

Department of Chemical Engineering
Program Outcomes (POs) & Program Specific Outcomes (PSOs)

Program Outcomes (POs) Chemical Engineering graduates will be able to:	
PO1	Engineering knowledge
	Graduates will have the ability to apply the knowledge of mathematics, science and engineering to solve domain specific engineering problems.
PO2	Problem analysis
	Graduates will have the ability to design and conduct experiments, also have the ability to analyze and interpret experimental results
PO3	Design/development of solutions
	Graduates will have the ability to design systems, processes to meet specified objectives within realistic constraints such as economic, environmental, social, ethical, health, safety and sustainability
PO4	Conduct investigations of complex problems
	Graduates will have the ability to conduct investigations to solve the complex problem based on the realistic situation
PO5	Modern tool usage
	Graduates will have the ability to explore and apply the techniques, skills and modern engineering tools necessary to solve Chemical Engineering problems
PO6	The engineer and society
	Graduates will have the knowledge about Engineer's responsibility for the up-liftment of the society
PO7	Environment and sustainability
	Graduates will have an idea about the impact of process on the environment and resource management
PO8	Ethics
	Graduates will have the knowledge of professional and ethical responsibilities
PO9	Individual and team work
	Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings
PO10	Communication
	Graduates will have the communication skills in English language in verbal and written and also graphical form to convey their innovative ideas in an effective way at various forums
PO11	Project management and finance
	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environment
PO12	Life-long learning
	Recognize the need for and, have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes

Program Specific Outcomes (PSOs)

PSO1	Applying knowledge in core and allied fields to solve complex Engineering problems
PSO2	Able to expose their skills using latest tools to arrive cost effective and appropriate solutions
PSO3	Apply the contextual knowledge with professional ethics to manage different projects in multi disciplinary environment

Department of Chemical Engineering

Course Outcomes (COs)

YEAR:I

SEMESTER:I

SUBJECT: Communicative English

CO1	At the end of the course, learners will be able to: Read articles of a general kind in magazines and newspapers.
CO2	Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
CO3	Comprehend conversations and short talks delivered in English
CO4	Write short essays of a general kind and personal letters and emails in English
CO5	Students should become adept in their use of written word for informational, possessive and creative purposes

SUBJECT: Engineering Mathematics-I

CO1	Use both the limit definition and rules of differentiation to differentiate functions and apply differentiation to solve maxima and minima problems
CO2	Demonstrate the tools for solving Partial differential equations and maxima, minima for functions of several variables
CO3	Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus and Evaluate integrals using techniques of integration, such as substitution, partial fraction and integration by parts
CO4	Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables
CO5	Apply various techniques in solving differential equations

SUBJECT: Engineering Physics

CO1	Students will be able to acquire the knowledge of elastic materials and illustrate the applications in various fields
CO2	Describe the basics of oscillatory physics, working of laser and propagation of light in optical fibers
CO3	Describe the knowledge of quantifying the thermal properties of materials and students will be able analyze the materials based on thermal conductivity
CO4	Summarize the importance of free electrons in determining the properties of metals to understand the concept of Fermi energy and apply the knowledge of quantum mechanics
CO5	Students will be able to recognize various planes in a crystal and describe the structure determination

SUBJECT: Engineering Chemistry

CO1	Interpret basics of hardness of water, boiler feed water problems and its treatment process in specific reverse osmosis process
CO2	Interpret basics of hardness of water, boiler feed water problems and its treatment process in specific reverse osmosis process
CO3	Illustrate the concepts of phase rule and the properties of alloys
CO4	Identify the types of fuels and their usage in the life span
CO5	Plan for renewable energy utilization in the twenty first century

SUBJECT: Problem Solving Python Programming

CO1	Develop algorithmic solutions to simple computational problems.
CO2	Read, write, execute by hand simple Python programs
CO3	Structure simple Python programs for solving problems
CO4	Decompose a Python program into functions
CO5	Represent compound data using Python lists, tuple and dictionaries.

SUBJECT: Engineering Graphics

CO1	Students will be able to familiarize with the fundamentals and standards of engineering graphics
CO2	Students will be able to perform freehand sketching of basic geometrical constructions and multiple views of objects
CO3	Students will be able to draw orthographic projections of lines and plane surfaces
CO4	Students will be able to draw projections of solids and development of surfaces
CO5	Students will be able to visualize and project isometric and perspective sections of simple solids

SUBJECT: Problem Solving Python Programming Laboratory

CO1	Write, test, and debug simple Python programs.
CO2	Implement Python programs with conditionals and loops.
CO3	Develop Python programs step-wise by defining functions and calling them.
CO4	Use Python lists, tuples, dictionaries for representing compound data.

CO5	Read and write data from/to files in Python.
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SUBJECT: Physics Laboratory

CO1	Apply principles of elasticity, engineering applications.
CO2	Optics engineering applications
CO3	Thermal properties for engineering applications
CO4	Understand the engineering properties of the various materials
CO5	Understand the properties of liquids

SUBJECT: Chemistry Laboratory

CO1	Understand the quantitative chemical analysis of water quality related parameters such as alkalinity and hardness
CO2	DO content in water eco system
CO3	Permissible limit of chloride content in potable water
CO4	Apply redox reaction to analyse iron content through potentiometric titration
CO5	Make use of neutralization reaction by instrumental analysis

SEMESTER:II

SUBJECT: Technical English

CO1	Read technical texts and write area - specific texts effortlessly.
CO2	Listen and comprehend lectures and talks in their area of specialization successfully
CO3	Speak appropriately and effectively in varied formal and informal contexts
CO4	Write reports and winning job applications
CO5	Listening to commentaries of games

SUBJECT: Engineering Mathematics-II

CO1	Matric Algebra: Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices
CO2	Vector Calculus: Gradient, divergence and curl of a vector point function and related identities. Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification
CO3	Analytic functions and conformal mappings
CO4	Complex integration, Taylor's and Laurent's series and Residue theorems
CO5	Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients

SUBJECT: Physics of Materials

CO1	Gain knowledge on phase diagrams and various material process methods
CO2	Students will be able to gain knowledge on electrical properties of materials
CO3	Students will be able to gain knowledge of semiconductor physics and its application
CO4	Students gain knowledge on dielectric and magnetic properties of materials
CO5	Students will be able to gain knowledge on New materials and Applications

SUBJECT: Chemistry for Technologists

CO1	Students are able to understand the various concepts of unit operations and unit processes and current scenario of chemical synthesis in industries
CO2	Students are able to understand the various types of reactions and the chemical activity of nucleophiles and electrophiles

CO3	Students are able to understand the chemical analysis of oil, fat, lubricants and soap
CO4	Students are able to understand the chemicals and auxiliaries
CO5	Students are able to understand the Theory of color and constitution

SUBJECT: Basic Mechanical Engineering

CO1	Students will be able to Know the various laws of Thermodynamics
CO2	Students should be able to know the different types of thermodynamic processes
CO3	Students should be able to balance apply thermodynamic concepts to different air standard cycles and solve problems
CO4	Students should be able to know the functioning and features of IC engines, components and auxiliaries
CO5	Students should be able to appreciate the theory behind operation of machinery and be able to design simple mechanisms

SUBJECT: Principles of Chemical Engineering

CO1	Students are skilled in basics of chemical engineering
CO2	Students will be able to attain knowledge on influence of basic and applied science in chemical engineering
CO3	Students can choose the appropriate relation between the processes
CO4	Students will attain knowledge get knowledge on application of soft computing, modeling and simulation in solving chemical engineering problems
CO5	Students could calculate the shifts available in chemical engineering

SUBJECT: Engineering Practice Laboratory

CO1	Fabricate carpentry components and pipe connections including plumbing works
CO2	Use welding equipments to join the structures
CO3	Carry out the basic machining operations
CO4	Make the models using sheet metal works
CO5	Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings

SUBJECT: Chemical Analysis Laboratory

CO1	Familiarization with equipment like viscometers, flash and fire point apparatus etc
CO2	Familiarization of methods for determining COD
CO3	Familiarization of a few simple synthetic techniques for soap
CO4	Analyse the phenol content and calorific value
CO5	Estimate the presence of nitrate in water.

YEAR: II

SEMESTER: III

SUBJECT: Probability and Statistics

CO1	Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon
CO2	Understand the basic concepts of one and two dimensional random variables and apply in engineering applications
CO3	Demonstrate the applications of various statistical techniques to test the hypothesis
CO4	Construct design for various problem drawn from industry, management and other engineering fields
CO5	The notion of sampling distributions and statistical techniques used in engineering and management problems.

SUBJECT: Process Calculation

CO1	Understand the fundamentals of units and stoichiometric equations
CO2	Write material balance for different chemical process
CO3	Understand the fundamentals of ideal gas behaviour and phase equilibria
CO4	Write energy balance for different chemical process
CO5	Write Orsat analysis report for combustion reactions.

SUBJECT: Fluid Mechanics for chemical Engineers

CO1	Get a basic knowledge of fluids in static, kinematic, and dynamic equilibrium
CO2	Understand and solve the problems related to equation of motion
CO3	Gain knowledge on dimensional and model analysis
CO4	Learn types and losses of flow in pipes
CO5	Understand and solve the boundary layer problems

SUBJECT: Solid Mechanics for Technologists

CO1	Get a basic knowledge of Stress, Strain and deformations of solids.
CO2	Understand Transverse of Loading in beams

CO3	Gain knowledge on Deflections of Beams
CO4	Understand about Stresses in Beams
CO5	Understand about Torsion and Columns

SUBJECT: Principles of Electrical and Electronics Engineering

CO1	Understand the concepts of various electric circuits
CO2	Understand the concepts of various electronic device
CO3	Choose appropriate instruments for electrical measurement for a specific application
CO4	Understand the working principles of electrical machines
CO5	Understand the concepts of AC circuits

SUBJECT: Organic Chemistry

CO1	Value the organic reaction mechanism at atomic level
CO2	Analyse the chemical nature of carbohydrates
CO3	Narrate the functioning of ring structure of matter
CO4	Understand the chemical nature of proteins
CO5	Distinguish chemicals that are used as drugs and dyes

SUBJECT: Electrical Engineering Laboratory

CO1	Ability to perform speed characteristic of different electrical machine
CO2	Ability to perform various test on transformer
CO3	Ability to regulate the alternator and motors
CO4	Understand the working principles of shunt motor
CO5	Understand the working principles of generator

SUBJECT: Mechanical Engineering Laboratory

CO1	Able to understand Power-generating units such as engines and operate IC engines and conduct tests
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CO2	Able to appreciate the theory behind the functioning of engines
CO3	Understand about material properties
CO4	Perform different kind of loading and testing
CO5	Understand the difference between the engines

SEMESTER: IV

SUBJECT: Numerical Methods

CO1	Understand the basic concepts and techniques of solving algebraic transcendental equations
CO2	Understand the numerical techniques of interpolation and error approximation in various intervals in real life situations
CO3	Apply the numerical techniques of differentiation and integration for engineering problems
CO4	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations
CO5	Solve the partial and ordinary differential equation with initial boundary conditions using certain techniques with applications

SUBJECT: Environmental Science and Engineering

CO1	Acquired knowledge to solve environmental problems
CO2	Understood relationship between biotic and abiotic components
CO3	Knew the role of human beings in maintaining a clean environment and the values of biodiversity
CO4	Able to understand topography and geographic distribution of organism
CO5	Conscious about conserving the natural resources and creating pollution free environment

SUBJECT: Instrumental Methods of Analysis

CO1	Electromagnetic radiation, its interaction with matter, various energy levels and transitions in organic and inorganic compounds
CO2	Understood qualitative analysis by UV and Visible spectroscopy
CO3	Understood quantitative analysis by UV and Visible Spectroscopy
CO4	Able to understand the theory, principle, instrumentation and working of IR Spectroscopy
CO5	Understand the chromatographic methods

SUBJECT: Chemical Engineering Thermodynamics-I

CO1	Describe the knowledge on solution thermodynamics
CO2	Understand the concept on phase equilibria

CO3	Apply First, Second and Third law of thermodynamics and other basic concepts
CO4	Understand the concept on thermodynamic properties of fluids
CO5	Understand the thermodynamic aspects of compression process

SUBJECT: Physical Chemistry

CO1	Acquire knowledge on Kohlrausch's law, Nernst equation and application of EMF series.
CO2	Understand the behaviour of corrosion and inhibitors
CO3	Predict the components, phases degree of freedom in phase rule
CO4	Attained the knowledge on the colloidal application in all fields
CO5	Understand the distribution law and its applications

SUBJECT: Mechanical Operations

CO1	Students are skilled in particle characterization and measurements
CO2	Students are competent in choice of size reduction equipment, power calculation and choice of size enlargement techniques
CO3	Students can choose the appropriate particle separation method for a given system
CO4	Students will be a Competent in design of filters
CO5	Students could calculate the power requirement for mixing and agitation and choose mixers or agitators for their need

SUBJECT: Fluid Mechanics Laboratory

CO1	Use variable area flow meters and variable head flow meters
CO2	Analyze the flow of fluids through closed conduits, open channels and flow past immersed bodies
CO3	Select pumps for the transportation of fluids based on process conditions/requirements and fluid properties
CO4	Understood hydrodynamic parameters of the fluid
CO5	Calculate the pressure drop in reactors

SUBJECT: Organic Chemistry Laboratory

CO1	Able to identify what distinguishes a strong and weak nucleophile and recall the rules of reactions
CO2	Mastery of nomenclature since ethyl bromide is not drawn out
CO3	Analyzes a list of compounds and determines their reactivity
CO4	Understood the methods of recrystallization
CO5	Able to identify the unknown organic compounds

YEAR: III

SEMESTER: V

SUBJECT: Chemical Process Industries

CO1	Students would gain knowledge of the various aspects of sulphur, sulfuric acid and cement industries and the different methods available for their production
CO2	Students would gain knowledge of the various aspects of the fertilizer industry and the different methods available for the production of nitrogenous, phosphorous and potassic fertilizers
CO3	Students would gain knowledge about the manufacturing processes in pulp, paper, sugar and starch industries
CO4	Students would gain knowledge about the manufacturing processes in petroleum and petrochemical industries
CO5	Students would gain knowledge about the manufacturing processes in Fuel and industrial gas industries

SUBJECT: Heat Transfer

CO1	Gain knowledge in various mode of heat transfer
CO2	Able to perform the dimensional analysis in heat transfer
CO3	To design heat transfer equipments such as furnace, boilers, heat exchangers evaporation
CO4	To analyze the performance of heat transfer equipments
CO5	Able to understand about radiation and its affect.

SUBJECT: Mass Transfer-I

CO1	Students would have knowledge in diffusion and its application in laminar and turbulent conditions
CO2	Able to apply the theories of mass transfer operations
CO3	Students would apply the mass transfer concepts in the design of humidification columns.
CO4	Students would apply the mass transfer concepts in the design of dryers.
CO5	Students would apply the mass transfer concepts in the design of crystallizers.

SUBJECT: Chemical Reaction Engineering-I

CO1	Students will be familiar to conduction of heat through solid media
CO2	Able to apply concepts of designing the continuous reactors
CO3	Students will be familiar to choice of reactors.
CO4	Students will able to design multiple reactors involved in chemical reaction.
CO5	Able to understand the relation between the reactors based on the flow

SUBJECT: Mechanical Operation Laboratory

CO1	Students would gain the practical knowledge and hands on various separation techniques like filtration, sedimentation, screening, elutriation, and centrifugation
CO2	Gain practical knowledge on liquid-solid separations
CO3	Able to mate test on separation of solids based on their size
CO4	Students will gain knowledge in size reduction of solids.
CO5	Able to understand the various forces acting in the size reduction

SUBJECT: Heat Transfer Laboratory

CO1	Gain practical knowledge in various mode of heat transfer
CO2	Able to calculate the heat transferred by conduction using classical phenomenon
CO3	Able to calculate the heat transferred by convection using classical phenomenon
CO4	To gain knowledge about the evaporation and condensation
CO5	Able to predict the performance of the various heat transferring equipments

SUBJECT: Professional Communication

CO1	Make effective presentations
CO2	Participate confidently in Group Discussions
CO3	Attend job interviews and be successful in them
CO4	Develop adequate Soft Skills required for the workplace
CO5	Able to predict the difference between team and group management

SEMESTER: VI

SUBJECT: Chemical Reaction Engineering-II

CO1	Students would gain the ability to determine experimentally the kinetics and rate constants of reactions in different types of reactors
CO2	Students will gain wide applications in various process industries
CO3	Students will be familiar to choice of reactors
CO4	Students would gain knowledge on gas solid catalytic processes
CO5	Students would gain knowledge on gas solid non-catalytic reactors

SUBJECT: Mass Transfer-II

CO1	Students would gain knowledge on physical and thermodynamic principle of gas absorption
CO2	Students gain knowledge on physical and thermodynamic principle of distillation
CO3	Students gain knowledge on physical and thermodynamic principle of extraction
CO4	Students gain knowledge on physical and thermodynamic principle of leaching
CO5	Students gain knowledge on physical and thermodynamic principle of adsorption

SUBJECT: Chemical Engineering Thermodynamics-II

CO1	Gain knowledge on properties of solution
CO2	Students will be able to understand the concept on chemical reaction equilibria
CO3	Students will be able to understand the concept on refrigeration
CO4	Students will be able to know the correlation and prediction of phase equilibria
CO5	Able to apply the concepts of phase rule

SUBJECT: Process Engineering Economics

CO1	Students understood basics in interest and plant cost in engineering economics
CO2	Students understood basics in project profitability and financial ratios in engineering economics

CO3	Students understood basics uneconomic balance in equipments in engineering economics
CO4	Students understood the basics in principles of management
CO5	Students understood basics in production planning and control

SUBJECT: Process Instrumentation, Dynamics and Control

CO1	Students understood basics of all instruments involved in measurements in a process industry
CO2	Students understood the dynamics of processes both first order and second order
CO3	Students understood the various controllers like P, PI, PD, PID
CO4	Students understood the design of controllers by frequency response
CO5	Students understood the various advanced control strategies

SUBJECT: Computational Programming Laboratory for Chemical Engineers

CO1	Gain knowledge on the software applicable for chemical engineers
CO2	Students are able to solve equations using MATLAB/EXCEL
CO3	Able to perform the steady state simulation
CO4	Able to perform the dynamic simulation
CO5	Able to calculate the Reynolds number, settling velocity and heat transfer co-efficient.

SUBJECT: Chemical Reaction Engineering Laboratory

CO1	Gain knowledge the practical knowledge about different types of reactors
CO2	Students are able to do RTD studies
CO3	They are capable of identifying micellar catalysts
CO4	Able to design and analysis the reactor based on their kinetics
CO5	Able differentiate the types of reactions.

YEAR: IV

SEMESTER: VII

SUBJECT: Transport Phenomena

CO1	Students would gain the knowledge of fundamental connections between the conservation laws in heat, mass, and momentum in terms of vector and tensor fluxes
CO2	Student will able to gain knowledge on one dimensional heat and momentum transport
CO3	Students will understand the diffusion of mass through different layers
CO4	Students would be able to understand the mechanism of fluids in motion under different conditions
CO5	Student will able to gain knowledge on isothermal and non-isothermal system

SUBJECT: Process Equipment Design

CO1	Apply the skill in thermal design of heat transfer equipment like shell and tube, double pipe heat exchangers and evaporators, and assessing thermal efficiency of the above equipment in practice
CO2	Demonstrate the skills in basic design and drawing of different dryers, cooling towers and cyclone separators
CO3	Apply the concepts involved in phase separation and design of distillation, Extraction and absorption columns
CO4	Demonstrate the skills in mechanical design of process equipment, design considerations of pressure vessels and its auxiliary devices design the layout of process industries
CO5	Demonstrate the skills in mechanical design of process equipment, design considerations of storage vessel

SUBJECT: Process Control Laboratory

CO1	Have knowledge on development of different system
CO2	They are able to perform to control the flow and level of the system
CO3	Gain the knowledge on tuning the reactor systems
CO4	Able to understand the characteristics of different control valves
CO5	Gain knowledge about various types of loops

SUBJECT: Mass Transfer Laboratory

CO1	Students would be able to determine important data for the design and operation of the process distillation
CO2	Students would be able to determine important data for the design and operation of the process extraction
CO3	Students would be able to determine important data for the design and operation of the process diffusion
CO4	Students would be able to determine important data for the design and operation of the process drying
CO5	Students will gain the knowledge on different mass transfer operations