



## Department of Chemical Engineering

### Course Outcomes (CO)

#### Semester III

#### **3CH01-APPLIED MATHEMATICS-III**

After successfully completing the course, the students will be able to:

CO 1. Demonstrate the knowledge to solve Ordinary Linear Differential Equations with Constant Coefficients (OLDECC). Reduce equations with variable coefficients to OLDECC.

CO 2. Define Laplace Transform and its inverse transform for basic functions. Locate the Laplace Transform of Periodic Function. Apply the concept of Laplace Transform to solve ordinary differential equations.

CO 3. Use the concept of Probability to the solution of various engineering problems. Demonstrate the knowledge of Probability Distributions (Binomial, Poisson & Normal) and their uses to the solution of various engineering problems.

CO 4. Gain and apply the knowledge of function of complex variables and contour integration to the solution of various engineering problems.

CO 5. Gain and apply the knowledge of various Numerical methods to get solution of – Algebraic and Transcendental equations. System of linear equations. Various differential equations (1<sup>st</sup> order 1<sup>st</sup> degree).

CO 6. Evaluate line, surface and volume integrals and their uses to the solution of various engineering problems. Find gradient, divergence, curl and directional derivatives of various vector fields. Use concept of Irrotational and Solenoidal vector fields.



### **3CH02-PROCESS INSTRUMENTATION**

After successfully completing the course, the students will be able to:

- CO 1. Learn the basic methods of measurement and performance characteristics of instruments.
- CO 2. Learn the operating principles, constructions and working of temperature measurement.
- CO 3. Learn the operating principles, constructions and working of Pressure measurement.
- CO 4. Learn the operating principles, constructions and working of Flow measurement.
- CO 5. Learn the operating principles, constructions and working of level measurement.
- CO 6. Learn the operating principles, constructions and working of PH and Humidity measurement.

### **3CH03-STRENGTH OF MATERIALS**

After successfully completing the course, the students will be able to:

- CO 1. Understand the basics of material properties, stress and strain.
- CO 2. Apply knowledge of mathematics, science for engineering applications.
- CO 3. Identify, formulate and solve engineering and real life problems.
- CO 4. Design and conduct experiments, as well as to analyze and interpret action and reaction data.
- CO 5. Understand specific requirement from the component to meet desired needs within realistic constraints of safety.
- CO 6. Understand concept of deflection of beams.



### **3CH04-CHEMICAL ENGINEERING THERMODYNAMICS-I**

After successfully completing the course, the students will be able to:

- CO 1. Apply fundamental concepts of thermodynamics to engineering applications.
- CO 2. Estimate thermodynamic properties of substances in gas and liquid states.
- CO 3. Determine thermodynamic efficiency of various energy related processes.
- CO 4. Design the chemical engineering equipments in processes.
- CO 5. Ability of application of thermodynamics to phase equilibria and reaction equilibria.
- CO 6. Apply thermodynamics to conversion devices.

### **3CH05-PROCESS CALCULATIONS**

After successfully completing the course, the students will be able to:

- CO 1. Understand the basic fundamentals of Chemical Engineering.
- CO 2. Understand the material balance of various unit operations.
- CO 3. Understand the material balance of various unit processes.
- CO 4. Understand the Energy Balance of various unit operations.
- CO 5. Understand the Energy Balance of various unit processes.
- CO 6. Understand the basics of fuel and combustion.

### **4CH01 - APPLIED PHYSICAL CHEMISTRY**

After successfully completing the course, the students will be able to:

- CO 1. Understand the concept of real and ideal gases, internal forces and molecular speed in gases.
- CO 2. Understand the rate of reaction, order, molecularity, energy of activation of chemical reactions and their determination.



CO 3. Understand the basic concepts of adsorption and types of catalysis and adsorption isotherms.

CO 4. Understand the transport phenomenon and the electrical properties of fluid.

CO 5. Understand the basic concepts of the 1st and 2nd Laws of Thermodynamics, Thermodynamic functions and their applications.

CO 6. Understand the basic concepts of spectroscopy and its analysis techniques with its principles and applications. To predict the high and low quantum yield photochemical reactions

#### **4CH02-MACHINE DESIGN & DRAWING**

After successfully completing the course, the students will be able to:

CO 1. Understand the sectional views and types of orthographic projections.

CO 2. Understand the development of surfaces, prism etc.

CO 3. Identify & calculate different forces & stresses induced in the machine parts like gears, I.C. engine parts, couplings, pressure vessels etc.

CO 4. Understand the design of helical springs, power screw, etc.

CO 5. Understand the different types of joints.

CO 6. Understand knowledge of the machine design & drawing.

#### **4CH03-FLUID FLOW OPERATIONS**

After successfully completing the course, the students will be able to:

CO 1. Understand the concept of types of fluids, pressure effect and forces on fluids.

CO 2. Analyze fluid flow problems with the application of the momentum and energy equations. To understand the concept of kinematics of flow.

CO 3. Understand the basic principles of conservation of mass, momentum and energy for calculation of flow rates.



CO 4. Understand the principle, working, and industrial applications of different flow meters.

CO 5. Uunderstand working principle, working, and industrial applications of different transporting machines.

CO 6. Understand the principle, working, applications of two phase flow.

#### **4CH04-CHEMICAL ENGINEERING THERMODYNAMICS-II**

After successfully completing the course, the students will be able to:

CO 1. Apply fundamental concepts of thermodynamics to engineering applications.

CO 2. Apply application of thermodynamics to phase equilibria and reaction equilibria.

CO 3. Apply thermodynamics to conversion devices.

CO 4. Design the chemical engineering equipments in processes.

CO 5. Determine thermodynamic efficiency of various energy related processes.

CO 6. Estimate thermodynamic properties of substances in gas and liquid states.

#### **4CH05- CHEMICAL ENGINEERING OPERATIONS-I(MECHANICAL OPERATIONS)**

After successfully completing the course, the students will be able to:

CO 1. Study law's, operating variables and equipments of energies

CO 2. Study particle response of fluids under different conditions.

CO 3. Study storage, transportation, and principles of mixing equipments.

CO 4. Study principal operation and equipments of solid liquid separation process.

CO 5. Study principal, operation and equipments of solid - liquid, solid - gas, liquid – liquid separation.

CO 6. Study principal, operation and equipments of adsorption with recent updates.



#### **4ES06 – ENVIRONMENTAL STUDIES**

After successfully completing the course, the students will be able to:

CO 1. Understand the significance of environmental studies and various natural resources and its management.

CO 2. Discover the knowledge in ecological perspective and value of environment.

CO 3. Demonstrate a comprehensive understanding of the world's biodiversity and the importance of its conservation.

CO 4. Categorize the different types of pollutions and their control measures. Discover effective methods of waste management. Analyze global environmental problems and come out with the best possible solution.

CO 5. Understand environmental laws and sustainable development.

CO 6. Understand the population growth and its effects on the society and environment.

#### **5CH01- HEAT TRANSFER**

After successfully completing the course, the students will be able to:

CO 1. Understand the concepts of heat transfer.

CO 2. Understands mechanisms of conduction, convection and radiation.

CO 3. Understand the heat transfer in parallel & counter current flow.

CO 4. Analyzes the performance of heat exchange equipments & evaporators.

CO 5. Understand the effect of heat transfer in boiling and evaporators.

CO 6. Understand the components subjected to thermal loading.



### **5CH02-CHEMICAL ENGINEERING PROCESS-I**

After successfully completing the course, the students will be able to:

- CO 1. Understand Importance and components of chemical engineering.
- CO 2. Understand the concepts of unit operations and unit processes.
- CO 3. Knows current scenario of chemical & allied process industries.
- CO 4. Understand the manufacturing of various inorganic chemicals.
- CO 5. Understand the process flow diagram and various process parameters.
- CO 6. Identify and solve engineering problems during production.

### **5CH03-MATERIAL SCIENCE & ENGINEERING**

After successfully completing the course, the students will be able to:

- CO 1. Understands the atomic, molecular, crystalline & microscopic structures of engineering materials.
- CO 2. Predicts and controls material properties.
- CO 3. Develops the techniques, skills, and modern engineering tools necessary for engineering practice.
- CO 4. Understand the different corrosion types and properties.
- CO 5. Select the polymeric materials for equipments.
- CO6. Understand the basic issues involved in polymer blends, composites and nanocomposites.

### **5CH04-ECONOMICS & MANAGEMENT**

After successfully completing the course, the students will be able to:

- CO 1. Understands the happenings in the field of & preliminary idea about management.





CO 2. Performs & can evaluate present worth, future worth and annual worth analyses on one or more economic alternatives.

CO 3. Performs & can evaluate payback period & capitalized cost on one or more economic alternatives.

CO 4. Carries out & evaluates benefit / cost, life cycle & break even analysis on one or more economic alternatives.

CO 5. Makes economic analyses in the decision making process to justify or reject alternative / projects on economic basis.

CO 6. Understand the Social awareness & marketing strategy related to economics is evaluated.

### **5CH05-RISK & SAFETY MANAGEMENT**

After successfully completing the course, the students will be able to:

CO 1. Get acquainted with different hazards identification and risk assessment methodology.

CO 2. Identify the different hazards causing situations and their avoidance.

CO 3. Get knowledge of effects of hazardous chemical exposure.

CO 4. Get exposure of hazards in different types of industries like fertilizer, paper and pulp, etc.

CO 5. Understand the knowledge of safety education and training.

CO 6. Understand legal aspects of industrial safety and safety audit.

### **6CH01-CHEMICAL ENGINEERING OPERATIONS-II (MASS TRANSFER-I)**

After successfully completing the course, the students will be able to:

CO 1. Study the diffusional mass transfer





CO 2. Study interphase and different analogies of mass transfer

CO 3. Study the mechanism of crystallization and absorption.

CO 4. Study the operation of Drying

CO 5. Study design and operation of the equipments.

CO 6. Know the recent developments in mass transfer operation.

### **6CH02-CHEMICAL ENGINEERING PROCESS-II**

After successfully completing the course, the students will be able to:

CO 1. Understand the Importance and components of chemical engineering.

CO 2. Understand the Concepts of unit operations and unit processes.

CO 3. Understand the manufacturing of various organic chemicals.

CO 4. Understand the process flow diagram and various process parameters.

CO 5. Identifies and solve engineering problems during production.

CO 6. Knows current scenario of chemical & allied process industries.

### **6CH03-COMPUTER PROGRAMMING & APPLICATIONS**

After successfully completing the course, the students will be able to:

CO 1. Apply numerical methods to evaluate the numerical solution of first order differential equation in chemical engineering.

CO 2. Relate the numerical methods to evaluate numerical solutions of system of equations in chemical engineering.

CO 3. Find the roots of the equation in chemical engineering by applying numerical methods.

CO 4. Solve and design algorithm for linear regression analysis applicable to chemical engineering.



CO 5. Understand how to apply optimization techniques to chemical engineering problems.

CO 6. Understand the design programs involving decision structures, loops and functions.

### **6CH04-PROCESS EQUIPMENT DESIGN & DRAWING**

After successfully completing the course, the students will be able to:

CO 1. Understand the Knowledge of basics of process equipment design and important parameters of equipment design.

CO 2. Understand the Knowledge of process equipment accessories & support systems.

CO 3. Design pressure vessels subjected to internal and external pressures.

CO 4. Design special vessels (ex. tall vessels) and various parts of vessel ( ex. heads)

CO 5. Understand the Knowledge of equipment fabrication & testing methods.

CO 6. Understand the Designs of the piping system

### **6CH05-RENEWABLE ENERGY SOURCES**

After successfully completing the course, the students will be able to:

CO 1. Study and understand solar energy and its applications as a renewable source of energy.

CO 2. Know how to harvest energy from wind and apply as a renewable source of energy.

CO 3. Understand the biomass energy generation and its technologies.

CO 4. Recognize hydrogen and fuel cell as a renewable source of energy.

CO 5. Acquire the knowledge of wave power, tidal power and geothermal principles and applications.

CO 6. Know the energy demand of world, nation and available resources to fulfill the demand.



### **7CH01- CHEMICAL ENGINEERING OPERATION-III (MASS TRANSFER-II)**

After successfully completing the course, the students will be able to:

- CO 1. Study separation by liquid- liquid extraction.
- CO 2. Study equipments in liquid-liquid extraction process.
- CO 3. Study the separation by leaching.
- CO 4. Study the design calculations of distillation column.
- CO 5. Study the design calculations of multi- component distillation column.
- CO 6. Study recent developments in mass transfer operation.

### **7CH02-CHEMICAL REACTION ENGINEERING-I**

After successfully completing the course, the students will be able to:

- CO 1. Develop rate laws for homogeneous reactions.
- CO 2. Design of ideal reactors for single and complex reactions.
- CO 3. Develop skills to choose the right reactor among single, multiple, recycle reactor, etc.
- CO 4. Design of multiple reactor system.
- CO 5. Design of non-isothermal reactors.
- CO 6. Design of recycle reactors.

### **7CH03- PROCESS DYNAMICS & CONTROL**

After successfully completing the course, the students will be able to:

- CO 1. Students will be able to model a physical process.
- CO 2. Students will have the knowledge of various controller designs, and methods of controller tuning.
- CO 3. Understands the advanced control techniques.



CO 4. Students will be exposed to various complex control schemes, characteristics and application of control valves.

CO 5. Understands the frequency response methods.

CO 6. Understands the dynamics and control of chemical equipments.

#### **7CH04 -PLANT DESIGN & PROJECT ENGINEERING**

After successfully completing the course, the students will be able to:

CO 1. Understands concepts of plant design and project engineering.

CO 2. Synthesize feasible and optimum flow-sheet.

CO 3. Estimation of capital investment, total product costs and profitability.

CO 4. Optimum design of equipments based on economics and process considerations.

CO 5. Understands the replacement and maintenance analysis.

CO 6. Understands inventory control and project management.

#### **7CH05- INDUSTRIAL WASTE TREATMENT**

After successfully completing the course, the students will be able to:

CO 1. Understand the different types of wastes generated in an industry.

CO 2. Understand the different unit operations and unit processes involved in conversion of highly polluted water to potable standards.

CO 3. Understand about the quantification and analysis of wastewater and treatment.

CO 4. Understand the disposal of water pollutants, and operating principles of control devices.

CO 5. Understand advanced waste water treatment processes.

CO 6. Understand environmental regulatory legislations and standards and climate changes.



### **8CH01–TRANSPORT PHENOMENON**

After successfully completing the course, the students will be able to:

- CO 1. Study phenomenological laws of transport process.
- CO 2. Apply the overall mass, momentum and energy equations for analysis.
- CO 3. Apply integral momentum equations for flow through different geometry.
- CO 4. Apply the boundary layer equations to analyze industrial problems.
- CO 5. Study the turbulent flow properties, its mechanism and analogies of transport process.
- CO 6. Apply technical concept of mass transfer analogies.

### **8CH02-CHEMICAL REACTION ENGINEERING-II**

After successfully completing the course, the students will be able to:

- CO 1. U Ability to distinguish between various RTD curves and predict the conversion from a non-ideal reactor using tracer information.
- CO 2. U Develop rate laws for heterogeneous reactions.
- CO 3. U Understands the adsorption phenomena.
- CO 4. U Design of reactors for non-catalytic and catalytic reactions.
- CO 5. U Design of towers for gas–liquid operations with and without chemical reaction.
- CO 6. U Designs different reactors.

### **8CH03-SYSTEM MODELING**

After successfully completing the course, the students will be able to:

- CO 1. Understand the important physical phenomena from the problem statement.
- CO 2. Develop model equations for the given system.



CO 3. Demonstrate the model solving ability for various processes/unit operations.

CO 4. Demonstrate the ability to use a process simulation.

CO 5. Solve problems by using least square analysis.

CO 6. Understand Correlation and Regression

### **8CH04-PETROCHEMICAL TECHNOLOGY**

After successfully completing the course, the students will be able to:

CO 1. Understand the history, need and development of petrochemical industries.

CO 2. Understand the concept of engineering and techno economical feasibility of first generation PC's manufactured.

CO 3. Understand the concept of engineering and techno economical feasibility of second generation PC's manufactured.

CO 4. Understand the concept of engineering and techno economical feasibility of third generation PC's manufactured.

CO 5. Understand the concept of engineering and techno economical feasibility of detergent, rubber and explosives.

CO 6. Study technological forecasting of petroleum and petrochemicals.