of plant-based materials for fuel, similar to ancient methods.

Text Books:

1. B.V. Subbarayappa, A Concise History of Science in India, 2nd Edition (2009)
2. V. Lad, Ayurveda: The Science of Self-Healing, 1st Edition (1994)
3. K. Kapoor & M. Danino, Traditional Knowledge System in India.
4. D. A. Kulkarni, A Textbook of Rasashastra.

Reference Books:

1. O. Levenspiel, Chemical Reaction Engineering (Indian Adaptation), 3rd Edition (2007)
2. Ashis Kumar Samanta, Chemistry and Technology of Natural and Synthetic Dyes and Pigments, 1st Edition (2020)
3. A. K. Bag, The Chemical Philosophy of Rasashastra
4. R. Balasubramaniam, Metallurgy in India – Ancient to Modern

Mapping of COs with POs:

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2CH117IK1.1	3	2	-	-	-	3	2	-	1	-	-
2CH117IK1.2	2	1	-	2	2	3	2	1	1	-	-
2CH117IK1.3	1	2	-	-	-	3	3	1	1	-	-
2CH117IK1 CO	2	2	-	1	1	3	2	1	1	-	-

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

Level: **4.5**	Course Code: **2CE117IK1**			Course Category: **IKS**	
Course Name	**Fundamentals of Vastushastra**				
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 2CE117IK1 Fundamentals of Vastushastra is a compulsory Indian Knowledge System Course for First Year B.Tech. in Civil Engineering.

Course Objectives:

The objective of this course is to introduce students to the fundamental principles, origin, and historical evolution of Vastu Shastra, enabling them to understand its relevance in traditional and modern construction practices.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
2CE117IK1.1	Understand the fundamental principles of Vastu Shastra including Pancha Mahabhutas directions and Vastu Purusha Mandala to implement traditional architectural concepts and their relevance in modern construction.	C-2
2CE117IK1.2	Apply theoretical knowledge of Vastushastra effectively to prepare charts, models, and floor plans for the practical design of buildings and site layouts.	C-3 & P-2
2CE117IK1.3	Analyze sites and existing buildings for Vastu compliance and manipulate suitable modifications while acknowledging the cultural significance and ethical responsibility of integrating Vastu principles in modern construction	C-3, P-4, &A-1

Course Contents:

Unit 1	**Introduction to Vastushastra** Definition and concept of Vastu Shastra, History and origin of Vastu Shastra, Benefits of Vastu in built environments, Fundamental principles of Vastu. Pancha Mahabhuta (Five elements): Earth, Water, Fire, Air & Space. Importance of directions & Vastu Purush Mandala.	07 hrs
Unit 2	**Vastu Applications in Building Construction** Site selection: land slope, soil type, plot shape, and location. Importance of orientation and alignment. Functional placement of rooms as per Vastu: Kitchen, Bathroom, Entrance, Bedroom, Living Room, Puja Room Zoning in residential, commercial, and institutional buildings. Vastu principles for: Foundation layout, Column positioning, Door and entrance placement, Staircase location and direction.	08 hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Study and preparation of Vastu Purush Mandala (9x9 grid).
2. Study of chart/model on Pancha Mahabhuta (five elements).
3. Determination of directions using compass on site as per Vastu Purush Mandala.
4. Study of zoning plan for a Vastu-compliant house (1BHK).
5. Study of Vastu criteria for site slope, soil, and shape
6. Study of directional markings on a Vastu-compliant residential plan.
7. Case study on Vastu analysis of an existing building
8. Study of functional Room Placement Zoning on Floor Plan.
9. Study of foundation Layout according to Vastushastra.

Text Books:

1. Vastu Shastra, Dr. B. B. Puri
2. Science of Vastu, Dr. Anand Bhardwaj
3. Vastu Shastra for Civil Engineers, Prof. A. K. Jain

Reference Books:

1. Vastu Shastra: Guidelines for Architecture, D. N. Shukla
2. National Building Code (NBC),Recommends spatial and functional planning concepts
3. Architecture and Vastu, D.S. Mehta

E Resources:

1. Indian Vastushastra, Dr. Pravesh Vyas, Shri Lal Bahadur Shastri National Sanskrit University, New Delhi (Swayam - https://onlinecourses.swayam2.ac.in/cec20_ar02/preview
2. Vastu for building planning and construction AkashJakatihttps://www.udemy.com/course/vastu-for-building-plan-and-construction/

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2CE117IK1.1	3	-	-	-	-	-	-	-	-	-	-
2CE117IK1.2	3	-	-	-	-	-	-	2	2	-	-
2CE117IK1.3	3	2	3	-	-	3	3	3	3	-	-
2CE117IK1CO	3	1	1	-	-	1	1	2	2	-	-

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

Level: **4.5**	Course Code: **2CS117IK1**		Course Category: **IKS**		
Course Name	**Indian Knowledge Systems for Computer Applications**				
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 2CS117IK1IKS I- Indian Knowledge Systems for Computer Applications is a compulsory Indian Knowledge System Course for First Year Computer Science And Engineering.

Course Objectives:
The objective of the course is that students will develop an appreciation for India's historical advancements and their relevance to contemporary society and professional practices.

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

CO	**Course Outcome**	**Domain Level**
2CS117IK1.1	Describe the role of Indian Knowledge Systems in logic, mathematics, linguistics and explain early computation, and relate them to modern computer science concepts.	C-2, P-2, A-4
2CS117IK1.2	Apply concepts from Sulbasutras, Vedic Mathematics, zero, decimal system, and traditional units of measurement toexecute computational problems and programming tasks.	C-3, P-5
2CS117IK1.3	Demonstrate Indian logical and linguistic traditions to skilfully operate with modern computing applications intergrating Boolean logic and Natural Language Processing.	C-3, P-5, A-4

Course Contents:

Unit 1	**Introduction to Indian Knowledge Systems (IKS) and Computing:** Overview of Indian Knowledge Systems. Role of logic, mathematics, and linguistics in Indian tradition. Early computation ideas: Sulbasutras, Vedic Mathematics. Mapping IKS with modern computer science concepts.	7 Hrs
Unit 2	**Indian Logic and Computer Applications**: The concept of zero and its importance, decimal system, measurement of time, distance and weight, Indian linguistics and Natural Language Processing Boolean parallels in Indian logic systems.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below

1. Construct right angles and simple geometric shapes using rope methods described in the Sulbasutras.
2. Solve arithmetic problems (multiplication, division, squaring,) using Vedic math sutras.
3. Trace the origin of zero and decimal system; solve simple mathematical problems using ancient techniques.
4. Write a simple C program to simulate positional value with zero, showing number expansion (e.g., 407 = 4×100 + 0×10 + 7).
5. Develop a program to convert numbers between decimal and other bases (binary, octal, hexadecimal).
6. Calculate time using traditional Indian units (eg. ghati, nadi) and compare with modern timekeeping.
7. Tokenize and parse any simple Sanskrit sentences (basic Panini grammar rules)
8. Implement a truth table for Boolean operations and relate them to Indian Nyaya logic statements.
9. Write a C program that converts modern time (HH:MM:SS) into traditional Indian units (ghati, pala, vipala).
10. Design a simple program or flowchart that takes Indian Nyaya logic statements and represents them in modern three-valued logic tables (True, False, Uncertain).

Text Books:

1. Introduction to Indian Knowledge System: Concepts and Applications by B.Mahadevan, Vinayak R. Bhat and Nagendra P. R. N.. PHI Learning Private Limited, 2022.
2. Indian Knowledge Systems – An IntroductionBy: Kapil Kapoor & Michel Danino, AICTE Publication (2022)

Reference Books:

1. Computation in Ancient India-Subhash Kak.
2. Indian Mathematics and its Computational Aspects-Natarajan & M. Srinivas.
3. Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study. Shimla. Tatvabodh of sankaracharya, Central chinmay mission trust, Bombay, 1995Kapur K and Singh A. K (Eds) 2005)..

E Resources:

1. Indian Knowledge Systems (General Overview) Link: https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004120632194475nishi_Indian_Knowledge_Systems.pdf
2. Indian Knowledge Systems (General Overview) Link: https://iksindia.org/images/2025/IKS_Textbook_Coursematerial_final.pdf

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2CS117IK1.1	3	2	-	-	-	-	1	2	1	1	1
2CS117IK1.2	3	2	1	-	1	-	-	-	-	-	1
2CS117IK1.3	3	3	2	2	1	-	1	1	-	1	1
1CE104ES1CO	3	2	1	1	1	-	1	1	0	1	1

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

<table>
<tr><td>Level: 4.5</td><td colspan="3">Course Code: 2EE117IK1</td><td colspan="2">Course Category: IKS</td></tr>
<tr><td>Course Name</td><td colspan="5">Origin and Pioneers of VidyutShastra</td></tr>
<tr><td>Credits</td><td>02</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60 Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>--</td><td>CIA Marks</td><td>--</td></tr>
<tr><td>EE Marks</td><td>--</td><td>PA Marks</td><td>50</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:
Subject Code 2EE117IK1 Origin and Pioneers of VidyutShastra is a compulsory Indian Knowledge System Course for First Year B.E. Electrical Engineering.

Course Objectives:
The objective of this course is to study the evolution and development of electrical engineering over time, understand the contributions of global and Indian pioneers in the field, and appreciate its legacy, growth, and future in the practical applications of science and technology.

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

CO	Course Outcome	Domain Level
2EE117IK1.1	Apply fundamental principles of electricity, magnetism, and electromagnetism to demonstrate experimental setups of these fundamental principles.	C-3, P-3
2EE117IK1.2	Use practical abilities in observing, constructing, and interpreting physical and electrical phenomena to develop hands-on training skills.	C-3, P-3
2EE117IK1.3	Relate theoretical concepts of electrical engineering to real-world applications through laboratory experiments and survey/visit.	C-3, A-2

Course Contents:

Unit 1	**Global Evolution of Electrical Engineering:** Natural phenomena and ancient history of electricity and magnetism. **Pioneers of classical electricity and magnetism:** William Gilbert, Benjamin Franklin, Hans Oersted, Ampère, Faraday, Maxwell. **Modern Day Inventors of the power era and its evolution:** Thomas Edison, Nikola Tesla, George Westinghouse, Charles Steinmetz; Journey from DC to AC and industrial electrification.	8 Hrs
Unit 2	**Contributions by Indian Visionaries in science and engineering:** Jagdish Chandra Bose, C.V. Raman, Homi Bhabha, M. Visvesvaraya, Vikram Sarabhai; Advancements in power generation and distribution (e.g., hydro-electric plants, ISRO's electric systems). **Establishment & Development of Public Sector Utilities:** Role of public-sector giants: BHEL, NTPC, PGCIL, ISRO; Rise of renewable energy and smart grids; India's role in global energy innovation and policy (e.g., e-mobility, Green Hydrogen).	7 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Demonstrate Static Electricity and Electrostatics using comb, balloon and electroscope.
2. Verify law of Electromagnetic Induction (Faraday's Law).
3. Construct a Simple DC Generator Model using rotating magnets and coils.
4. Demonstrate the Working of an Induction Motor (Cut Model or Kit).
5. Demonstrate the Wireless Power Transmission (Basic Tesla Coil or Kit).
6. Illustrate electric energy storage and determine the RC time constant during discharge.
7. Observe and map magnetic lines of force (magnetic field patterns) around magnets and current-carrying conductors, and to relate the patterns to field direction and strength.
8. Observe Light Scattering effect Using a Laser and Water (Raman Effect Demo).
9. Survey/Visit Report on a Local Power Plant or Substation.

Text Books:

4. Percy H. Thomas, A Short History of Electrical Engineering, Cambridge University Press Publication.
5. John Munro, The Story of Electricity, Forgotten Books Publication.
6. J.R. Cogdell, Foundations of Electrical Engineering, Pearson Publication

Reference Books:

1. John Gribbin, The Scientists: A History of Science Told Through the Lives of Its Greatest Inventors, Random House Publication.
2. Jill Jonnes, Empires of Light: Edison, Tesla, Westinghouse, and the Race to Electrify the World, Random House Publication.
3. Subrata Dasgupta, Jagadish Chandra Bose and the Indian Response to Western Science, Oxford University Press.
4. Government of India Publications, MNRE, ISRO, BHEL, CEA reports.

E-Resources:

1. https://www.magcraft.com/history-of-magnetism-and electricity?srsltid=AfmBOoqI9c1UFwxAtGJNiIgFRZR9w1EKD689wrM6PwFY3j6zqFLdX0z_
2. https://www.gutenberg.org/files/45446/45446-h/45446-h.html
3. https://bop2-iitk.vlabs.ac.in/exp/variation-magnetic-field/simulation.html
4. https://csc-iiith.vlabs.ac.in/exp/tyndall-scattering/objective.html
5. https://bes-iitr.vlabs.ac.in/exp/electrical-equipments/

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2EE117IK1.1	3	-	-	-	1	-	2	-	-	-	1
2EE117IK1.2	2	-	3	-	-	1	2	1	1	-	1
2EE117IK1.3	3	-	1	-	2	1	1	2	1	-	-
2EE117IKCO	3	-	1	-	1	1	2	1	1	-	1

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

Level: **4.5**	Course Code: 2ET117IKS			Course Category: **IKS**	
Course Name	**Indian Knowledge System (IKS) in Electronics & Telecommunication**				
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 2ET117IKS Foundations of Indian Knowledge Systems in Electronics is a compulsory Indian Knowledge System (IKS) for First Year B.Tech. Electronics and Telecommunication Engineering program.

Course Objectives:
The course aims to provide students with an understanding of Indian Knowledge Systems (IKS) in the context of electronics, focusing on their historical contributions, philosophical foundations, and practical applications in ancient communication, instrumentation, and materials relevant to modern electronics.

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

CO	Course Outcome	Domain Level
2ET117IKS.1	Understand the philosophical and scientific foundations of Indian Knowledge Systems in electronics-related domains.	C-2
2ET117IKS.2	Demonstrate ancient Indian communication and instrumentation techniques using modern electronics principles.	C-3
2ET117IKS.3	Apply principles of ancient Indian technologies to correlate with electronic circuits.	C-3, P4

Course Contents:

Unit 1	**Overview of Indian Knowledge Systems and their multidisciplinary approach:** Historical timeline of electronics-related technologies in ancient India. Contributions of Indian scholars: Maharshi Bharadwaja's *Vaimanika Shastra*, Panini's grammar as coding logic. Introduction to ancient materials used in electronics: metals, semiconductors, carbon inks.	7 Hrs
Unit 2	**Ancient communication & Instrumentation:** Acoustic communication and early sound instruments: Veena, Shankha (waveforms, resonance). Traditional measuring instruments (Yantras) and their working principles: Water clocks (Ghati Yantra), Sundials – principles and precision, Indian navigation tools and communication systems in temples and forts: sound signaling systems, flag codes.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Timeline of Ancient Indian Contributions to Electronics
2. Pingala's Binary Representation and Coding Logic
3. Study of Conductivity in Traditional Materials (Copper, Carbon, Clay)
4. Mapping Panini's Grammar Rules to Logic Operations
5. Waveforms in Ancient Instruments (Veena, Shankha, Tuning Fork)
6. Demonstration of Water Clock (Ghati Yantra) Principle
7. Construction of Sundial and Shadow Time Measurement
8. Acoustic Signaling and Echo Principle in Temples/Forts
9. Simulation of Flag/Light Code Communication System
10. Study of Traditional Measuring Instruments (Yantras/Astrolabe)

Text Books

1. Debiprasad Chattopadhyaya, Science and Philosophy in Ancient India, Aakar Books 2013
2. V. Sivaramakrishnan, Science and Technology in Ancient India, Bharatiya Vidya Bhavan, 1st Edition

Reference Books

1. Kapil Kapoor, Indian Knowledge Systems: Nature, Structure, and Applications, DK Printworld, 1st Edition.
2. Subhash Kak, The Wishing Tree: The Presence of Indian Knowledge Systems in Modern Science, Aditya Prakashan, 1st Edition.

E- Resources

1. https://iksindia.org/
2. https://www.ancient-origins.net/history-ancient-technology

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2ET117IKS.1	3	-	-	-	-	-	-	-	1	-	2
2ET117IKS.2	3	-	-	-	-	-	2	-	1	-	2
2ET117IKS.3	2	-	-	-	-	2	2	2	1	-	2
2ET117IKS.CO	3	-	-	-	-	1	1	1	1	-	2

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

<table>
<tr><td>Level: 4.5</td><td colspan="3">Course Code: 2ME117IK1</td><td colspan="2">Course Category: IKS</td></tr>
<tr><td>Course Name</td><td colspan="5">Indian Heritage in Mechanical Engineering</td></tr>
<tr><td>Credits</td><td>2</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60 Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>--</td><td>CIA Marks</td><td>--</td></tr>
<tr><td>EE Marks</td><td>--</td><td>PA Marks</td><td>50</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:
Subject Code 2ME117IK1 Indian Heritage in Mechanical Engineering is a compulsory Course under the category of Indian Knowledge System for First Year B. Tech. Mechanical Engineering students.

Course Objectives:
To explore the rich legacy of India’s contributions to mechanical sciences and engineering, emphasizing their relevance and inspiration for modern engineering practices.

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

CO	Course Outcome	Domain Level
2ME117IK1.1	Interpret the origin and evolution of mechanical devices and tools to understand the various manufacturing techniques in ancient India.	C-2
2ME117IK1.2	Interpret the traditional knowledge of forging and precision casting in ancient times to know its relevance in recent era.	C-2
2ME117IK1.3	Associate sustainable ancient design principles and mechanical mechanisms to relate these concepts in modern eco-friendly engineering solutions.	C-2

Course Contents:

Unit 1	**Foundations of Indian Scientific and Engineering Heritage:** Introduction to Indian Knowledge Systems (IKS): Overview of Indian science and technology tradition, Interdisciplinary nature of ancient innovative knowledge in context of Mechanical Engineering. Historical Contributions to concepts of simple machines, Heat, metallurgy, and traditional foundry practices, Water management systems, pumps, and irrigation mechanisms such as Persian wheel, step wells.	7 Hrs
Unit 2	**Revival and Application of Heritage in Modern Mechanical Engineering:** Traditional Manufacturing Techniques and their Modern Adaptations: Lost-wax casting, blacksmithing, forging. Sustainable Engineering Practices in Indian Heritage: Resource optimization in ancient Indian industry, Eco-friendly Solar techniques and applications. Indigenous Technologies for Rural Development: Use of traditional mechanical devices in rural settings, Case studies: Bullock-driven oil expellers and bio-energy setups.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Comparative study of Traditional and Modern Foundry Tools.
2. Study of Ancient Indian Mechanical Inventions.
3. Study of traditional metalworking techniques.
4. Study of Lost-Wax Casting Technique.
5. Study of Bullock-Driven Oil Expellers.
6. Study of Traditional Methods of Material Testing.
7. Study of an ancient Indian manufacturing setup.
8. Study of Rural Bio-energy Systems.
9. Case study on Traditional Design and Manufacturing Techniques.

Text Books:

1. Dharampal, Indian Science and Technology in the Eighteenth Century.
2. D. M. Bose, S. N. Sen, A Concise History of Science in India.

Reference Books:

1. Debiprasad Chattopadhyaya, Science and Technology in Ancient India
2. (Vol. I–IV).
3. B. Mahadevan, M.D. Srinivas, and S. Kannan, Introduction to Indian
4. Knowledge System: Concepts and Applications. S. Irfan Habib, Science in India.

E- Resources:

1. https://www.vlab.co.in/broad-area-mechanical-engineering
2. https://vlab.amrita.edu/

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2ME117IK1.1	3	-	-	-	-	2	2	-	-	-	2
2ME117IK1.2	3	-	-	-	-	2	2	-	-	-	2
2ME117IK1.3	3	-	-	-	-	-	2	-	-	-	2
2ME117IK1 CO	3	-	-	-	-	1	2	-	-	-	2

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

Level: **4.5**	Course Code: **2TX117IK1**			Course Category: **IKS**	
Course Name	**Cultural Aesthetics in Indian Textile Design**				
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 2TX117IK1 Cultural Aesthetics in Indian Textile Design is a compulsory Indian Knowledge System Course for First Year B. Tech. Textile Engineering program.

Course Objective
The objective of this course is to understand the cultural and symbolic context of Indian textile traditions which explores the aesthetic principles and regional diversities that define Indian textile design.

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

CO	Course Outcomes	Domain Level
CO1	Demonstrate traditional Indian motifs, weaves, to embellish fabric surface.	C-3
CO2	Apply and execute traditional concepts to develop innovative textile products inspired by Indian heritage.	C-3, P-5
CO3	Evaluate and execute practical skills for fabric surface embellishment.	C-3, P-5

Course Contents:

Unit 1	**Cultural Foundations of Indian Textile Design:** Significance of textiles in Indian culture and rituals. Mapping of regional crafts and textile symbolism. Textiles in identity, tradition, and festivals. Eco-spiritual and community-based aspects of traditional practice.	8 Hrs
Unit 2	A**esthetic Principles & Design Integration:** Traditional techniques: weaving, dyeing, embroidery, and printing; Design elements: motifs, geometry, symmetry, and color symbolism; Fusion of traditional art into modern textile design; contemporary relevance and sustainable practices.	7 Hrs

List of Practical Experiments

Minimum Eight practicals from the list mentioned below.

1. Study and recreate traditional Motifs
2. Apply natural dyes on textiles
3. Print fabric using Indian block patterns
4. Study Indian traditional weaves
5. Carry out surface embellishment using traditional techniques (Embroidery & Embellishment)
6. Print fabric using Warli technique.
7. Print fabric using Tie and Dye method.
8. Create contemporary design fusion inspired by tradition
9. Create textile collage based on Indian festivals
10. Use digital tools for creating Indian Tribal Art Pattern

Text Books:

1. Aditi Ranjan & M.P. Ranjan, Handmade in India
2. Rosemary Crill ,The Fabric of India
3. John Gillow & Nicholas Barnard ,Indian Textiles

Reference Books:

1. Jasleen Dhamija ,Textile Traditions of India
2. Gaurang Shah, Anita Dongre, Portfolios of textile designers
3. Asok Chatterjee ,Indian Textiles: Past and Present

E- Resource:

1. NPTEL – Threads of Visual Exploration: Textiles and Allied Practices (IIT Kanpur) https://onlinecourses.nptel.ac.in/noc24_hs168/preview
2. Swayam–Indian Culture and Art
   https://onlinecourses.swayam2.ac.in/cec21_hs34/preview
3. Crafts Council of India – Digital Resources
   https://craftscouncilofindia.in/

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
2TX117IK11.1	-	2	-	-	-	2	-		2	-	-
2TX117IK1.2	-	-	2	-	-	2	-	-	-	-	-
2TX117IK1.3	-	-	-	-	-	3	-	-	-	-	-
2TX117IK1CO	-	1	1	-	-	2	-	-	1	-	-

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

<table>
<tr><td>Level: 4.5</td><td colspan="2">Course Code: 2SH121VS1</td><td colspan="3">Course Category: SEC</td></tr>
<tr><td>Course Name</td><td colspan="5">Universal Human Values</td></tr>
<tr><td>Credits</td><td>02</td><td rowspan="2">Total L:T :P Hours</td><td rowspan="2">1:0:2
45 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">15 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>60 Hrs</td></tr>
<tr><td>SEE Marks</td><td>--</td><td>SEE Time</td><td>--</td><td>CIA Marks</td><td>--</td></tr>
<tr><td>EE Marks</td><td>--</td><td>PA Marks</td><td>50</td><td>Total Marks</td><td>50</td></tr>
</table>

Course Description:
Subject Code 2SH121VS1 Universal Human Values is a compulsory skill enhancement Course for first Year B.Tech and common for all branches.

Course Objectives:
The objective of this course is to encompass the significance of universal human values and their role in individual and societal well-being.

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

CO	Course Outcome	Domain Level
2SH121VS1.1	Classify the significance and universal applicability of human values for personal development	C-3
2SH121VS1.2	Demonstrate harmony in family, society, and nature through trust, respect, and cooperation	A-3
2SH121VS1.3	Apply ethical decision-making and value-based practices in professional and daily life situations	C-3, A-3

Course Contents:

Unit 1	**Foundations of Human Values and Harmony:** Meaning and importance of value education, Universal nature of human values, Harmony in the individual: self and body, needs of the self vs body, happiness and prosperity, Harmony in the family: trust, respect, communication, responsibilities.	7 Hrs
Unit 2	**Application of Human Values in Life, Society, and Nature:** Harmony in society: justice, cooperation, equality, social roles, Harmony with nature: ecosystems, sustainable living, responsible use of resources, Living with universal human values: ethical living, human–nature relationship, environmental care, Ethics and professionalism: integrity, accountability, teamwork, Personal growth: life goals, self-awareness, gratitude, empathy, Action plan: personal code of ethics, community service, value-based living	8 Hrs

List of Practical Experiments

Minimum Eight practicals from the list mentioned below.

1. Write a reflection on “Who am I?” (self vs body).
2. List personal needs – physical vs self.
3. Share an example of trust and respect in family.
4. Role play on good communication.
5. Discuss an ethical dilemma and suggest a solution.
6. Small group community service activity.
7. Record daily resource use (water, electricity) and suggest savings.
8. Group discussion on equality in society.
9. Visit a park/field and note examples of coexistence in nature.
10. Prepare a personal action plan based on values

Text Books:

1. Dr. Saroj Kumar and Prof. Sheenu Nayyer ,Universal Human Values and Professional Ethics.
2. Dr. Ritu Soryan, Universal Human Values and Professional Ethics.
3. R. R. Gaur, R. Sangal, G. P. Bagaria , A Foundation Course in Human Values and Professional Ethics – Excel Books, New Delhi.

Reference Books:

1. A. N. Tripathi, Human Values – New Age International Publishers, New Delhi.
2. B. N. Tandon, Foundations of Human Values – Concept Publishing Company, New Delhi.
3. S. B. Oza & R. Thaker, Values and Ethics in Profession – University Science Press, New Delhi.
4. Subhash Sharma**,** Management in New Age: Western Windows, Eastern Doors – New Age International.
5. A. C. Fernando, Business Ethics and Corporate Governance – Pearson Education India.
6. S. K. Chakraborty, Foundations of Managerial Work: Contributions from Indian Thought – Himalaya Publishing House.
7. S. Balachandran, K. C. Raja & B. S. Nair**,** Ethics and Values in Business Management – Himalaya Publishing House.

E-Resources

1. AICTE – Universal Human Values (UHV) Cell
   https://uhv.aicte-india.org
2. NPTEL – Human Values and Professional Ethics
   https://nptel.ac.in/courses/109/104/109104068
3. SWAYAM – Universal Human Values Course
   https://swayam.gov.in
4. IGNOU eGyankosh – Human Values and Professional Ethics
   http://egyankosh.ac.in
5. UGC e-Pathshala – Value Education
   https://epgp.inflibnet.ac.in

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
2SH121VS1.1	3	-	-	-	-	-	-	-	-	-	-
2SH121VS1.2	-	-	-	-	-	3	3	-	-	-	-
2SH121VS1.3	-	-	3	-	-	-	-	3	-	-	3
2SH121VS1CO	1	-	1	-	-	1	1	1	-	-	1

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

Level: **4.5**	Course Code: **3CH123EC1**		Course Category: **EC**		
Course Name	**Material and Energy Balance**				
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 3CH123EC1 Material and Energy Balance is a Exit Course (L 4.5) in Chemical Engineering for First Year B. Tech.

Course Objectives:
The objective of this course is to make analysis of chemical processes through calculations, which need to be performed in the chemical processing operations and also to formulate and solve material and energy balances in processes with and without chemical reactions.

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

CO	Course Outcome	Domain Level
3CH123EC1.1	Apply stoichiometry, mole concepts, and ideal gas laws to solve material balance problems and follow experiments on evaporation, extraction, and crystallization.	C-3,P-3
3CH123EC1.2	Analyze material balances with and without reactions, including recycle, purge, bypass, conversion, and Operate drying, gas absorption, and psychrometric studies.	C-4, P-4
3CH123EC1.3	Analyze energy balances involving enthalpy changes, phase transitions, and combustion, and Perform on heat exchangers, evaporation, drying, and liquid mixing.	C-4,P-5

Course Contents:

Unit 1	**Review of Concepts:** Basic principles, the concept of gram atom and gram mole, conversion of units, concept of excess reactant, conversion and yield, Selectivity and degree of completion of reaction **Ideal Gas Calculations:** Ideal gases, partial pressure, vapor pressure, application of ideal gas laws, volume change with change in composition, dissociating gases, humidity and saturation, solubility.	10 Hrs
Unit 2	**Material Balance:** Material balance without chemical reaction, recycle, purge and bypass calculations, material balance with chemical reaction **Material Balance With Chemical Reaction:** Principle of stoichiometry, simple oxidation reaction, multiple chemical reaction, percentage Conversion, percentage Yield, and selectivity, calculation involving combustion of gases, liquid and solid fuel. Recycle, purge and bypass calculations.	8 Hrs
Unit 3	**Energy Balance without Chemical Reaction:** open and closed system, heat capacity, calculations of enthalpy changes, enthalpy changes for phases transitions, evaporation, Solution and mixing. **Energy Balance with Chemical Reaction:** Energy balance with chemical reaction, combined material and energy balances, Fuels and combustion, types of fuels, heating values of fuels, theoretical and excess air, heat and combustion problems	12 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. Evaporation process in an open-pan or single-effect evaporator and verify the material balance.
2. Separate a solute between two immiscible solvents and perform an overall material balance.
3. Prepare crystals (e.g., copper sulfate) and carry out material balance around the crystallizer.
4. Determine the drying rate of wet solids and evaluate the material balance for moisture removal.
5. Gas absorption in a packed column and verify the material balance.
6. Measure the final temperature on mixing hot and cold water and verify the energy balance.
7. Heating/cooling of a fluid in a double pipe heat exchanger and analyze the energy balance.
8. Evaluate the energy requirements of an evaporation process and verify the energy balance.
9. Determine the moisture content of a wet solid in a drying oven and perform an energy balance.

10. Measure humidity and related properties using wet and dry bulb thermometers and apply psychrometric relations.
11. Determination of Calorific Value of Fuels by Bomb Calorimeter
12. Measurement of Temperature and Pressure in a Flow System

Text Books:

1. D.M. Himmalblau, Basic Principles and Calculations in Chemical Engineering, 6th Edition, Prentice Hall, 2011.
2. B.I. Bhatt, S.M. Vora, Stoichiometry, 4th Edition, Tata-McGraw-Hill, 2004.
3. K.V. Narayanan, B. Laxmikutty, Stoichiometry and Process Calculation, Prentice Hall of India 2006.
4. A. Hougen, M. Watson, Chemical Process Calculation, Third Edition, John Wiley & Sons, 2000.
5. Felder, R.M. & Rousseau, R.W. – *Elementary Principles of Chemical Processes*, Wiley.

Reference Books:

1. J. F. Richardson & J. M. Coulson, Chemical Engineering, Vol. I, Butterworth-Heinemann.
2. J. M. Smith, H. C. Van Ness & M. M. Abbott, Introduction to Chemical Engineering Thermodynamics, McGraw Hill.
3. K. V. Narayanan, Stoichiometry and Process Calculations, Prentice Hall of India.
4. M. R. Patel, Chemical Engineering Thermodynamics and Energy Balance, Khanna Publishers.
5. K. V. Narayan & B. Lakshmikutty, Stoichiometry and Process Calculations, PHI Learning.
6. S. K. Ghosal, S. K. Sanyal & S. Dutta, Introduction to Chemical Engineering, Tata McGraw Hill.

E-Resources:

1. https://nptel.ac.in/courses/102106069
2. https://onlinecourses.nptel.ac.in/noc21_ch50/preview

Mapping of COs with POs:

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1CE104ES1.1	3	2	-	2	2	-	-	-	-	-	-
1CE104ES1.2	3	3	2	1	2	1	-	1	-	-	-
1CE104ES1.3	3	3	2	-	2	2	-	1	-	-	-
1CE104ES1CO	3	3	1	1	2	1	-	1	-	-	-

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

Level: **4.5**	Course Code: **3CH124EC1**			Course Category: **EC**	
Course Name	**Numerical Method in Chemical Engineering**				
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 3CH124EC1 Numerical Method in Chemical Engineering is a Exit Course (L 4.5) in Chemical Engineering for First Year B. Tech.

Course Objectives:
The objective of this course is to present the basic principles and logical skills in solving the problems using computational methods and understanding the computational methods to solve the problems related to the chemical engineering applications.

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

CO	Course Outcome	Domain Level
3CH124EC1.1	Apply error analysis, root-finding, and methods for solving linear and nonlinear algebraic equations, and perform them using MATLAB/SCILAB through root determination and matrix operations.	C-3,P-5
3CH124EC1.2	Apply regression, curve fitting, interpolation, and numerical integration/differentiation to Examine chemical engineering data, and demonstrate these methods through computational experiments.	C-3,P-5
3CH124EC1.3	Solve ordinary and partial differential equations using numerical methods, and Reproduce modular programs to simulate and optimize chemical engineering processes.	C-3,P-3

Course Contents:

Unit 1	**Linear algebraic equations:** Introduction, Approximation and Concept of Error & Error Analysis, Linear Algebraic Equations: Methods like Gauss elimination, LU decomposition and matrix inversion, Gauss-Siedel method, Chemical engineering problems involving solution of linear algebraic equations. **Nonlinear algebraic equations:** Root finding methods for solution on non-linear algebraic equations: Bisection, Newton-Raphson and Secant methods, iteration, Regula-Falsi methods.	10 Hrs
Unit 2	**Regression Analysis:** Method of least square, methods of group average approximation by chebychev polynomial **Numerical integration:** Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Chemical engineering problems involving numerical differentiation and integration.	10 Hrs
Unit 3	**Ordinary Differential Equations:** Euler method, Runge-Kutta method, Initial and boundary value problems, Chemical engineering problems involving single, and a system of ODEs. **Modular Programming Concepts:** Computer programming in modular form, use of subroutine libraries, Block diagrams of preliminary aids in programming, capacity optimization.	10 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. Introduction to programming in MATLAB/SCILAB for solving chemical engineering problems.
2. Determination of roots using bracketing methods: Bisection method and False-position method.
3. Determination of roots using open methods: Newton–Raphson method and Secant method.
4. Solution of linear algebraic equations and matrix problems using Gauss Elimination and iterative methods (Gauss–Seidel, Jacobi,).
5. Computation of eigen values and eigenvectors of matrices.
6. Curve fitting and interpolation techniques, including cubic splines.
7. Numerical integration using Trapezoidal rule and Simpson's rules.
8. Numerical differentiation using MATLAB.
9. Solution of ordinary differential equations (ODEs) – initial value problems using Euler's method and Runge–Kutta methods.
10. Solution of ordinary differential equations (ODEs) – boundary value problems using shooting method.
11. Solving Chemical Reactor Design Equations Numerically
12. Curve Fitting and Regression Analysis using Least Squares Method

Text Books:

1. S. K. Gupta, Numerical Methods for Engineers, New Academic Science, 2012.
2. S. C. Chapra & R. P. Canale, Numerical Methods for Engineers with Personal Computer Applications, McGraw Hill Book Company, 1985
3. R. L. Burden & J. D. Faires, Numerical Analysis, 7th Edition, Brooks Cole, 2000.
4. S. S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India.

Reference Books:

1. R. G. Rice & D. D. Do, Applied Mathematics and Modelling for Chemical Engineers, Wiley.
2. K. E. Atkinson, An Introduction to Numerical Analysis, John Wiley & Sons, 1978.
3. W. H. Press et al., Numerical Recipes in C: The Art of Scientific Computing, 3rd Edition, Cambridge University Press, 2007.
4. B. A. Finlayson, Introduction to Chemical Engineering Computing, Wiley.
5. B. Carnahan, H. A. Luther & J. O. Wilkes, Applied Numerical Methods, Wiley.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc20_ge20/preview
2. https://www.youtube.com/watch?v=P2BevNTw8vM&list=PLhLv_8 Kdyl-VSZF1xHacdthqWEv97K2i

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1CE104ES1.1	3	2	-	2	3	-	-	-	-	-	-
1CE104ES1.2	3	2	-	2	3	-	-	-	2	-	-
1CE104ES1.3	3	2	2	3	3	2	-	1	2	2	-
1CE104ES1CO	3	2	1	2	3	1	0	0	1	1	-

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

Level: **4.5**	Course Code: **3CE123EC1**		Course Category: **EC**		
Course Name	**Site Supervision and Surveying**				
Credits	**03**	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 3CE123EC1Site Supervision and Surveying is an optional Exit Course (L 4.5) for First Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to develop fundamental skills in site supervision and surveying, enabling students to manage construction activities, ensure safety and quality, interpret drawings, and perform essential field measurements and documentation.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE123EC1.1	Understand the roles, responsibilities, and fundamental practices of site supervision to ensure safety, quality and resource management.	C-2
3CE123EC1.2	Apply theoretical concepts to perform basic construction activities and surveying operations to prepare site documentation	C-3& P-5
3CE123EC1.3	Analyze site conditions and execute supervision and surveying activities collaboratively while acknowledging the importance of teamwork and professional responsibility in construction practices.	C-4, P-5& A-1

Course Contents:

Unit 1	**Introduction to Site Supervision** Role and responsibilities of a site supervisor, Basics of construction management: manpower, materials, machinery, Importance of safety, quality, and communication, Reading and interpreting construction drawings, Site documentation: logbooks, checklists, work permits	10Hrs
Unit 2	**Basics of construction** Foundation works: excavation, PCC, footings, Brickwork, concreting, shuttering and reinforcement basics, Plumbing and electrical layout supervision, Handling of building materials (cement, sand, aggregates, steel), Supervision during curing, de-shuttering, and quality checks	8 Hrs
Unit 3	**Basics of Surveying** Principles of surveying and types and classification, Chain surveying: tools and procedures, Compass surveying and bearings. **Site Measurements and Field Applications** Layout of buildings and road, Contour surveying and plotting, Area and volume calculation from field data, Practical use of Theodolite or Total Station (introductory level), Report preparation and data presentation	12 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. Study of reading and interpreting basic construction drawings.
2. Study of supervision practices for brickwork and concreting.
3. Study and prepare daily site logbook and checklist.
4. Study of layout marking for a small building plan using line and pegs.
5. Study of surveying instruments and their basic functions.
6. Determination of linear measurements using chain and tape.
7. Conducting chain triangulation for plot measurement and area calculation.
8. Determination of bearings with compass survey including declination adjustment.
9. Study of levelling setup and temporary adjustments of dumpy/auto level.
10. Study of site measurement and prepare contour report.
11. Study of safety equipment (PPEs) and preparation of a safety compliance checklist.
12. Conducting curing practices and study of different methods of curing in concrete work
13. Study of theodolite / total station –parts temporary adjustments and angle measurement.

Text Books:

1. B.C. Punmia, Ashok Jain, Arun k. Jain: Surveying Vol. I, Laxmi publications (P), Ltd
2. Fundamentals of Surveying by R. Subramaniam
3. *Construction Supervision, QC + HSE Management in Practice* — Urizar

Reference Books:

1. Building Construction, B.C. Punmia – Construction methods and supervision
2. Surveying Vol. 1,B.C. Punmia or S.K. Duggal
3. CPWD Works Manual – Site procedures, documentation
4. IS 7913:1975 – Safety code for construction workers
5. Construction Technology, S.C. Rangwala
6. CPWD Specifications (Vol 1 & 2) – Material handling and quality checks

E Resources:

1. NPTEL Course – Surveying, IIT Roorkeehttps://nptel.ac.in/courses/105107157
2. Quality Supervision for Quality Practicehttps://www.udemy.com/course/quality-supervision-for-quality-practice/?couponCode=IND21PM
3. Virtual Labs (VLab) https://sl-iitr.vlabs.ac.in/

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
3CE123EC1.1	3	1	-	-	-	-	-	-	-	2	-
3CE123EC1.2	3	1	-	2	3	-	-	2	2	-	-
3CE123EC1.3	3	-	-	-	3	-	-	3	3	-	-
3CE123EC1CO	3	1	-	1	2	-	-	2	2	1	-

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

Level: **4.5**	Course Code: **3CE124EC1**			Course Category: **EC**	
Course Name	**Bar Bending Schedule & Material testing**				
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 3CE124EC1 Bar Bending Schedule & Material Testing is an Optional Exit Course (L 4.5) for First Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to build foundational knowledge of construction materials, their testing methods, and bar bending schedules, enabling students to perform quality control, material assessment, and basic site execution tasks effectively.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE124EC1.1	Illustrate the properties and testing procedures of construction materials and prepare bar bending schedule in compliance with relevant IS codes for construction practices.	C-3& P-2
3CE124EC1.2	Determine the quality parameters of construction material by Performing standard laboratory tests for construction quality control.	C-3 & P-5
3CE124EC1.3	Analyze the outcomes of material testing and prepare bar bending schedules for simple structural elements while acknowledging the importance of quality assurance and safety practices in construction.	C-4, P-2, & A-1

Course Contents:

Unit 1	**Introduction to Construction Materials and Testing** Types of construction materials: cement, aggregates, steel, water, admixtures**,** Importance of material testing in construction quality control**,** Introduction to laboratory testing standards (IS codes)**,** Basic mechanical properties: strength, hardness, toughness, ductility.	10 Hrs
Unit 2	**Testing of Construction materials** Cement: fineness, standard consistency, setting time, compressive strength, Aggregates: sieve analysis, bulking of sand, impact and abrasion value, Concrete: standard and nominal mix, concrete mix design, workability of concrete, compressive strength test.	8 Hrs
Unit 3	**Testing of materials: Steel** Properties and identification of reinforcement bars, Mechanical tests: tensile test, bar bending test. **Bar Bending Schedule** Introduction to BBS and its significance in site execution, Reading structural drawings: beam, slab, column, and footing, BBS preparation for simple structural elements	12 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below:

1. Study of IS codes relevant to material testing (IS 269, IS 383, IS 456,).
2. Determination of particle size distribution of fine and coarse aggregates by sieve analysis.
3. Determination of standard consistency of cement using Vicat apparatus.
4. Determination of Compressive strength of cement mortar cubes.
5. Determination of workability of fresh concrete by slump cone test.
6. Determination of tensile strength of mild steel bar using Universal Testing Machine (UTM).
7. Determination of impact value of coarse aggregates.
8. Determination of compressive strength of concrete cubes.
9. Study of cutting, bending, and storage practices of steel bars at site (Field Visit).
10. Preparation and study of Bar Bending Schedule (BBS) for simple structural elements.
11. Study of different types of reinforcement bars and their identification marks
12. Conducting tensile test on steel reinforcement bars and plotting stress-strain curve.

Text Books:

1. Building Materials: Testing and Sustainability, N. Subramanian
2. Complete Bar Bending Schedule, Ranjeet Sahani

Reference Books:

1. Testing of Construction materials, Ravi Kumar Sharma
2. IS 383:2016 – Coarse and Fine Aggregates Specification
3. Building Materials by S.K. Duggal
4. Engineering Materials by Rangwala
5. IS 4031 (Parts 1–15) – Cement Testing Methods
6. IS 2386 (Parts I–VIII) – Testing of Aggregates
7. IS 1608:2005 – Tensile Testing of Metals

E Resources:

1. Bar Bending Schedule Basics - BBS Reinforcement Calculationhttps://www.udemy.com/course/bar-bending-schedule-basics-bbs-reinforcement-calculation/?couponCode=IND21PM
2. https://www.youtube.com/watch?v=nGoTdkCxsuk&list=PLMvnbnderiJZZuVGcexozbwxN89WGvGtK
3. Building Materials Fundamentalshttps://www.udemy.com/course/building-materials-fundamentals/?couponCode=IND21PM
4. Virtual Labs (VLab) https://www.vlab.co.in/broad-area-civil-engineering

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
3CE124EC1.1	3	2	-	-	-	-	-	-	-	-	-
3CE124EC1.2	3	2	-	3	3	-	-	-	2	-	-
3CE124EC1.3	3	2	3	3	3	-	-	-	3	-	-
3CE124EC1CO	3	2	1	2	2	-	-	-	2	-	-

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

<table>
<tr><td>Level: 4.5</td><td colspan="3">Course Code: 3CS123EC1</td><td colspan="2">Course Category: EC</td></tr>
<tr><td>Course Name</td><td colspan="5">Digital Literacy and Office Automation</td></tr>
<tr><td>Credits</td><td>04</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">2:0:4
90 Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">02
30 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>120 Hrs</td></tr>
<tr><td>SEE Marks</td><td>30</td><td>SEE Time</td><td>2 Hrs</td><td>CIA Marks</td><td>20</td></tr>
<tr><td>EE Marks</td><td>25</td><td>PA Marks</td><td>25</td><td>Total Marks</td><td>100</td></tr>
</table>

Course Description:
Subject Code 3CS123EC1Digital Literacy and Office Automation is an Exit Course (L 4.5) for First Year B. Tech. Computer Science Engineering.

Course Objectives:
The objective of the course is introducing the fundamental concepts of computer systems, including hardware, software, operating systems, and internet basics and to prepare students to apply digital literacy and office automation skills for improved productivity in academic, professional, and business contexts.

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

CO	Course Outcome	Domain Level
3CS123EC1.1	Demonstrate the ability to operate a computer system, operate basic operating system tasks, and utilize internet tools for effective information retrieval and communication.	C-3, P-4
3CS123EC1.2	Apply word processing tools to reproduce, format, and enhance academic and professional documents using templates, tables, images, and review tools.	C-3, P-3
3CS123EC1.3	Determine digital threats and security issues, manipulate documents or presentations on digital citizenship and ethical computing practices, and comply with responsible and ethical behaviour in online environments.	C-3, P-4 & A-2

Course Contents:

Unit 1	**Fundamentals of Computer Systems and Internet** Introduction to Digital Literacy and its importance, Basic components of a computer system: Input, Output, CPU, Memory Types of hardware and software, Operating Systems: Types, functions, user interfaces, Basics of computer networks and Internet, Web browsers, search engines, and effective browsing techniques Introduction to cloud computing and online storage	10 Hrs
Unit 2	**Word Processing Tools** Introduction to word processing software (e.g., MS Word or Google Docs), Creating and saving documents, Formatting text and paragraphs, inserting images, tables, headers/footers, page numbers, using templates, styles, and themes, reviewing tools: Spell check, comments, and track changes, Printing and exporting documents	10 Hrs
Unit 3	**Digital Safety, Ethics, and Responsibility** Introduction to cybersecurity: threats and preventive measures,Digital footprints and privacy concerns, Safe browsing and secure password practices, Ethical issues in digital communication and data sharing, Cyberbullying, plagiarism, and digital citizenship, Responsible use of technology in academic and professional contexts	10 Hrs

List of Practicals:

Minimum 10 practicals from the list mentioned below.

1. Identify and describe computer hardware components (CPU, RAM, motherboard, input/output devices).
2. Demonstrate how to install, navigate, and manage settings in a Windows or Linux operating system.
3. Use a web browser to perform advanced searches, bookmark pages, and manage history and downloads.
4. Set up and use an email account to compose, attach files, send, and organize emails into folders.
5. Create and format an academic document with headings, page numbers, and footnotes.
6. Insert a table, image, and chart into a word document and apply layout adjustments.
7. Use spell check, grammar tools, comments, and track changes for document review.
8. Create a resume or project report using predefined templates and styles.
9. Identify phishing emails, create a strong password, and demonstrate two-factor authentication.
10. Prepare a short document or presentation on topics like digital citizenship, cyberbullying, or plagiarism with real-world examples.
11. Prepare a Word document on “Digital Citizenship and Responsible Internet Use” with images and references.
12. Develop a PowerPoint (6–8 slides) on “Best Practices for Online Ethics, Privacy & Security” using animations, transitions, and charts.

Text Books:

1. V. Rajaraman, "Fundamentals of Computers" by Publisher: PHI Learning
2. Santosh, "Computer Fundamentals and Office Automation",
3. Anita Goel, "Computer Fundamentals and Office Automation" by Publisher: Pearson Education

Reference Books:

1. ITL Education Solutions Limited**,** "Introduction to Information Technology" by Publisher: Pearson
2. Randy Nordell, "Microsoft Office 365: In Practice, 2019 Edition" by Publisher: McGraw-Hill Education
3. P.K. Sinha & Priti Sinha, "Computer Fundamentals",BPB Publications, New Delhi

List of Virtual Labs:

1. GCFGlobal Free Computer Basics Lab: https://edu.gcfglobal.org/en/
2. Cybersecurity Virtual Labs: https://cybersecurity.csevlab.amrita.edu
3. Tirunelveli, "Computer Fundamentals and Office Automation"

Mapping of COs with POs

CO	**PO**										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
3CS123EC1.1	3	-	-	-	2	-	-	-	-	-	-
3CS123EC1.2	2	-	-	-	2	-	-	-	1	-	-
3CS123EC1.3	2	-	-	-	2	1	2	2	-	-	-
3CS123EC1CO	2	-	-	-	2	-	1	1	-	-	-

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

Level: **4.5**	Course Code: **3CS124EC1**			Course Category: **EC**	
Course Name	**Hardware Maintenance & Networking**				
Credits	**04**	Total L:T:P Hours	2:0:4	Total SL Hours	**02**
Total Credit Hours	**120 Hrs**		**90 Hrs**		**30 Hrs**
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:
Subject Code EC-II (3CS124EC1) Hardware Maintenance & Networking Lab is an Exit course (L 4.5) for First Year B.Tech. Computer Science and Engineering.

Course Objectives:
The objective of the course is to provide hands-on experience in assembling, troubleshooting, and maintaining computer hardware, and to develop practical skills in configuring and managing basic networking components and systems.

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

CO	Course Outcome	Domain Level
3CS124EC1.1	Describe the working of computer hardware components and networking devices, and express interest in handling them practically.	C-2, P-3, A-3
3CS124EC1.2	Apply assembling a computer system, install and configure operating systems, to comply with systematic maintenance and reliable practices.	C-3, P-3, A-3
3CS124EC1.3	Analyze networking concepts, demonstrate teamwork and responsibility in configuring LANs to resolve troubleshooting of networks effectively.	C-4, P-5, A-4

Course Contents:

Unit 1	**Introduction to Computer Hardware** Computer Components: Overview of the system unit, motherboard, CPU, RAM, ROM, storage devices (HDD, SSD), power supply, and peripheral devices. Input and Output Devices: Keyboards, mouse, monitors, printers, and other I/O devices. Assembly and Disassembly: Steps for assembling and disassembling a computer system. Operating Systems Basics: Introduction to various, operating systems (Windows, Linux), their features and functionalities. Operating System Installation and Configuration,	10 Hrs
Unit 2	**Operating System and Basic Networking Concepts:** Installation: Installing an operating system, understanding BIOS/UEFI settings, partitioning, and file systems. Configuration and Maintenance: Device drivers, system utilities, and basic troubleshooting.	10 Hrs
Unit 3	**Networking Fundamentals:** Definition, advantages, and types of networks (LAN, WAN, MAN). Network Topologies: Star, bus, ring, mesh, and hybrid topologies. Network Devices and Cabling: Routers, switches, hubs, modems, cables (UTP, STP, coaxial, fiber optics). Basic Network Configuration: Setting up a network, IP addressing, subnetting, and basic network troubleshooting.	10 Hrs

List of Practicals:

Minimum 10 practicals from the list mentioned below.

1. To study and understand working of Computer Hardware Components.
2. Assemble a basic computer system from individual components.
3. Install Windows Operating System on computer.
4. Install Linux/Redhat/Fedora Operating System on computer.
5. Perform basic OS configuration and maintenance of OS
6. To study introduction to networking devices such as routers, switches, hubs, modems
7. Connect and configure a basic LAN using routers and switches.
8. Configure network settings on computer.
9. Study and understand Network Topologies.
10. Basic network troubleshooting.
11. Study and configuration of BIOS/UPFI settings.
12. File sharing and printer sharing in a local network.

Textbook:

1. Mastering PC Hardware and Networking by Ajit Mittal and Ajay Rana
2. PC Hardware: The Complete Reference by Craig Zacker and John Rourke

Reference Books:

1. PC Hardware: A Beginner's Guideby Ron Gilster
2. Computer Fundamentals - by P.K.Sinha
3. Networking The Complete Reference, Third Edition by Bobbi Sandberg
4. Basics of Computer Networking by Thomas Robertazzi

E-Resources:
1. www.vlab.co.in.IItKharagpur-Basics of Network Simulation
2. www.vlab.co.in.IITHyderabad-Networking

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
3CS124EC1.1	3	2	1	-	2	-	-	1	-	1	1
3CS124EC1.2	3	2	2	-	3	-	-	2	1	2	1
3CS124EC1.3	3	3	3	1	3	-	-	2	3	1	2
3CS124EC1CO	3	2	2	-	2	-	-	1	1	1	1

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

Level: **4.5**	Course Code: **3EE123EC1**			Course Category: **EC**	
Course Name	**Electrification of Building**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90Hrs**	Total SL Hours	**30Hrs**
Total Credit Hours	**120Hrs**				
SEE Marks	**30**	SEE Time	**2Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:

Subject Code 3EE123EC1 Electrification of Building is an optional Exit Course (L 4.5) for First Year B.E. Electrical Engineering.

Course Objectives:

The objective of this course is to present the basic principles of static and dynamics and help develop proficiency in applying these principles to formulate and solve problems.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3EE123EC1.1	Explain the fundamentals of building electrification, electrical loads, standards, and perform basic load estimation.	C-3
3EE123EC1.2	Select appropriate wiring systems, cables, accessories, and protection devices while ensuring proper earthing and safety.	C-2 P-3
3EE123EC1.3	Prepare single-line diagrams, electrical layouts, and cost estimations for residential and commercial buildings using conventional and CAD tools.	C-3 P-2 A-2

Course Contents:

Unit 1	**Fundamentals of Building Electrification & Load Estimation** Types of electrical supply (single-phase, three-phase),Voltage levels and frequency in India, Classification of loads: lighting, heating, cooling, motor loads, Overview of building electrification process, Standards and codes (IS 732, National Electrical Code, IEC basics),Connected load vs. demand load, Load diversity factor, demand factor, power factor, Lighting design basics (lumens method, lux levels),Load calculation examples for residential, office, and industrial buildings	10Hrs
Unit 2	**Wiring Systems, Accessories & Protection :**Types of wiring: conduit, casing-capping, surface, underground, Selection of cables and conductors (IS standards).Switches, sockets, MCB, RCCB, ELCB, distribution boards, Earthing systems and lightning protection, Case studies of wiring in small vs. large buildings	10Hrs
Unit 3	**Electrical Layout, Planning &Documentation :**Single-line diagrams (SLD) and wiring diagrams, Distribution system planning (main and sub-circuits),Layout preparation for residential and commercial buildings, Use of CAD tools for electrical layout drawing, Estimation and costing of electrical installation.	10Hrs

List of Practicals:

Minimum Ten Practical's from the list mentioned below.

1. Analyse the classification of electrical loads and record the power consumption of lighting, heating, cooling, and motor loads.
2. Design a lighting system using the lumen method and calculate illumination levels for a classroom/office.
3. Perform load estimation by calculating the connected load and demand load of a small residential building.
4. Demonstrate different wiring methods such as conduit, casing-capping, and surface wiring on wooden/metallic boards.
5. Select suitable cables and conductors based on current rating, voltage drop, and IS standards.
6. Test electrical accessories such as switches, sockets, MCB, RCCB, ELCB, and distribution board wiring.
7. Demonstrate pipe earthing and plate earthing with earth resistance measurement.
8. Prepare a wiring diagram for a residential building electrical installation.
9. Develop main and sub-circuit wiring diagrams for a small office installation.
10. Design an electrical layout for a residential setup using e-CAD software.
11. Perform energy Audit of selected area (Classroom /office) and suggest energy conversion measures with cost benefits analysis.
12. Design distribution for a workshop / lab with lighting and motor load.

Textbooks:
1. Surjit Singh, Electrical Estimating and Costing, DhanpatRai& Sons
2. S.L. Uppal, Electrical Wiring, Estimation & Costing ,Khanna Publishers
3. J.B. Gupta , A Course in Electrical Installation, Estimating and Costing, S.K. Kataria& Sons

Reference Books:
1. Bureau of Indian Standards IS 732: Code of Practice for Electrical Wiring Installations
2. Indian National Electrical Code (NEC),Latest Edition
3. K.B. Raina& S.K. Bhattacharya, Electrical Design, Estimating and Costing, New Age International
4. IEC Standards , Low Voltage Electrical Installations

E – Resources:
1. https://www.opentextbooks.org.hk/system/files/export/9/9648/p
2. df/Fundamentals_of_Electrical_Engineering_I_9648.pdf
3. https://econtent.msbte.edu.in/econtent/econtent_home.php#:~:text=...For%20Marathi%20E%2DContent%20(K,PN%20%2D%20Printing%20T...echnology
4. https://ncert.nic.in/vocational/pdf/kvdl103.pdf
   https://www.vlab.co.in/broad-area-electrical-engineering

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
3EE123EC1.1	3	-	1	1	2	1	1	-	-	-	1
3EE123EC1.2	1	-	3	-	1	3	-	2	-	-	-
3EE123EC1.3	2	2	3	2	3	2	-	-	-	1	2
3EE123ECCO	2	2	2	1	2	2	1	2	-	1	1

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

Level: **4.5**	Course Code: **3EE124EC1**		Course Category: **EC**		
Course Name	**Repairing and Maintenance of Domestic Appliances**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120Hrs**				
SEE Marks	**30**	SEE Time	**2Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:
Subject Code 3EE123EC1 Repairing and Maintenance of Domestic Appliances is an optional Exit Course (L 4.5) for First Year B.E. Electrical Engineering.

Course Objectives:
The objective of this course is to equip learners with knowledge of domestic appliances and hands-on skills in diagnosing, repairing, and maintaining them, while ensuring effective use of tools, adherence to safety, and promotion of energy-efficient and environmentally responsible servicing practices.

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

CO	Course Outcome	Domain Level
3EE123EC1.1	Demonstrate knowledge of domestic appliances, their working principles, and major components.	C-3
3EE123EC1.2	Diagnose, repair, and document faults in heating, motor-based, cooling, and electronic appliances using appropriate tools and techniques.	C-2 P-3
3EE123EC1.3	Apply preventive maintenance, safety practices, and sustainable approaches while exploring entrepreneurial opportunities in appliance servicing.	C-2 P-2 A-2

Course Contents:

Unit 1	**Fundamentals of Domestic Appliances & Components:** Classification of appliances: Heating (iron, geyser, oven), cooling (fan, cooler, refrigerator), cleaning (vacuum cleaner, washing machine), entertainment & personal care devices. Basic working principles: Electrical, electromechanical, and electronic appliances. Major components: Motors (AC, DC, universal), heating elements, thermostats, sensors, timers, compressors, control circuits. Reading and interpreting appliance nameplates, wiring diagrams, and service manuals. Diagnostic techniques: Visual inspection, continuity testing, resistance/voltage/insulation testing.	12Hrs
Unit 2	**Fault Diagnosis& Repair of Appliances:** **Heating appliances**: Electric iron, immersion heater, toaster, microwave oven, geyser – construction, operation, common faults, repair methods. **Motor-based appliances**: Mixer grinder, ceiling fan, exhaust fan, washing machine, vacuum cleaner – working principles, fault symptoms, repair methods. **Cooling appliances**: Refrigerator, water cooler, air cooler, window air-conditioner (basics) – faults and repairs (compressor, thermostat, capacitor, motor, condenser).**Electronic appliances**: Induction cooktop , LED TV basics, microwave control circuits – PCB issues and replacement procedures. Repair techniques: Replacing elements, rewinding motors, adjusting thermostats, capacitor replacement, cleaning/servicing methods. Service documentation: Fault reports, repair logs, estimation sheets.	12Hrs
Unit 3	**Preventive Maintenance, Safety & Sustainable Practices:** Preventive maintenance: Lubrication, cleaning, alignment checks, filter cleaning, inspection schedules. Entrepreneurship in appliance servicing: Setting up service centers, customer handling, warranty support, business opportunities.	6 Hrs

List of Practicals:

Minimum Ten Practical's from the list mentioned below.

1. Demonstrate the working and testing of heating elements, thermostats, sensors, and compressors.
2. Carry out diagnostic techniques such as visual inspection, continuity testing, resistance measurement, voltage testing, and insulation testing on appliance parts.
3. Diagnose and repair common faults in heating appliances such as electric iron, immersion heater, and toaster.
4. Analyze the operation of microwave oven/geyser, identify fault symptoms, and replace defective heating elements or thermostats.
5. Motor-based appliances such as ceiling fan or mixer grinder, including bearing replacement, rewinding demonstration, and capacitor testing.
6. Perform inspection, fault identification, and minor repair/cleaning of washing machine or vacuum cleaner.

7. Test cooling appliances such as refrigerator or air cooler by checking thermostat, capacitor, motor, and demonstrating condenser cleaning.
8. Diagnose PCB-related faults in electronic appliances (induction cook top/microwave control circuit) and perform basic component replacement (capacitor/IC).
9. Carry out preventive maintenance activities such as lubrication, filter cleaning, and alignment checks on fan, cooler, or washing machine.
10. Demonstrate safe dismantling of an old appliance for e-waste management, segregate recyclable parts, and prepare a mini business plan for a service center.
11. Demonstrate use of PPE, insulation resistance testing and safe....handling of appliances.
12. Identify heating, cooling, cleaning appliances available in the lab.

Textbooks:

1. R.K. Rajput, Utilization of Electrical Energy, Laxmi Publications
2. B.L. Theraja& A.K. Theraja, A Textbook of Electrical Technology, Vol. II (AC & DC Machines, Utilization & Appliances), S. Chand
3. S.L. Uppal , Electricity and Appliances, Khanna Publishers
4. V.K. Mehta &Rohit Mehta, Principles of Electrical Machines, S. Chand

Reference Books:

1. National Skill Development Corporation (NSDC),Domestic Appliance Repair Technician Training Manuals
2. S. Rao, Testing, Commissioning, Operation and Maintenance of Electrical Equipment , Khanna Publishers
3. R. Gupta , Handbook of Electrical Installation Practice , Wiley India
4. Consumer Electronics Servicing Handbooks (Sony, LG, Samsung, Whirlpool, service manuals , practical reference)

E- Resources:

1. https://rckolkata.nios.ac.in/house-wiring-electrical-appliance-repairing-code-601.html
2. https://www.accessengineeringlibrary.com/content/book/9780071770187
3. https://www.talkingelectronics.com/Download%20eBooks/Fix%20Everything%20Electronic.pdf
4. https://www.vlab.co.in/broad-area-electrical-engineering

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
3EE124EC1.1	3	3	1	1	3	2	1	-	1	-	2
3EE124EC1.2	2	1	-	2	3	1	2	2	-	-	1
3EE124EC1.3	-	2	3	1	2	3	3	-	2	-	-
3EE124ECCO	3	2	2	1	3	2	2	2	1	-	1

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

Level: **4.5**	Course Code: **3ET123EC1**		Course Category: **EC**		
Course Name	**Electronics Servicing and Maintenance**				
Credits	**04**	Total L:T:P Hours	2:0:4 **90Hrs**	Total SL Hours	**30 Hrs**
Total Credit Hours	**120Hrs**				
SEE Marks	**30**	SEE Time	**2Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:

Subject Code 3ET123EC1 Electronics Servicing and Maintenance is an Exit Option-1 (L 4.5) for award of UG Certificate in Electronics & Telecommunication Engineering.

Course Objectives:

The course, designed for first year exit option, seeks to deepen students' knowledge of electronic components, diagnostic methods, and maintenance procedures, while fostering practical skills to troubleshoot, repair, and maintain everyday electronic devices and circuits.

Course Outcomes:

After completing the course students will be able to:

CO	**Course Outcome**	**Domain Level**
3ET123EC1.1	Identify, test, and classify electronic components using appropriate tools and safety measures.	C-3, P-4
3ET123EC1.2	Apply troubleshooting techniques to diagnose faults in electronic circuits and devices.	C-3
3ET123EC1.3	Demonstrate servicing, repair, and maintenance procedures for common electronic appliances.	C-3, P-4

Course Contents:

Unit 1	**Fundamentals of Electronics and Components:** Introduction to electronic systems, identification and classification of passive components (resistors, capacitors, inductors) and active components (diodes, transistors, ICs, LEDs, MOSFETs). Basic principles of electronic circuits, power supplies, and safety precautions in servicing.	10 Hrs
Unit 2	**Tools, Testing, and Troubleshooting:** Overview of servicing tools (multimeters, oscilloscopes, LCR meters, soldering irons). Testing methods for components and circuits, fault diagnosis techniques, common faults in electronic devices, and systematic troubleshooting approaches.	10 Hrs
Unit 3	**Servicing and Maintenance of Electronic Devices:** Preventive maintenance practices, repair of basic electronic appliances (e.g., power supplies, amplifiers, radios), disassembly and reassembly techniques, use of service manuals, and documentation of repairs. Introduction to SMD components and basic PCB repairs	10 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. Identification and classification of passive and active electronic components.
2. Measurement of resistors using color codes and verification with digital multimeter (DMM).
3. Testing of capacitors and inductors using LCR meter.
4. Testing of diode and transistor using multimeter and CRO.
5. Use of oscilloscope for waveform observation and frequency measurement.
6. Soldering and desoldering practice on PCBs.
7. Troubleshooting a simple rectifier circuit on breadboard.
8. Assembly and testing of a basic power supply circuit.
9. Fault finding in an audio amplifier circuit.
10. Repair and maintenance of a simple radio receiver.
11. Testing and replacement of faulty components in LED lighting systems.
12. Disassembly, cleaning, and reassembly of a household electronic appliance (e.g., fan regulator).
13. Use of function generator and logic probe for digital circuit testing.
14. PCB repair techniques, including track repair and component replacement.
15. Preventive maintenance of computer power supplies.

Text Books

1. R. S. Khandpur, McGraw-Hill, Printed Circuit Boards: Design, Fabrication, and Assembly, 1st Edition.
2. G. C. Loveday, Longman, Electronic Fault Diagnosis, 4th Edition.
3. A.K. Sawhney, Puneet Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, DHANPAT RAI & Co. (PVT.) Ltd. 19th Edition.

Reference Books

1. Thomas L. Floyd, Electronic Devices, Pearson Education, 10th Edition
2. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, Pearson Education, 11th Edition.
3. IPC Standards for PCB Design, IPC International, Inc.

E- Resources

1. https://www.electronics-tutorials.ws/
2. https://www.allaboutcircuits.com/
3. https://vlab.amrita.edu/?sub=1&brch=282

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
3ET123EC1.1	3	-	-	-	2	-	-	-	2	-	1
3ET123EC1.2	3	-	-	-	2	-	-	-	2	-	1
3ET123EC1.3	2	-	-	-	2	2	-	2	3	-	2
3ET123EC1.CO	3	-	-	-	2	1	-	1	2	-	1

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

<table>
<tr><td colspan="2">Level: 4.5</td><td colspan="2">Course Code: 3ET124EC1</td><td colspan="2">Course Category: EC</td></tr>
<tr><td>Course Name</td><td colspan="5">Assembly & Maintenance of Personal Computer</td></tr>
<tr><td>Credits</td><td>04</td><td rowspan="2">Total L:T:P Hours</td><td rowspan="2">2:0:4
90Hrs</td><td rowspan="2">Total SL Hours</td><td rowspan="2">30 Hrs</td></tr>
<tr><td>Total Credit Hours</td><td>120Hrs</td></tr>
<tr><td>SEE Marks</td><td>30</td><td>SEE Time</td><td>2Hrs</td><td>CIA Marks</td><td>20</td></tr>
<tr><td>EE Marks</td><td>25</td><td>PA Marks</td><td>25</td><td>Total Marks</td><td>100</td></tr>
</table>

Course Description:

Subject Code 3ET124EC1 Assembly and Maintenance of Personal Computer is an Exit Option-1 (L 4.5) for award of UG Certificate in Electronics & Telecommunication Engineering.

Course Objectives:

The course, designed for first year exit course, aims to enhance students' understanding of personal computer hardware components, assembly techniques, and maintenance practices, while developing practical skills to assemble, troubleshoot, and maintain personal computer systems.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ET124EC1.1	Identify and classify personal computer hardware components using appropriate tools and safety measures.	C-3, P-4
3ET124EC1.2	Assemble and configure a personal computer system for hardware and software setup.	C-3, P-4
3ET124EC1.3	Apply troubleshooting and maintenance techniques to diagnose and resolve common PC issues.	C-3, P-4

Course Contents:

Unit 1	**Introduction to Personal Computer Hardware:** Overview of personal computer architecture, identification and classification of major components (CPU, motherboard, RAM, storage devices, power supply, graphics cards, cooling systems). Safety precautions and electrostatic discharge (ESD) prevention during assembly and maintenance.	10 Hrs
Unit 2	**PC Assembly and Configuration:** Step-by-step assembly of a personal computer, installation of hardware components, cable management, BIOS/UEFI setup, and operating system installation. Introduction to peripheral devices: keyboards, mice, monitors and their connectivity.	10 Hrs
Unit 3	**Maintenance and Troubleshooting:** Preventive maintenance practices, cleaning and upgrading hardware components, troubleshooting common PC issues (e.g., boot failures, overheating, hardware conflicts), use of diagnostic tools, and documentation of maintenance procedures.	10 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. Identification and classification of PC hardware components (e.g., CPU, RAM, motherboard).
2. Demonstration of proper ESD prevention techniques during PC assembly.
3. Assembly of a personal computer from individual components.
4. Installation and configuration of a power supply unit.
5. Installation of RAM modules and verification of recognition in BIOS.
6. Installation and configuration of storage devices (HDD/SSD).
7. Cable management and organization inside a PC case.
8. BIOS/UEFI setup and configuration for optimal performance.
9. Installation of an operating system (e.g., Windows/Linux) on a PC.
10. Troubleshooting a PC that fails to boot.
11. Cleaning and maintenance of PC cooling systems (fans, heat sinks).
12. Upgrading hardware components (e.g., RAM, GPU, or storage).
13. Use of diagnostic software to identify hardware issues.
14. Testing and troubleshooting peripheral device connectivity (e.g., USB devices, monitors).
15. Replacement of a faulty power supply unit and verification.

Text Books

1. P.K. Sinha & Priti Sinha, Computer Fundamentals, BPB Publications, 6th Edition.
2. V. Rajaraman & T. Radhakrishnan, Computer Organization and Architecture, PHI Learning, 1st Edition.
3. E. Balagurusamy, Fundamentals of Computers, McGraw Hill Education, 1st Edition.

Reference Books

1. Ashok N. Kamthane & Amit A.Kamthane,Programming and Problem Solving with Python, McGraw Hill Education, 2nd Edition
2. Pang-Ning Tan, Michael Steinbach, & Vipin Kumar, Introduction to Data Mining, Pearson Education India, 1st Edition.

E- Resources

1. https://www.comptia.org/training/resources/a-core-series
2. https://www.ifixit.com/Guide/PC+Assembly
3. https://www.howtogeek.com/category/hardware

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
3ET124EC1.1	3	2	-	-	2	-	-	-	2	-	-
3ET124EC1.2	3	2	-	-	3	-	-	2	2	-	2
3ET124EC1.3	2	2	-	-	2	-	-	2	2	-	2
3ET124EC1CO	3	3	-	-	2	-	-	1	2	-	1

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

Level: **4.5**	Course Code: **3ME123EC1**			Course Category: **EC**	
Course Name	**Welding Technology/Joining Processes**				
Credits	**4**	Total L:T:P Hours	2:0:4	Total SL Hours	**30Hrs**
Total Credit Hours	**120 Hrs**		**90 Hrs**		
SEE Marks	**30**	SEE Time	**2 Hrs**	CIA Marks	**20**
EE Marks	**25**	PA Marks	**25**	Total Marks	**100**

Course Description:

Subject Code 3ME123EC1 Welding Technology/Joining Processes is a exit course (L 4.5) for first year B.Tech Program in Mechanical Engineering.

Course Objectives:

To provide students with foundational knowledge and hands-on experience in various Welding and Joining Processes

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3ME123EC1.1	Interpret the fundamentals of various welding processes to perform the jobs.	C-2
3ME123EC1.2	Perform basic joining operations to fabricate the jobs.	C-2
3ME123EC1.3	Analyze welding parameters, defects, and testing methods to ensure quality and reliability of welded components.	C-2, P-1

Course Contents:

Unit 1	**Fundamentals of Welding and Gas Welding:** Introduction and classification of welding processes, Types of weld joints and welding positions, Oxy-acetylene welding: principle, equipment, flame types, Gas cutting: principle, equipment, applications, advantages, disadvantages.	9 Hrs
Unit 2	**Arc and Resistance Welding Processes:** Electric arc welding: SMAW, GMAW (MIG), GTAW (TIG), SAW – working principles, equipment, consumables, Resistance welding: spot, seam, projection, flash welding – principles, applications, Comparison between arc and resistance welding, Power sources and polarity selection, Welding parameters and control.	12 Hrs

Unit 3	**Weld Metallurgy, Defects & Inspection:** Weldability of ferrous and non-ferrous metals, Heat-affected zone (HAZ) and thermal cycles, Common weld defects – causes and remedies, Inspection methods: visual, destructive, non-destructive testing: NDT – UT, RT, PT and MT. Welding symbols and standards: AWS/ISO/ASME.	9 Hrs

List of Practicals:

Minimum Ten practicals from the list mentioned below.

1. Study and demonstration of gas welding setup.
2. Study of different Welding parameters.
3. Perform a job on Arc welding setup and safety demonstration.
4. Demonstration of MIG welding.
5. Demonstration of TIG welding.
6. Study of welding defects.
7. Perform a job on TIG welding setup and safety demonstration.
8. Perform a job on MIG welding setup and safety demonstration.
9. Demonstration of resistance spot welding.
10. Demonstration of advanced welding process.
11. Study of non-destructive testing.

Text Books:

1. O. P. Khanna, Welding Technology, Dhanpat Rai Publications
2. Richard Little, Welding and Welding Technology , Tata McGraw Hill.
3. P. N. Rao, Manufacturing Technology: Vol. 1-Foundry, Forming & Welding.

Reference Books:

1. Larry Jeffus, Welding: Principles and Applications
2. Howard B. Cary & Scott Helzer, Modern Welding Technology ,Pearson Education

E-Resources:

1. http://www.nitttrkol.ac.in/virlab.php#top
2. http://vlabs.iitkgp.ac.in/vlt/

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
3ME123EC1.1	3	2	3	-	3	-	-	3	-	-	2
3ME123EC1.2	3	2	3	-	3	-	-	3	-	-	2
3ME123EC1.3	3	3	2	-	2	-	-	2	-	-	2
3ME123EC1	3	2	3	-	3	-	-	3	-	-	2

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

Level: **4.5**	Course Code: **3ME124EC1**		Course Category: **EC**		
Course Name	**Metal Forming Processes**				
Credits	**4**	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 3ME124EC1 Metal Forming Processes is a exit course (L 4.5) for first year B.Tech Program in Mechanical Engineering.

Course Objectives:
The objective of this course is to provide fundamental knowledge of metal forming processes, including bulk and sheet metal forming, their mechanics, defects, tooling, and applications in manufacturing industries.

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

CO	Course Outcome	Domain Level
3ME124EC1.1	Interpret the basic principles and mechanics of metal forming processes to build a strong foundation in the fundamentals of bulk and sheet metal forming processes.	C-2
3ME124EC1.2	Identify and compare various bulk and sheet metal forming techniques to develop analytical skills.	C-2, P-1
3ME124EC1.3	Apply practical Knowledge of appropriate forming techniques to tool design, formability, and its applications in various sectors.	C-3

Course Contents:

Unit 1	**Fundamentals of Metal Forming:** Classification of forming processes – Bulk and Sheet metal forming, Stress-strain behaviour and flow curve, True stress and strain, Formability and workability, Effect of strain rate and temperature, Cold, Warm, and Hot metal forming processes, Friction and lubrication in forming.	9 Hrs
Unit 2	**Bulk Deformation Processes:** Forging: Open die and closed die forging, forging defects, equipment, Rolling: Types, rolling variables, defects in rolled products, Wire and rod drawing: Mechanics, drawing stress, die design, Extrusion: Hot and cold extrusion, direct and indirect extrusion, Rotary Swaging, Upsetting, Coining, Hubbing, Advantages, limitations and applications of bulk deformation processes in aerospace and automotive sectors.	12 Hrs
Unit 3	**Sheet Metal Forming Processes:** Shearing, Blanking, Punching, Bending, Deep Drawing, Stretch forming, Spinning, Hemming, Spring-back and its correction, Forming limit diagram (FLD), basics of Tool design and die materials.	9 Hrs

List of Practicals:

Minimum ten practicals from the list mentioned below.

1. Study of forging tools and equipment.
2. Demonstration of forging tools and equipment.
3. Study of Cold Forging on Aluminium.
4. Cold forging of soft metal – simple upsetting or flattening operation.
5. Manual sheet metal bending using vice and bending fixture.
6. Fabrication of a small sheet metal model
7. Lapped seam joint fabrication using hand tools and riveting
8. U-bending and channel bending using bending block and hammer
9. Shearing/cutting of sheet metal using hand snips or guillotine cutter
10. Straight and V-bending of a sheet metal strip using hand tools or Vice.
11. Study of Stress-strain behaviour and flow curve of various materials.

Text Books:

1. S. Kalpakjian & S.R. Schmid, Manufacturing Engineering and Technology.
2. P. N. Rao, Manufacturing Technology.

Reference Books:

1. Ghosh and Mallik, Manufacturing Science.
2. Dieter, Mechanical Metallurgy.
3. ASM Handbook – Volume 14: Forming and Forging.

E-Resources:
1. https://www.dei.ac.in/dei/
2. https://www.iitk.ac.in/

Mapping of COs with POs

CO	PO										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
3ME124EC1.1	3	2	3	-	3	-	-	3	-	-	2
3ME124EC1.2	3	2	3	-	3	-	-	3	-	-	2
3ME124EC1.3	3	3	2	-	2	-	-	2	-	-	2
3ME124EC1	3	2	3	-	3	-	-	3	-	-	2

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

Level: **4.5**	Course Code: **3TX123EC1**			Course Category: **EC**	
Course Name	**Testing 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	**25**	Total Marks	**100**

Course Description:

Subject Code 3TX123EC1 Testing of Textile Materials is an exit course (L 4.5) after First Year B. Tech. Textile Engineering.

Course Objectives:

The objective of this course is to provide students with fundamental knowledge and skills for testing textile materials to assess their physical and mechanical properties.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3TX123EC1.1	Describe importance and objectives of textile testing and quality standards to assess properties of Textile materials	C-2
3TX123EC1.2	Apply and demonstrate fibre and yarn testing methods to assess their properties.	C-3,P-5
3TX123EC1.3	Apply and demonstrate the testing methods for fabric properties.	C-3,P-5

Course Contents:

Unit 1	**Introduction to Textile Testing:** Importance and objectives of textile testing. Standards and standardization bodies (BIS, ISO, ASTM). Sampling techniques for fibres, yarns, and fabrics.	10 hrs
Unit 2	**Fibre and Yarn Testing:** Measurement of fibre fineness; Fibre maturity; Fibre length and Fibre strength. Determination of yarn count; Measurement of yarn twist; Yarn tensile strength and elongation.	10 hrs
Unit 3	**Fabric Physical and Aesthetic Testing:** Testing of fabric for Tensile strength, Abrasion resistance, Pilling resistance, Air permeability, Crease recovery and dimensional stability. Colour fastness testing for washing, rubbing, and light.	10 hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Determination of Fibre Length by Baer Sorter Method.
2. Determination of Yarn Linear Density (Count).
3. Measurement of Yarn Twist per Unit Length.
4. Determination of Yarn Tensile Strength and Elongation for Single Yarn.
5. Determination of Fabric Tensile Strength using Tensile Testing Machine.
6. Determination of Fabric air permeability.
7. Measurement of Fabric Abrasion Resistance by abrasion Tester.
8. Determination of Fabric Pilling Resistance using ICI Pilling Box Tester.
9. Determination of Fastness to Washing using Launderometer.
10. Determination of Fastness to rubbing using Crock meter.
11. Determination of fabric crease recovery angle.
12. Determination of fabric dimensional stability after washing.

Text Books

1. J.E., Booth, Butterworth-Heinemann, Principles of Textile Testing.
2. Grover, E., & Hamby, Handbook of Textile Testing and Quality Control,
3. B. P. Saville, Physical Testing of Textiles

Reference Books:

1. Lomas, B., The Textile Institute Textile Testing.
2. BIS Textile Testing Standards Manuals.
3. ASTM Textile Testing Standards Manuals.

E Recourses:

1. Testing of Functional and Technical Textiles NPTEL course
   https://onlinecourses.nptel.ac.in/noc24_te03/preview
2. Textile Testing and Processing Fundamentals online course
   https://www.udemy.com/course/textile-testing-and-processing-fundamentals/?srsltid=AfmBOoo0EY0DXzo7a98KM7P1Vp-Vyroj90ap2kA0ocVWGV-jSfe1F0X5&couponCode=MT180825C

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
3TX123EC1.1	1	-	-	-	-	-	-	-	-	-	-
3TX123EC1.2	3	-	-	2	2	-	-	-	2	-	-
3TX123EC1.3	3	-	-	2	2	-	-	-	2	-	-
3TX123EC1CO	2	-	-	1	1	-	-	-	1	-	-

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

ANNEXURE –I

Curriculum Structure for Four Year Multidisciplinary Undergraduate B. Tech. Degree Programme In Chemical Engineering

(In view of NEP-2020)

For students admitted in academic session 2025-26 and onwards

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)

15. Curriculum Structure (Scheme) of Semester III to VIII for Four Year Multidisciplinary Undergraduate B. Tech. in Chemical Engineering Degree Programme.

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

<u>Oil & Gas Industry</u>

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.

<u>Pharmaceutical Industry</u>

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	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**	
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	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										

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**	
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 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	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	

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 (PEC-V)	7CH304PE2
17	VIII	Carbon Capture, Utilization and Storage (PEC-VI)	8CH310PE1
		OR	
18		Nanotechnology for Chemical Engineering (PEC-VI)	8CH310PE2

Curriculum Structure 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

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

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16. Curriculum Structure (Scheme) of Semester III to VIII for Four Year Multidisciplinary Undergraduate B. Tech. in Civil Engineering Degree Programme.

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.
80. Teamwork and Leadership
81. 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.
82. Leadership Skills: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
83. Conflict Resolution: Ability to resolve conflicts between team members, clients, or contractors, ensuring that project objectives are still achieved.

D. Attention to Detail

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

E. Ethical and Professional Integrity

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

F. Adaptability and Flexibility

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

G. Technical Competency

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

H. Creativity and Innovation

93. Creative Problem Solving: Thinking outside the box and coming up with novel solutions to engineering challenges.
94. 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

95. Sustainability Awareness: Knowledge of sustainable construction methods, green building practices, and the importance of reducing the environmental impact of engineering projects.
96. Cultural Sensitivity: Understanding and respecting cultural differences when working in diverse teams or international projects.
97. 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

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

K. Regulatory and Legal Knowledge

100. Familiarity with Building Codes and Standards: Understanding and ensuring compliance with local, national, and international building codes, safety regulations, and legal standards.

101. 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

102. Client Management: Building and maintaining strong relationships with clients, understanding their needs, and ensuring their expectations are met throughout the project.
103. 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**	

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	7CE403RP1	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 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

Curriculum Structure 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

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)

17. Curriculum Structure (Scheme) of Semester III to VIII for Four Year Multidisciplinary Undergraduate B. Tech. in Computer Science Engineering Degree Programme.

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 responsiveweb 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	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

Sr. No.	Course Name	Course Category	Course Code	L	T	P	SL	Total	Credits	SEE Max	CIA Max	Theory Max	Theory Min	EE Max	PA Max	PT Max	PT Min	Total Max Marks	Theory Exam Time
12	Double Minor / Honours Course - I	DH	3CS211DH1/2	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.

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										

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

Curriculum Structure 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

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

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18. Curriculum Structure (Scheme) of Semester III to VIII for Four Year Multidisciplinary Undergraduate B. Tech. in Electrical Engineering Degree Programme.

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.

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

Curriculum Structure 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

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)

19. Curriculum Structure (Scheme) of Semester III to VIII for Four Year Undergraduate B. Tech. in Electronics & Telecommunication Engineering Degree Programme.

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

65. Remember principles of power conversion for designing efficient

inverters.

66. Understand thermal management techniques for high-power systems.
67. Apply control strategies to stabilize voltage in power supply systems.
68. Analyze power losses in converters to improve energy efficiency.
69. Evaluate reliability of power electronics in renewable energy systems.
70. Create high-efficiency power converters for solar and wind energy.
71. Design switching circuits for high-frequency power applications.
72. Develop control algorithms for smart grid power distribution.
73. Assess safety standards compliance in power electronic systems.
74. Integrate energy storage systems with power electronics for grid stability.
75. Optimize power factor correction in industrial power systems.

Research and Academia

76. Remember fundamental theories of electronics for teaching.
77. Understand emerging trends in telecommunication technologies for research.
78. Apply simulation tools to model electronic circuits for experiments.
79. Analyze experimental data to validate telecommunication theories.
80. Evaluate feasibility of novel electronic designs for research applications.
81. Create innovative research methodologies for wireless technologies.
82. Design experimental setups for testing electronic components.
83. Develop open-source tools for educational purses in electronics.
84. Assess impact of research findings on industry applications.
85. Integrate interdisciplinary approaches in electronics research.
86. Synthesize new theoretical frameworks for telecommunication protocols.

Broadcasting and Media

87. Remember broadcasting standards (e.g. ATSC DVB) for media transmission.
88. Understand signal compression techniques for high-quality media streaming.
89. Apply digital signal processing to enhance audio and video quality.
90. Analyze transmission errors to improve broadcasting reliability.
91. Evaluate performance of media delivery networks for low-latency streaming.
92. Create adaptive streaming algorithms for variable network conditions.
93. Design satellite broadcasting systems for global content

distribution.

94. Develop software for real-time media encoding and decoding.
95. Assess signal interference in broadcasting systems for optimal performance.
96. Integrate IP-based technologies for hybrid broadcasting solutions.
97. Optimize bandwidth usage for 4K/8K video streaming applications.

Semiconductor Industry

98. Analyze the characteristics and behaviour of semiconductor devices for application in ICs.
99. Design VLSI circuits and systems using industry-standard EDA tools.
100. Apply semiconductor fabrication processes to create functional devices.
101. Evaluate the performance, yield, and reliability of semiconductor devices and systems.
102. Implement FPGA/ASIC solutions for specific applications.
103. Integrate semiconductor packaging and testing techniques to meet industry standards.
104. Develop low-power, high-performance microelectronic systems considering scalability and cost-effectiveness.
105. Create simulation models to verify and validate semiconductor circuit designs.

Basic Science

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

Engineering Science Courses

109. Demonstrate proficiency in basic workshop operations (fitting, carpentry, welding, sheet metal, plumbing and machining etc.).
110. Apply the principles of engineering mechanics to analyse and solve problems involving forces, moment, equilibrium, friction, centred and MOI etc.
111. Apply the principles electrical engineering to analyse and maintain electrical systems, circuits, machines and power systems.
112. Demonstrate ability to interpreted and create drawings using

geometric constructions, orthographic projections, isometric projections and CAD tools.

113. Demonstrate ability to apply fundamental principles of algorithms, programming, data structures and computing system to solve conceptual problems.

Generic Competencies

A. Problem-Solving Skills

114. Analytical Thinking: Ability to analyze complex problems, break them down into smaller components, and find effective solutions.
115. 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

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

C. Project Management

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

D. Teamwork and Leadership

123. 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.
124. Leadership Skills: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
125. Conflict Resolution: Ability to resolve conflicts between team

members, clients, or contractors, ensuring that project objectives are still achieved.

E. Attention to Detail

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

F. Ethical and Professional Integrity

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

G. Adaptability and Flexibility

130. Openness to Change: Being able to adapt to new technologies, tools, and methods, as well as evolving project requirements or environmental conditions.
131. 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

132. Creative Problem Solving: Thinking outside the box and coming up with novel solutions to engineering challenges.
133. 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

134. Sustainability Awareness: Knowledge of sustainable construction methods, green building practices, and the importance of reducing the environmental impact of engineering projects.
135. Cultural Sensitivity: Understanding and respecting cultural differences when working in diverse teams or international projects.
136. 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

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

K. Regulatory and Legal Knowledge

139. Familiarity with Building Codes and Standards: Understanding and ensuring compliance with local, national, and international building codes, safety regulations, and legal standards.
140. 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

141. Client Management: Building and maintaining strong relationships with clients, understanding their needs, and ensuring their expectations are met throughout the project.
142. 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	-										
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**	
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	7ET403RP1	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 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

Curriculum Structure 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

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)

20. Curriculum Structure (Scheme) of Semester III to VIII for Four Year Undergraduate B. Tech. in Mechanical Engineering Degree Programme.

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

6. Educate, Prepare and mentor the students to build their abilities and enhance their professional skill to make them competitive.
7. Provide adequate recourses and facilities conducive to quality learning
environment.
8. Develop alliances with industry as well as government establishments to prepare students for careers and inculcate the attitude of entrepreneurship.
9. 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.
139. **Customer Service Orientation**: Ensuring that client concerns are addressed promptly, and working toward providing value-added solutions that meet their goals.

A. Problem-Solving Skills

116. **Analytical Thinking**: Ability to analyze complex problems, break them down into smaller components, and find effective solutions.
117. **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

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

C. Project Management

121. **Time Management**: Efficiently managing time and prioritizing tasks to meet deadlines in a dynamic project environment.
122. **Resource Management**: Ability to plan, allocate, and manage resources such as labour, materials, and equipment to ensure project efficiency.
123. **Budgeting and Cost Control**: Skills in estimating project costs, monitoring budgets, and ensuring projects are completed within

financial constraints.

124. **Risk Management**: Ability to identify, assess, and mitigate risks during the planning and execution of engineering projects.

D. Teamwork and Leadership

125. **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.
126. **Leadership Skills**: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
127. **Conflict Resolution**: Ability to resolve conflicts between team members, clients, or contractors, ensuring that project objectives are still achieved.

E. Attention to Detail

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

F. Ethical and Professional Integrity

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

G. Adaptability and Flexibility

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

H. Technical Competency

134. **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.
135. **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.

136. **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

137. **Creative Problem Solving**: Thinking outside the box and coming up with novel solutions to engineering challenges.

138. **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

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

140. **Cultural Sensitivity**: Understanding and respecting cultural differences when working in diverse teams or international projects.

141. **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

142. **Data-Driven Decisions**: Using available data, facts, and technical analysis to make informed decisions about the design, execution, and management of projects.

143. **Prioritizing Decisions**: Knowing which decisions need immediate attention and which can be deferred, especially in a high-pressure environment.

L. Regulatory and Legal Knowledge

144. **Familiarity with Building Codes and Standards**: Understanding and ensuring compliance with local, national, and international building codes, safety regulations, and legal standards.

145. **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

146. **Client Management**: Building and maintaining strong relationships with clients, understanding their needs, and ensuring their expectations are met throughout the project.

147. **Customer Service Orientation**: Ensuring that client concerns are addressed promptly, and working toward providing value-added solutions that meet their goals.

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.) L	T	P	SL	Total	Credits	Theory Evaluation SEE Max Marks	Theory Evaluation CIA Max Marks	Theory (Total) Max Marks	Theory (Total) Min Marks	Practical/Term Work Evaluation EE Max Marks	Practical/Term Work Evaluation PA Max Marks	Practical/Term Work Evaluation (Total) Max Marks	Practical/Term Work Evaluation (Total) Min Marks	Total Max Marks	Theory Exam Time (Hrs.)
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	-						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 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	

10. 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

Curriculum Structure 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

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)

21. Curriculum Structure (Scheme) of Semester III to VIII for Four Year Undergraduate B. Tech. in Textile Engineering Degree Programme.

1. 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. 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,
53. stitching, finishing) for marketing and merchandising.
54. Exposure to tech pack preparation and BOM (Bill of Materials) for marketing and merchandising.
55. Ability to communicate with buyers, vendors, designers and teams for apparel.
56. Basic knowledge of Excel, ERP systems, and production reports for merchandising.
57. Ability to support production planning and line balancing in merchandising.

Textile Machine Manufacturing

58. Ability to support production planning and line balancing in Textile Machine manufacturing industries.
59. Exposure to technical textiles, functional finishes, smart textiles for making machines.

Textile Products Sales, Servicing and Marketing

60. Awareness of national/international standards (ISO, BIS, OEKO-TEX, GOTS) for textile product, sales, servicing and marketing
61. Ability to support production planning and line balancing for textile product, sales, servicing and marketing.

Textile Education & Research Institutes

62. Knowledge and Use of textile testing equipment in Textile Education and research institutes.
63. Participation in R&D, prototyping, and new product development.
64. Knowledge of quality control and assurance protocols in Textile Education

Government and Public Sectors

65. Skills in process monitoring and troubleshooting in Government sectors like Ministry of textiles, DRDO
66. Participation in R&D, prototyping, and new product development in challenging area of government schemes

Textile Certifications

67. Knowledge and Use of textile testing equipment for certification.
68. Awareness of national/international standards (ISO, BIS, OEKO-TEX, GOTS) for certification.
69. Knowledge of quality control and assurance protocols for certification

Fashion and Apparel Designing/Consultants

70. Basic garment manufacturing techniques (cutting, stitching, finishing) for making garment.
71. Exposure to tech pack preparation and BOM (Bill of Materials) for competing complete order.
72. Knowledge of Fashion design/CAD softwares for fashion designing and ERP systems for automatic operations in garment industry.
73. Proficiency in MS Office, Excel, for preparation of reports.
74. Basic knowledge of Excel, ERP systems and production reports for garment production.

Basic Science

75. Apply mathematical techniques such as algebra, trigonometry, calculus, differential equations, linear algebra, probability and statistics to solve problems.
76. Apply physical principles such as motion, forces, energy and

materials to solve problems.

77. Apply knowledge of chemical properties and reactions for construction material and environment (Corrosion, polymer, electrochemistry etc.).

Engineering Science Courses

78. Demonstrate proficiency in basic workshop operations (fitting, carpentry, welding, sheet metal, plumbing and machining etc.).
79. Apply the principles of engineering mechanics to analyse and solve problems involving forces, moment, equilibrium, friction, centred and MOI etc.
80. Apply the principles electrical engineering to analyse and maintain electrical systems, circuits, machines and power systems.
81. Demonstrate ability to interpreted and created draw ings using geometric constructions, orthographic projections, isometric projections and CAD tools.
82. 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

83. Analytical Thinking: Ability to analyze complex problems, break them down into smaller components, and find effective solutions.
84. 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

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

C. Project Management

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

D. Teamwork and Leadership

92. 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.
93. Leadership Skills: Leading and motivating a team of engineers, contractors, and other stakeholders to meet project goals and deadlines.
94. Conflict Resolution: Ability to resolve conflicts between team members, clients, or contractors, ensuring that project objectives are still achieved.

E. Attention to Detail

95. Accuracy: Ensuring all engineering calculations, designs, and project plans are accurate and align with weave and design og fabric, regulations, and standards.
96. 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.)
				L	T	P	SL	Total		SEE	CIA			EE	PA				
										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