Course Outcomes (CO)

(R 2017)

Branch: B.Tech, Chemical Engineering

Course Code: C101 Course Name:HS87151 Communicative English

C101.1	**Read different genres of texts adopting various reading strategies.**
C101.2	**Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.**
C101.3	**Listen/view and comprehend different spoken discourses/excerpts in different accents.**
C101.4	**Speak clearly, confidently, comprehensibly.**
C101.5	**Communicate with one or many listeners using appropriate communicative strategies.**

Course Code: C102 Course Name: MA8151 Engineering Mathematics – I

C102.1	**Use both the limit definition and rules of differentiation to differentiate functions**
C102.2	**Apply differentiation to solve maxima and minima problems.**
C102.3	**Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.**
C102.4	**Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.**
C102.5	**Apply various techniques in solving differential equations.**

Course Code:C103 Course Name: PH8151 Engineering Physics

C103.1	**Acoustics, Production and the applications of Ultrasonics in Engineering and Medical Fields.**
C103.2	**Interference, different types of lasers and its application in various fields.**
C103.3	**Fiber optics and optical fiber and its applications.**
C103.4	**Development of quantum mechanics and its necessary, wave equations and its applications, X - Ray.**
C103.5	**Crystallography and can able to calculate the crystal parameters**

Course Code: C104 Course Name:CY 8151 Engineering Chemistry

C104.1	**To make the students conversant with basics of polymer chemistry.**
C104.2	**To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications.**
C104.3	**To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.**
C104.4	**To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.**
C104.5	**To acquaint the students with the basics of nano materials, their properties and applications.**

Course Code: C105 Course Name: GE8151 Problem solving and Python Programming

C105.1	**Explain the components of computer and logical operations.**
C105.2	**Convert the number system and their representation.**
C105.3	**Discuss hardware and software devices**
C105.4	**Summarize network fundamentals.**
C105.5	**Plan the logic using flowchart and develop algorithm to write a C Program.**

Course Code: C106 Course Name: GE8152 Engineering Graphics

C106.1	**Ability to familiarize with the fundamentals and standards of Engineering graphics**
C106.2	**Ability to perform freehand sketching of basic geometrical constructions and multiple views of objects**
C106.3	**Ability to Project orthographic projections of lines and plane surfaces**

C106.4	Ability to draw projections of solids and development of surfaces
C106.5	Ability to visualize and to project isometric and perspective sections of simple solids

Course Code: C107 Course Name:GE8161 Problem solving and Python Programming laboratory

C107.1	Prepare data using MS-word & Excel to visualize graphs, charts in MS-Excel.
C107.2	Outline the logic using flowchart for a given problem and to program using Switch case& Control structures
C107.3	Develop logic using decision making & looping statements
C107.4	Apply passing parameters using Arrays & Functions
C107.5	Construct structure and Union for a given database and to bring out the importance of Unions over structure

Course Code:C108 Course Name:BS68163 Physics and Chemistry Laboratory

C108.1	To provide the basic practical exposure to all the engineering and technological streams in the field of physics. .
C108.2	To provide the basic practical exposure to all the engineering and technological streams in the field of chemistry.
C108.3	The students are able to know about the water containing impurities and some physical parameters.
C108.4	To gain the knowledge about light, sound, laser, fiber optics and magnetism.
C108.5	To develop the knowledge of conductometric titration and viscometry

Course Code:C109 Course Name:HS8251 Technical English

C109.1	Read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
C109.2	Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
C109.3	Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.
C109.4	Speak convincingly, express their opinions clearly.
C109.5	Initiate a discussion, negotiate, argue using appropriate communicative strategies.

Course Code:C110 Course Name:MA8251 Engineering Mathematics – II

C110.1	Eigen values and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
C110.2	Gradient, divergence and curl of a vector point function and related identities.
C110.3	Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
C110.4	Analytic functions, conformal mapping and complex integration.
C110.5	Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

Course Code:C111 Course Name:PH8254 Physics of Materials

C112.1	Electric conduction, electrical conductivity, carrier concentration of metals.
C112.2	Semiconductors, carrier concentration of semiconductors, Hall effect and semiconductor devices.
C112.3	Types of magnetic materials, ferro magnetic materials, magnetic storage devices, Super conductors and their properties and applications.
C112.4	Dielectrics, properties and its applications, ferro electricity.
C112.5	Modern engineering materials, Nano materials and Carbon nano tubes.

Course Code:C112 Course Name:CY8292 Chemistry for Technologists

C112.1	To make the students conversant with boiler feed water requirements, related problem and water treatment techniques.
C112.2	Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
C112.3	Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
C112.4	Preparation, properties and applications of engineering materials.
C112.5	Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.

Course Code: C113 Course Name: BE8256 Basic Mechanical Engineering

C113.1	Ability to illustrate the vectorial and scalar representation of forces and moments
C113.2	Ability to analyse the rigid body in equilibrium
C113.3	Ability to evaluate the properties of surfaces and solids

C113.4	Ability to calculate dynamic forces exerted in rigid body
C113.5	Ability to determine the friction and the effects by the laws of friction

Course Code: C114 Course Name: CH8201 Principles of chemical engineering

Course Code:C115 Course Name: GE8261 Engineering Practices Laboratory

C115.1	Ability to Fabricate carpentry components and pipe connections including plumbing works
C115.2	Ability to Use welding equipments to join the structures
C115.3	Ability to Carry out the basic machining operations
C115.4	Ability to Make the models using sheet metal works
C115.5	Ability to Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings

Course Code:C116 Course Name: CH8281 Chemical Analysis Laboratory

C116.1	Able to understand basic principles involved in estimation and characterization of industrially important materials.
C116.2	understanding on the estimation and analysis of chemical compounds.
C116.3	Analysis of fuels

Course code :C201 Course Name: MA8391 Probability and Statistics

C201.1	Understand the basic concepts of One way and Two way classification
C201.2	Understand how to solve the problem based on the One way and Two way classification
C201.3	Understand the fundamental knowledge of the concepts of 2 POWER 2 experiment
C201.4	Understand how to solve the given X-chart and R-chart
C201.5	The basic knowledge of control chart and problem based on np-chart, p-chart and c-chart.

Course code : C202 Course Name: CH8351 Process Calculations

C202.1	Students would have the knowledge of fundamentals units and stoichiometric equations.
C202.2	Student will understand the fundamentals of Humidity, Drying and the equipments used.
C202.3	Students will solve problems on basic laws for Radiation, apply these principles to radiative heat transfer between different types of surfaces.
C202.4	Students will understand the fundamentals of ideal gas behavior and phase equilibria
C202.5	Write energy and material balance for different chemical process.

Course code :C203 Course Name: CH8301 Fluid Mechanics for Chemical engineering

C203.1	Understand the fundamental properties of fluids
C203.2	Understand the characteristics under static and dynamic conditions
C203.3	Develop empirical correlation using dimensionless analysis
C203.4	Analyze flow of fluid through pipe and over the of solid
C203.5	Understand and select flow meter(s), characteristics of pumps used in Chemical Process

Course code : C204 Course Name: CH8302 of Solid Mechanics for Technologists

C204.1	the students would be able to design the support column
C204.2	the students would be able to design the beams
C204.3	the students would be able to design the pipelines, storage tanks
C204.4	the students would be able to design the reaction columns and tanks
C204.5	Able to do process equipment design and drawing.

Course Code: C205 Course Name:EE8352 Principles of Electrical and Electronics engineering

C205.1	To understand the operation and characteristics of Motors
C205.2	To understand the operation and characteristics of generator
C205.3	To understand the operation and characteristics of Tranducers

Course code :C206 Course Name: CY8291 Organic Chemistry

C206.1	At the end of the course students will have knowledge on various reaction mechanisms.

C206.2	About the types of carbohydrates and their structural elucidation.
C206.3	About the different polynuclear aromatics, heterocycles and their properties.
C206.4	Different types of amino acids, protein synthesis and structure.
C206.5	Various dyes and drugs and their synthesis methods.

Course Code: C207 Course Name:EE8361 Electrical Engineering Laboratory

C207.1	To understand the operation and characteristics of Motors
C207.2	To understand the operation and characteristics of generator
C207.3	To understand the operation and characteristics of Tranducers

Course Code:C208 Course Name: ME8362 Mechanical Engineering Laboratory

C208.1	Ability to Fabricate carpentry components and pipe connections including plumbing works
C208.2	Ability to Use welding equipments to join the structures
C208.3	Ability to Carry out the basic machining operations
C208.4	Ability to Make the models using sheet metal works
C208.5	Ability to Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings

Course code : C209 Course Name: MA8491 NUMERICAL METHODS

C209.1	Understand the basic concepts and techniques of solving algebraic and transcendental equations.
C209.2	Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations
C209.3	Apply the numerical techniques of differentiation and integration for engineering problems
C209.4	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
C209.5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications

Course code :C210 Course Name: GE8291 Environmental Science and Engineering

C210.1	Describe the structure and functions of different eco system.
C210.2	Identify the various causes, effects and control measures of different types of pollution.
C210.3	Summarize the over exploitation and their effects of natural resources.
C210.4	Appraise the environmental issues and possible solution.
C210.5	Explain the causes of population growth and explosion.

Course code :C211 Course Name: CH8491 INSTRUMENTAL METHODS OF ANALYSIS

C211.1	To make the students understand the concepts of EMR, various energy levels, and electronic transitions.
C211.2	To make the students gain knowledge in the Qualitative analysis of UV /Visible spectroscopy instrumentation and different rules.
C211.3	To make the students well equipped in Quantitative applications of UV/Visible spectroscopy.
C211.4	To make the students to excel in IR spectroscopy and its application in various fields.
C211.5	To make the students apply their ideas and become resourceful in different separation methods using Chromatography.

Course code : C212 Course Name: CH8401 Chemical Engineering Thermodynamics I

C212.1	Understand Zeroth Law and terminologies associated with Engineering Thermodynamics
C212.2	Apply First law, Second law, Third law for Thermodynamic process
C212.3	Able to Mathematically relate PVT behavior of fluids
C212.4	Relate Thermodynamic properties Mathematically
C212.5	Calculate heat and work quantities for industrial processes and power cycles

Course code :C213 Course Name: CH8402 Physical Chemistry

C213.1	To study the Principles of electrochemical reactions, redox reactions in cell constant.
C213.2	To study the Principles of corrosion of materials and methods of prevention for Corrosion
C213.3	To study the fundamental concepts in colloids

C213.4	To study the develop an understanding of the basic concepts of phase rule and its applications to single and two component systems
C213.5	To study the limitations of Nernst Distribution law and colligative properties.

Course code :C214 Course Name: CH8451 Mechanical Operations

C214.1	Students will understand the particle characterization and size analysis techniques.
C214.2	Students will understand the particle size reduction and particle enlargement latest techniques.
C214.3	Students will understand the latest particle separation methods
C214.4	Students will understand the filtration and latest filtration techniques available
C214.5	Students will understand the mixing and particle handling methods

Course code :C215 Course Name: CH8461 FLUID MECHANICS LABORATORY

C215.1	To learn experimentally to calibrate flow meters
C215.2	Able to find pressure loss for fluid flows
C215.3	Able to determine pump characteristics.

Course code : C216 Course Name: CY8281 Organic Chemistry Laboratory

C216.1	able to identify what distinguishes a strong and weak nucleophile and recall the rules of reactions. The student analyzes a list of compounds and
C216.2	Able to analyze a list of compounds
C216.3	Able to determine their reactivity.

Course code :C301 Course Name: CH8501 Chemical Process Industries

C301.1	Able to gain knowledge on various aspects of production engineering
C301.2	Understand the practical methods of production in a chemical factory.
C301.3	Able to integrate various courses such as chemistry, unit operations, mechanical operation, stoichiometry etc.,

Course code :C302 Course Name: CH8591 HEAT TRANSFER

C302.1	To understand the concepts of heat transfer in conduction, fins, critical radius of thickness and lumped heat analysis.
C302.2	To understand the concepts of convection in flow through flat plates and pipes
C302.3	To understand the various concepts of boiling and condensation
C302.4	To understand the concept behind evaporator and radiation heat transfer
C302.5	To know about heat exchangers and its types

Course code :C303 Course Name: CH8551 MASS TRANSFER I

C303.1	To understand the basic concept of diffusion and diffusivity prediction and measurement.
C303.2	To understand the concept of mass transfer coefficient for various phase types and stage wisedifferential contractors.
C303.3	To understand the principals of humidification with design and theories of cooling towers.
C303.4	To understand the principals of drying with material balance and determination of length of dryers.
C303.5	To understand the concepts of crystallization with mass and energy balance and design of crystallizers.

Course code :C304 Course Name: CH8502 CHEMICAL REACTION ENGINEERING – I

C304.1	Interpret kinetic data and mechanism.
C304.2	Design a reactor for a chemical reaction
C304.3	Understand the choice of reactors
C304.4	Identify appropriate reactor for a chemical reaction under different operating conditions
C304.5	Analysis the optimum reaction condition for a chemical reaction.

Course code : C305 Course Name: CH8075 Petroleum Refining and Petrochemicals (PE-I)

C305.1	Understand the classification, composition and testing methods of crude petroleum / product.
C305.2	To develop innovative refining process and develop quality control and assurance techniques.
C305.3	Apply the knowledge of treatment processes to develop the manufacture of petroleum products.
C305.4	Overview of petrochemical technologies and discuss upon the general topology of the petrochemical process technologies.

C305.5	Petrochemicals refers to all those compounds that can be derived from the petroleum refinery products

Course code : C306 Course Name: ORO551 RENEWABLE ENERGY SOURCES (open Elective I)

C306.1	Knowledge in capturing and applying other forms of energy sources like wind, biogas
C306.2	Knowledge in wind energy and biomass with its economic aspects.
C306.3	Knowledge in applying solar energy in a useful way.
C306.4	Ability to classify the solar energy collectors and methodologies of storing solar energy.
C306.5	Understanding the physics of solar radiation. geothermal energies

Course code : C307 Course Name: CH8581 MECHANICAL OPERATIONS LABORATORY

C307.1	Able to develop a sound working knowledge on different types of crushing equipments
C307.2	Able to study the characteristics of different mechanical operation separators.
C307.3	Gain knowledge on various separation techniques like filtration, sedimentation, screening, elutriation, and centrifugation

Course code :C308 Course Name: CH8561 HEAT TRANSFER LABORATORY

C308.1	To develop a sound working knowledge on different types of heat transfer equipments.
C308.2	Able to calculate heat transfer by conduction
C308.3	Able to understand different types of convection using classical models

Course code : C309 Course Name: CH8601 CHEMICAL REACTION ENGINEERING – II

C309.1	Understand the concepts of partial molar properties of solutions and Gibbs Duhem Equation
C309.2	Explain the basic concepts in phase equilibria, chemical potential, fugacity, azeotropes and Vapour-Liquid Equilibrium
C309.3	Understand the various concepts in activity coefficient-composition models andthermodynamic consistency of phase equilibria
C309.4	Understand the concepts in evaluating equilibrium constant and thermodynamic analysis in reaction
C309.5	Understand the various concepts in refrigeration, liquefaction process and performance of vapour refrigeration cycles

Course code : C310 Course Name: CH8651 MASS TRANSFER II

C310.1	Students will be able to design an absorber and a Stripper
C310.2	Students will be able to design a distillation column.
C310.3	Students will be able to design extractors.
C310.4	Students will be able to design leaching equipments.
C310.5	Students will be able to design adsorbers.

Course code : C311 Course Name: CH8602 CHEMICAL REACTION ENGINEERING – II

C311.1	Understand the concepts of partial molar properties of solutions and Gibbs Duhem Equation
C311.2	Explain the basic concepts in phase equilibria, chemical potential, fugacity, azeotropes and Vapour-Liquid Equilibrium
C311.3	Understand the various concepts in activity coefficient-composition models andthermodynamic consistency of phase equilibria
C311.4	Understand the concepts in evaluating equilibrium constant and thermodynamic analysis in reaction
C311.5	Understand the various concepts in refrigeration, liquefaction process and performance of vapour refrigeration cycles

Course code : C312 Course Name: CH8652 PROCESS ENGINEERING ECONOMICS

C312.1	knowledge on time value of money, cost and asset accounting
C312.2	knowledge on profitability, alternative investments, income statement, balance sheet
C312.3	knowledge on economic balance of Chemical Process Industries
C312.4	knowledge on principles of management, organization and quality
C312.5	knowledge on inventory control and types of production planning and control

Course code : C313 Course Name: CH8652 PROCESS INSTRUMENTATION, DYNAMICS AND CONTROL

C313.1	Understand the concepts of Instrumentation
C313.2	Open and closed loop systems and its responses.
C313.3	Understand the concept of control loop components.

C313.4	Understand the Stability of control systems.
C313.5	Able to understand the concept of Advanced control System

Course code : C314 Course Name: CH8004 WASTE WATER TREATMENT (PE II)

C314.1	Students will understand the concepts and overview of waste water treatment.
C314.2	Students will understand the selection of process for the nature of waste water.
C314.3	Students will understand the chemical process methods and available latest techniques.
C314.4	Students will understand the biological treatment methods.
C314.5	Students will understand the advanced waste water treatment methods available right now.

Course code : C315 Course Name: CH8611 COMPUTATIONAL PROGRAMMING LABORATORY FOR CHEMICAL ENGINEERS

C315.1	To give the students an understanding the fundamentals concepts in mathematics.
C315.2	To gain knowledge in problems solving and computer programming.

Course code :C316 Course Name: CH8612 CHEMICAL REACTION ENGINEERING LABORATORY

C316.1	To gain knowledge on different types of reactors.
C316.2	To gain knowledge on design of reactors.

Course code : C401 Course Name: CH8791 TRANSPORT PHENOMENA

C401.1	Understand the fundamental connections between the conservation laws in heat, mass and momentum Interpret the importance of analogies between transport operation
C401.2	Identify the method of shell balance approach to transfer problems
C401.3	
C401.4	Apply the time smoothed equations of change for turbulent flow in pipes
C401.5	Interpret the importance of analogies between transport operation

Course code : C402 Course Name: CH8701 PROCESS EQUIPMENT DESIGN

C402.1	Able to develop skill to design process equipments used widely in the chemical industry.
C402.2	Able to install process equipments used widely in a chemical industry.

Course code : C403 Course Name: CH8093 Modern Seperation Techniques (PROFESSIONAL ELECTIVE - III)

C403.1	Create the understanding of separation processes for selecting optimal process for new and innovative applications.
C403.2	Ability to exhibit the skill to develop membrane processes.
C403.3	Ability to exhibit the skill to develop adsorption process and inorganic separation process.
C403.4	Apply the latest concepts like super critical fluid extraction, pervaporation, lyophilisation etc., in Chemical process industries.
C403.5	Understand Innovative techniques of controlling and managing oil spills.

Course code : C404 Course Name: CH8078 Process Plant Utilities (PROFESSIONAL ELECTIVE 4)

C404.1	Students can learn about Plant utilities, Water, Water softening and Reverse osmosis
C404.2	Students can learn about Steam and steam generation
C404.3	Students can learn about Refrigeration and Refrigerant.
C404.4	Students can learn about Compressed air, compressor
C404.5	Students can learn about Fuel and waste disposal

Course code : C405 Course Name: OME754 INDUSTRIAL SAFETY (OPEN ELECTIVE – II)

C405.1	To gain knowledge on safety engineering fundamentals and safety management practices.
C405.2	Able to identify and prevent chemical, environmental mechanical, fire hazard through analysis
C405.3	Able to apply proper safety techniques on safety engineering and management.

Course code : C406 Course Name: CH8711 PROCESS CONTROL LABORATORY

C406.1	To understand the methods of controlling the processes including measurements using process simulation techniques.
C406.2	To development and use of right type of control dynamics for process control under different operative conditions.

Course code : C407 Course Name: CH8781 MASS TRANSFER LABORATORY

C407.1	**to develop sound working knowledge on different types of mass transfer equipments.**
C407.2	**able to determine important data for the design and operation of the process equipments like distillation, extraction, diffusivity and drying principles which are having wide applications in various industries**

Course code : C408 Course Name: CH8712 INTERNSHIP

C408.1	**Students undergo training in R&D institutions / Academics / Industries for a minimum period of 15 days. At the end of internship students must submit a report for internal evaluation.**

Course code : C409 Course Name: CH8073 Industrial Process Plant Safety (PROFESSIONAL ELECTIVE 5)

C409.1	**Able to learn about implementation of safety procedures, risk analysis and assessment, hazard identification**
C409.2	**Able to Demonstrate the awareness of plant safety in selection and layout of chemical plants and the usage of safety codes.**
C409.1	**Exhibit the skill in classifying chemical, fire, explosion hazards and to understand the occupational diseases**
C409.2	**Analyze the bio medical and engineering response to health hazards and to implement the effective process control and instrumentation.**

Course code : C410 Course Name: CH8010 Petroleum Technology (PROFESSIONAL ELECTIVE 6)

C410.1	**Students will understand the basic operations in petroleum refining, refinery products.**
C410.2	**Students will understand the concepts of catalytic cracking.**
C410.3	**Students will understand the blending and forming process involved.**
C410.4	**Students will understand the concepts of lubricating used in oil and gas production.**
C410.5	**Students will understand the cost evaluation techniques**

Course code : C411 Course Name: CH8811 Project Work

C411.1	**Able to practice Project Management principles while developing chemical formulations.**
C411.2	**Able to take up any challenging practical problems**
C411.3	**Able to find solution by formulating proper methodology.**

Course code :C412 Course Name: CH8812 SEMINAR

C412.1	**To assess the overall level of proficiency of the students**
C412.2	**To understand the scholastic attainment of the student in the various subjects studied during the degree course**