



## Course Outcomes (CO)

(R 2013)

Branch: B.Tech, Chemical Engineering

Course Code: C101 Course Name: HS6151 Technical English – I

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: MA6151 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: PH6151 Engineering Physics – I

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 6151 Engineering Chemistry – I

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: GE6151 Computer 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: GE6152 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: GE6161 Computer Practices Laboratory

C107.1	Prepare data using MS-word & Excel to visualize graphs, charts in MS-Excel.
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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: GE6162 Engineering Practices Laboratory

C108.1	Ability to Fabricate carpentry components and pipe connections including plumbing works
C108.2	Ability to Use welding equipments to join the structures
C108.3	Ability to Carry out the basic machining operations
C108.4	Ability to Make the models using sheet metal works
C108.5	Ability to Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings

Course Code:C109 Course Name:GE6163 Physics and Chemistry Laboratory - I

C109.1	To provide the basic practical exposure to all the engineering and technological streams in the field of physics. .
C109.2	To provide the basic practical exposure to all the engineering and technological streams in the field of chemistry.
C109.3	The students are able to know about the water containing impurities and some physical parameters.
C109.4	To gain the knowledge about light, sound, laser, fiber optics and magnetism.
C109.5	To develop the knowledge of conductometric titration and viscometry

Course Code:C110 Course Name:HS6251 Technical English – II

C110.1	Read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
C110.2	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.
C110.3	Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.
C110.4	Speak convincingly, express their opinions clearly.
C110.5	Initiate a discussion, negotiate, argue using appropriate communicative strategies.

Course Code:C111 Course Name:MA6251 Mathematics – II

C111.1	Eigen values and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
C111.2	Gradient, divergence and curl of a vector point function and related identities.
C111.3	Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
C111.4	Analytic functions, conformal mapping and complex integration.
C111.5	Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

Course Code:C112 Course Name:PH6251 Engineering Physics – II

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:C113 Course Name:CY6251 Engineering Chemistry – II

C113.1	To make the students conversant with boiler feed water requirements, related problem and water treatment techniques.
C113.2	Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
C113.3	Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
C113.4	Preparation, properties and applications of engineering materials.
C113.5	Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.

Course Code:C114 Course Name:GE6252 Basic Electrical and Electronics Engineering

C114.1	Ability to understand basic theorems used in Electrical circuits and the different components
C114.2	Ability to explain about the function and characteristics of electrical machines.
C114.3	Ability to explain about the fundamentals of semiconductor and applications.
C114.4	Ability to explain about the principles of digital electronics.
C114.5	Ability to explain about the knowledge of communication.

Course Code: C115 Course Name: GE6253 Engineering Mechanics

C115.1	Ability to illustrate the vectorial and scalar representation of forces and moments
C115.2	Ability to analyse the rigid body in equilibrium
C115.3	Ability to evaluate the properties of surfaces and solids
C115.4	Ability to calculate dynamic forces exerted in rigid body
C115.5	Ability to determine the friction and the effects by the laws of friction

Course Code:C116 Course Name:GE6262 Physics and Chemistry Laboratory -II

C116.1	To provide the basic practical exposure to all the engineering and technological streams in the field of physics. .
C116.2	To provide the basic practical exposure to all the engineering and technological streams in the field of chemistry.
C116.3	The students are able to know about the water containing impurities and some physical parameters.
C116.4	To gain the knowledge about properties of matter, semiconductors and solar cells
C116.5	To develop the knowledge of spectrophotometry.

Course Code: C117 Course Name:GE6263 Computer Programming Laboratory

C117.1	Sketch simple figures with title block using AutoCAD software commands.
C117.2	Sketch curves like parabola, spiral and involute of square & circle and draw the orthographic projection of simple solids.
C117.3	Prepare orthographic projection of simple machine parts and draw a plan of residential building.
C117.4	Sketch simple steel truss and sectional views of simple solids.
C117.5	Prepare 2D multi view drawing from 3D model.

Course Code: C118 Course Name:GE6264 Basic Electrical and Electronics Laboratory

C118.1	To understand the operation and characteristics of Motors
C118.2	To understand the operation and characteristics of generator
C118.3	To understand the operation and characteristics of Transducers

Course code :C201 Course Name: MA6351 Transforms and Partial Differential Equations

C201.1	Understand how to solve the given standard partial differential equations.
C201.2	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
C201.3	Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
C201.4	Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
C201.5	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

Course code : C202 Course Name: EE6351 Electrical Drives and Controls

C202.1	Understand the basics of electric circuits laws and steady state solution of DC circuits
C202.2	Understand the basics of AC circuits and types of wiring
C202.3	Understand the working principles and construction of electrical machines
C202.4	Understand the concepts of various electronic devices and its application
C202.5	Choose appropriate instruments for electrical measurement for a specific application

Course code :C203 Course Name: CH6301 Organic Chemistry

C203.1	At the end of the course students will have knowledge on various reaction mechanisms.
C203.2	About the types of carbohydrates and their structural elucidation.
C203.3	About the different polynuclear aromatics, heterocycles and their properties.
C203.4	Different types of amino acids, protein synthesis and structure.
C203.5	Various dyes and drugs and their synthesis methods.

Course code : C204 Course Name: CH6302 Mechanics of Solids

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: CH6303 Physical Chemistry

C205.1	To study the Principles of electrochemical reactions, redox reactions in cell constant.
C205.2	To study the Principles of corrosion of materials and methods of prevention for Corrosion
C205.3	To study the fundamental concepts in colloids
C205.4	To study the develop an understanding of the basic concepts of phase rule and its applications to single and two component systems
C205.5	To study the limitations of Nernst Distribution law and colligative properties.

Course code :C206 Course Name: CH6304 Fluid Mechanics

C206.1	Understand the fundamental properties of fluids
C206.2	Understand the characteristics under static and dynamic conditions
C206.3	Develop empirical correlation using dimensionless analysis
C206.4	Analyze flow of fluid through pipe and over the of solid
C206.5	Understand and select flow meter(s), characteristics of pumps used in Chemical Process

Course code : C207 Course Name: CH6311 Organic Chemistry Laboratory

C207.1	able to identify what distinguishes a strong and weak nucleophile and recall the rules of reactions. The student analyzes a list of compounds and
C207.2	Able to analyze a list of compounds
C207.3	Able to determine their reactivity.

Course code :C208 Course Name: CH6312 Physical Chemistry Laboratory

C208.1	Able to determine the properties of solvents and mixtures.
C208.2	Able to determine the characteristics of solvents and mixtures.

Course code :C209 Course Name: CH6468 Probability and Statistics

C209.1	Understand the basic concepts of One way and Two way classification
C209.2	Understand how to solve the problem based on the One way and Two way classification
C209.3	Understand the fundamental knowledge of the concepts of 2 POWER 2 experiment
C209.4	Understand how to solve the given X-chart and R-chart
C209.5	The basic knowledge of control chart and problem based on np-chart, p-chart and c-chart.

Course code :C210 Course Name: CH6401 Chemical Process Industries I

C210.1	Able to gain knowledge on various aspects of production engineering
C210.2	Understand the practical methods of production in a chemical factory.
C210.3	Able to integrate various courses such as chemistry, unit operations, mechanical operation, stoichiometry etc.,

Course code : C211 Course Name: CH6402 Chemical Engineering Thermodynamics I

C211.1	Understand Zeroth Law and terminologies associated with Engineering Thermodynamics
C211.2	Apply First law, Second law, Third law for Thermodynamic process
C211.3	Able to Mathematically relate PVT behavior of fluids
C211.4	Relate Thermodynamic properties Mathematically
C211.5	Calculate heat and work quantities for industrial processes and power cycles

Course code : C212 Course Name: CH6403 Chemical Process Calculations

C212.1	Students would have the knowledge of fundamentals units and stoichiometric equations.
C212.2	Student will understand the fundamentals of Humidity, Drying and the equipments used.
C212.3	Students will solve problems on basic laws for Radiation, apply these principles to radiative heat transfer between different types of surfaces.
C212.4	Students will understand the fundamentals of ideal gas behavior and phase equilibria
C212.5	Write energy and material balance for different chemical process.

Course code :C213 Course Name: CH6404 Mechanical Operations

C213.1	Students will understand the particle characterization and size analysis techniques.
C213.2	Students will understand the particle size reduction and particle enlargement latest techniques.
C213.3	Students will understand the latest particle separation methods
C213.4	Students will understand the filtration and latest filtration techniques available
C213.5	Students will understand the mixing and particle handling methods

Course code :C214 Course Name: GE6351 Environmental Science and Engineering

C214.1	Describe the structure and functions of different eco system.
C214.2	Identify the various causes, effects and control measures of different types of pollution.
C214.3	Summarize the over exploitation and their effects of natural resources.
C214.4	Appraise the environmental issues and possible solution.
C214.5	Explain the causes of population growth and explosion.

Course code : C215 Course Name: CH6411 TECHNICAL ANALYSIS LABORATORY

C215.1	Able to understand basic principles involved in estimation and characterization of industrially important materials.
C215.2	understanding on the estimation and analysis of chemical compounds.
C215.3	Analysis of fuels

Course code :C216 Course Name: CH6412 FLUID MECHANICS LABORATORY

C216.1	To learn experimentally to calibrate flow meters
C216.2	Able to find pressure loss for fluid flows
C216.3	Able to determine pump characteristics.

Course code : C301 Course Name: CH6459 NUMERICAL METHODS

C301.1	Understand the basic concepts and techniques of solving algebraic and transcendental equations.
C301.2	Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations
C301.3	Apply the numerical techniques of differentiation and integration for engineering problems
C301.4	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
C301.5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications

Course code :C302 Course Name: CH6501 INSTRUMENTAL METHODS OF ANALYSIS

C302.1	To make the students understand the concepts of EMR, various energy levels, and electronic transitions.
C302.2	To make the students gain knowledge in the Qualitative analysis of UV /Visible spectroscopy instrumentation and different rules.
C302.3	To make the students well equipped in Quantitative applications of UV/Visible spectroscopy.
C302.4	To make the students to excel in IR spectroscopy and its application in various fields.
C302.5	To make the students apply their ideas and become resourceful in different separation methods using Chromatography.

Course code : C303 Course Name: CH6502 CHEMICAL PROCESS INDUSTRIES II

C303.1	Able to gain knowledge on various aspects of production engineering
C303.2	Understand the practical methods of production in a chemical factory.
C303.3	Able to integrate various courses such as chemistry, unit operations, mechanical operation, stoichiometry etc.,
C303.4	Able to classify the chemical process industry into industrial categories of base, intermediate end-products
C303.5	Able to specify chemicals manufacturers

Course code : Course Name: CH6503 CHEMICAL ENGINEERING THERMODYNAMICS II

C304.1	Understand the concepts of partial molar properties of solutions and Gibbs Duhem Equation
C304.2	Explain the basic concepts in phase equilibria, chemical potential, fugacity, azeotropes and Vapour-Liquid Equilibrium
C304.3	Understand the various concepts in activity coefficient-composition models and thermodynamic consistency of phase equilibria
C304.4	Understand the concepts in evaluating equilibrium constant and thermodynamic analysis in reaction
C304.5	Understand the various concepts in refrigeration, liquefaction process and performance of vapour refrigeration cycles

Course code :C305 Course Name: CH6504 HEAT TRANSFER

C305.1	To understand the concepts of heat transfer in conduction, fins, critical radius of thickness and lumped heat analysis.
C305.2	To understand the concepts of convection in flow through flat plates and pipes
C305.3	To understand the various concepts of boiling and condensation
C305.4	To understand the concept behind evaporator and radiation heat transfer
C305.5	To know about heat exchangers and its types

Course code :C306 Course Name: CH6505 MASS TRANSFER I

C306.1	To understand the basic concept of diffusion and diffusivity prediction and measurement.
C306.2	To understand the concept of mass transfer coefficient for various phase types and stage wise differential contractors.

C306.3	To understand the principals of humidification with design and theories of cooling towers.
C306.4	To understand the principals of drying with material balance and determination of length of dryers.
C306.5	To understand the concepts of crystallization with mass and energy balance and design of crystallizers.

Course code :C307 Course Name: GE6563 COMMUNICATION SKILLS

C307.1	Able to provide opportunities to learners to practice their communicative skills to make them become proficient users of English.
C307.2	Enable learners to fine-tune their linguistic skills (LSRW) with the help of technology to communicate globally.
C307.3	Able too enhance the performance of learners at placement interviews and group discussions and other recruitment procedures.

Course code : C308 Course Name: CH6511 PROCESS EQUIPMENT DESIGN– I

C308.1	Able to develop skill to design process equipments used widely in the chemical industry.
C308.2	Able to install process equipments used widely in a chemical industry.

Course code : C309 Course Name: CH6512 MECHANICAL OPERATIONS LABORATORY

C309.1	Able to develop a sound working knowledge on different types of crushing equipments
C309.2	Able to study the characteristics of different mechanical operation separators.
C309.3	Gain knowledge on various separation techniques like filtration, sedimentation, screening, elutriation, and centrifugation

Course code :C310 Course Name: CH6601 ENERGY ENGINEERING

C310.1	Able to understand the interaction between different parts of the energy system
C310.2	Ability to apply the fundamentals of energy conversion
C310.3	Able to understand the applications of energy conversion

Course code :C311 Course Name: CH6602 CHEMICAL REACTION ENGINEERING – I

C311.1	Interpret kinetic data and mechanism.
C311.2	Design a reactor for a chemical reaction
C311.3	Understand the choice of reactors
C311.4	Identify appropriate reactor for a chemical reaction under different operating conditions
C311.5	Analysis the optimum reaction condition for a chemical reaction.

Course code : C312 Course Name: CH6603 MASS TRANSFER II

C312.1	Students will be able to design an absorber and a Stripper
C312.2	Students will be able to design a distillation column.
C312.3	Students will be able to design extractors.
C312.4	Students will be able to design leaching equipments.
C312.5	Students will be able to design adsorbers.

Course code : C313 Course Name: CH6604 MATERIALS SCIENCE AND TECHNOLOGY

C313.1	emphasis on the fundamental scientific and engineering principles of material structure
C313.2	Able to know about processing, properties of materials
C313.3	Able to analyze the performance of all classes of materials used in engineering systems.

Course code : C314 Course Name: CH6605 PROCESS INSTRUMENTATION, DYNAMICS AND CONTROL

C314.1	Understand the concepts of Instrumentation
C314.2	Open and closed loop systems and its responses.
C314.3	Understand the concept of control loop components.
C314.4	Understand the Stability of control systems.
C314.5	Able to understand the concept of Advanced control System

Course code :C316 Course Name: CH6611 HEAT TRANSFER LABORATORY

C316.1	To develop a sound working knowledge on different types of heat transfer equipments.
C316.2	Able to calculate heat transfer by conduction
C316.3	Able to understand different types of convection using classical models

Course code : C317 Course Name: CH6612 PROCESS EQUIPMENT DESIGN II

C317.1	Gain knowledge on the shape and drawing of the process equipments
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C317.2	To gain knowledge and to develop key concepts and techniques to design the process equipment in a process plant.
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Course code : C318 Course Name: CH6613 MASS TRANSFER LABORATORY

C318.1	to develop sound working knowledge on different types of mass transfer equipments.
C318.2	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 : C401 Course Name: CH6701 CHEMICAL REACTION ENGINEERING – II

C401.1	Understand the concepts of partial molar properties of solutions and Gibbs Duhem Equation
C401.2	Explain the basic concepts in phase equilibria, chemical potential, fugacity, azeotropes and Vapour-Liquid Equilibrium
C401.3	Understand the various concepts in activity coefficient-composition models and thermodynamic consistency of phase equilibria
C401.4	Understand the concepts in evaluating equilibrium constant and thermodynamic analysis in reaction
C401.5	Understand the various concepts in refrigeration, liquefaction process and performance of vapour refrigeration cycles

Course code : C402 Course Name: CH6702 TRANSPORT PHENOMENA

C402.1	Understand the fundamental connections between the conservation laws in heat, mass and momentum Interpret the importance of analogies between transport operation
C402.2	Identify the method of shell balance approach to transfer problems
C402.3	Apply equations of change to solve heat, mass and momentum transfer problems
C402.4	Apply the time smoothed equations of change for turbulent flow in pipes
C402.5	Interpret the importance of analogies between transport operation

Course code : C403 Course Name: CH6703 CHEMICAL PROCESS PLANT SAFETY

C403.1	Students would have learnt the basic concepts relating to safety programs
C403.2	Students would have learnt the basic concepts relating to chemical hazards, risk, and ethics.
C403.3	Students will be able to identify the different accidents and their causes.
C403.4	Students develop knowledge of quantitatively analyze release and dispersion rates of liquids and vapors.
C403.5	Students would have an awareness of the various legal aspects of safety

Course code : C404 Course Name: CH6704 PROCESS ECONOMICS

C404.1	knowledge on principles of management, organization and quality
C404.2	knowledge on cost and asset accounting, time value of money
C404.3	knowledge on profitability, alternative investments, minimum attractive rate of return
C404.4	knowledge on balance sheet, sensitivity and risk analysis
C404.5	knowledge on economic balance of Chemical Process Industries

Course code : C405 Course Name: CH6705 BIOCHEMICAL ENGINEERING

C405.1	To understand the basic biochemical engineering principles and applications relevant to bioprocesses and biotechnology operations.
C405.2	To understand the concept of biochemistry and microbiology and kinetics of enzyme action
C405.3	To understand the principals underlying and the derivation of the design equations for enzyme reactions and fermentation reactor operation and design.
C405.4	To understand the basic issues in biotechnology industry product/process development.
C405.5	To understand the concepts available to purify the product from bioreactor/fermentor in laboratory and pilot plant.

Course code : C406 Course Name: CH6009 Fertilizer Technology

C406.1	Understand the concepts of manufacture of nitrogenous fertilizers
C406.2	Understand the concepts of manufacture of Phosphatic fertilizers
C406.3	Understand the concepts of manufacture of Potassic fertilizers
C406.4	Interpret the complex and NPK fertilizer
C406.5	Understand the concept of manufacturing techniques and design of equipments in fertilizer industries.

Course code : C407 Course Name: CH6711 CHEMICAL REACTION ENGINEERING LABORATORY

C407.1	To gain knowledge on different types of reactors.
C407.2	To gain knowledge on design of reactors.

Course code : C408 Course Name: CH6712 SEMINAR AND COMPREHENSION

C408.1	To assess the overall level of proficiency of the students
C408.2	To understand the scholastic attainment of the student in the various subjects studied during the degree course

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Course code : C409 Course Name: CH6713 PROCESS CONTROL LABORATORY

C409.1	To understand the methods of controlling the processes including measurements using process simulation techniques.
C409.2	To development and use of right type of control dynamics for process control under different operative conditions.

Course code : C410 Course Name: CH6013 Petroleum Technology

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: CH6018 Process Plant Utilities

C411.1	Students will understand the importance of health, safety and the environment in process industries.
C411.2	Students will understand the utility of steam and its usefulness.
C411.3	Students will understand the refrigeration processes used in industry.
C411.4	Students will understand the concepts of compressed air and its application in industries.
C411.5	Students will understand that efficient operation involving fuel is imperative for economic and safe operation is essential for the survival of industries.

Course code : C412 Course Name: CH6811 Project Work

C412.1	Able to practice Project Management principles while developing chemical formulations.
C412.2	Able to take up any challenging practical problems
C412.3	Able to find solution by formulating proper methodology.