



**CHAITANYA BHARATHI
INSTITUTE OF TECHNOLOGY**

An Autonomous Institute | Affiliated to Osmania University
Kokapet Village, Gandipet Mandal, Hyderabad, Telangana-500075, www.cbti.ac.in



COMMITTED TO
RESEARCH,
INNOVATION AND
EDUCATION

45
years

CHEMICAL ENGINEERING DEPARTMENT

Program Outcomes (PO's)

Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems

Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.

The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Prof & Head M. Mukunda Vani
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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 and in multidisciplinary environments.

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 change.

R20:

Department Vision

To become the most sought center of excellence engaged in training and shaping students as professionals for higher education and process industries both in India and abroad and allow the students to do R & D projects and publish same in the reputed journals.

Department Mission

Imparting contemporary technical education and training manpower to create a skilled human resource talent pool to serve, manage the process industries globally with a sense of responsibility towards society and the environment.

Program Education Objectives (PEOs):

- To train the students for identifying problems relevant to design and general practice of chemical engineering field.
- To provide experience in the three significant design areas of equipment, process and plant operation of chemical industries.
- To educate the students in understanding the multifaceted aspects of chemical engineering and in applying the various computational methods studied, for problem analysis and solution.
- To prepare the students to pursue post graduate studies or to succeed in industry / technical profession through global technical education.

Program Specific Outcomes (PSOs)



Prof & Head M. Mukunda Vani
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

PSO-1: Undertake research activities in the area of heat & mass transfer, separation processes, Reaction engineering, related to Green Chemical Engineering.

PSO-2: Undertake real life projects in process industries and allied fields.

R18:

Department Vision

To become the most sought center of excellence engaged in training and shaping students as professionals for higher education and process industries both in India and abroad and allow the students to do R & D projects and publish same in the reputed journals.

Department Mission

Imparting contemporary technical education and training manpower to create a skilled human resource talent pool to serve, manage the process industries globally with a sense of responsibility towards society and the environment.

Program Education Objectives (PEOs):

- To train the students for identifying problems relevant to design and general practice of chemical engineering field.
- To provide experience in the three significant design areas of equipment, process and plant operation of chemical industries.
- To educate the students in understanding the multifaceted aspects of chemical engineering and in applying the various computational methods studied, for problem analysis and solution.
- To prepare the students to pursue post graduate studies or to succeed in industry / technical profession through global technical education.

Program Specific Outcomes (PSOs)

PSO-1: Undertake research activities in the area of heat & mass transfer, separation processes, Reaction engineering, related to Green Chemical Engineering.

PSO-2: Undertake real life projects in process industries and allied fields.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)

Gandipet, Hyderabad -75

Chemical Engineering Department

Course Outcome Statements for B. Tech (Chemical)

R20

S.No	Course		Course Outcomes Statements
	Code	Name	
1.	20MT C05	Calculus	Apply the Matrix Methods to solve system of linear equations
			Apply the Matrix Methods to solve the system of linear equations
			Analyse the geometrical interpretation of Mean value theorems.
			Determine the extreme values of functions of two variables.
			Examine the convergence and divergence of infinite Series.
2.	20CE C01	Engineering Mechanics - I	Calculate the Euler's coefficients for Fourier series of a function
			Calculate the components and resultant of coplanar forces system.
			Understand free body diagram and apply equilibrium equations to solve for unknown forces.
			Apply concepts of friction for solving engineering problems.
			Analyse simple trusses for forces in various members of a truss
3.	20PY C01	Chemistry	Determine centroid for elementary, composite figures and bodies.
			Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
			Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells
			Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
			Classify the various methods used in treatment of water for domestic and industrial use.
4.	20CS C01	Programming for Problem Solving	Outline the synthesis of various Engineering materials & Drugs.
			Identify and understand the computing environments for scientific and mathematical problems.
			Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
			Choose data types and control structures to solve mathematical and scientific problem.
			Decompose a problem into modules and use functions to implement the modules.
			Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
			Develop applications using file I/O.

Prof & Head M. Mukunda Vani
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.



Prof & Head M. Mukunda Vani
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

S.No	Course		Course Outcomes Statements
	Code	Name	
5	20CY C02	Chemistry Lab	Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
			Estimate the amount of chemical substances by volumetric analysis.
			Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
			Calculate the concentration and amount of various substances using instrumental techniques.
			Develop the basic drug molecules and polymeric compounds.
6	20CS C02	Programming For Problem Solving Lab	Identify and setup program development environment.
			Design and test programs to solve mathematical and scientific problems.
			Identify and rectify the syntax errors and debug program for semantic errors
			Implement modular programs using functions.
			Represent data in arrays, pointers, structures and manipulate them through a program
7	20ME C02	Workshop / Manufacturing Practice	Create, read, and write to and from simple text files.
			Understand safety measures to be followed in workshop to avoid accidents.
			Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
			Make a given model by using workshop trades including fitting, carpentry, tinsmith and House wiring.
			Perform various operations in welding, machining and casting processes.
8	20ME C03	Engineering Exploration	Conceptualize and produce simple device/mechanism of their choice.
			Understand the role of an engineer as a problem solver.
			Identify multi-disciplinary approaches in solving an engineering problem.
			Build simple systems using engineering design process.
			Analyze engineering solutions from ethical and sustainability perspectives.
9	20MT C06	Vector Calculus And Differential Equations	Use basics of engineering project management skills in doing projects.
			Calculate the areas and volumes.
			Apply the vector differential operators to Scalars and Vector functions
			Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
			Calculate the solutions of first order linear differential equations.
			Solve higher order linear differential equations.

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

S.No	Course		Course Outcomes Statements
	Code	Name	
10	20 EG C01	English	Illustrate the nature, process and types of communication and communicate effectively without barriers.
			Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
			Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
			Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
			Critique passages by applying effective reading techniques
11.	20PY C07	Physics	Demonstrate the physical properties of the light.
			Find the applications of lasers and optical fibers in engineering and technology.
			Identify different types of magnetic and dielectric materials.
			Recall the fundamentals of nanomaterials.
			Apply the ideas of quantum mechanics for related problems
12.	20EEC01	Basic Electrical engineering	Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits 2. 3. 4. 5. 6.
			Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
			Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
			Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
			Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
			Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations
13	20EG C02	English Lab	Define the speech sounds in English and understand the nuances of pronunciation in English.
			Apply stress correctly and speak with the proper tone, intonation and rhythm.
			Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
			Determine the context and speak appropriately in various situations.
			Design and present effective posters while working in teams, and discuss and participate in Group discussions.
14	20PY C10	Physics Lab	Interpret the errors in the results of an experiment.
			Demonstrate the wave nature of light experimentally
			Utilize physical properties of magnetic and dielectric materials for various applications
			Make use of lasers and optical fibers for engineering applications
			Explain light induced phenomenon and motion of electrons in electric and magnetic fields

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

S.No	Course		Course Outcomes Statements
	Code	Name	
15.	20EEEC02	Basic Electrical Engineering Lab	Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
			Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
			Comprehend the circuit analysis techniques using various circuital laws and theorems.
			Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
			Recognize the basic characteristics of transformer and components of switchgear.
			Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.
16.	20ME C01	CAD And Drafting	Become conversant with appropriate use of CAD software for drafting.
			Recognize BIS, ISO Standards and conventions in Engineering Drafting.
			Construct the projections of points, lines, planes, solids
			Analyse the internal details of solids through sectional views
17.	20MBC02	Community Engagement	Create an isometric projections and views
			Gain an understanding of Rural life, Culture and Social realities.
			Develop a sense of empathy and bonds of mutuality with Local Communities
			Appreciate significant contributions of Local communities to Indian Society and Economy.
			Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
18.	20MTC08	Partial Differential Equations And Statistics	Utilise the opportunities provided by Rural Development Programmes
			Find solution of initial value problems of ODE by Numerical Method.
			Solve Linear and Non-Linear PDE's.
			Solve One-Dimension Wave and Heat equations and Two Dimension Laplace equation
			Use the basic probability for fitting the Random phenomenon.
19	20CSC06	Basics Of Data Structures	Analyze the random fluctuations of probability distribution and Principles of Least Squares approximations for the given data.
			Identify various data structures, searching & sorting techniques and their applications.
			Describe the linear and non-linear data structures, searching and sorting techniques.
			Apply suitable data structures to solve problems.
			Analyze various searching and sorting techniques.
			Evaluate the linear and non-linear data structures.



Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

SNo	Course		Course Outcomes Statements
	Code	Name	
20.	20CHC01	CHEMICAL ENGINEERING THERMODYNAMICS-I	Understand the fundamental concepts of thermodynamics to engineering applications.
			Understand the relation between the measurable nature of P, V, T and the un-measurable nature of H, U, A, G
			Calculate the thermodynamic properties of real gases by using EOS.
			Understand and analyze the various thermodynamic processes involving ideal gases.
			Analyze the power cycles; refrigeration cycles, and liquefaction processes.
			Apply the energy balance equations to Open and Closed systems and also to evaluate the thermodynamic efficiency of nozzles, turbines and compressors.
21.	20CHC02	FLUID MECHANICS	Distinguish different types of fluids, manometers
			Apply Shell balances to illustrate fluid flow phenomena
			Identify the concepts of incompressible flow in pipes, channels and associated frictional losses
			Explain the concept of fluidization and flow through packed beds.
			Choose the types of pumps for different fluids under different conditions such as toxic, acidic, slurry type.
			Identify equipment to be used to measure fluid flow based on their properties
22.	20CHC03	MATERIAL ENERGY BALANCE CALCULATIONS	Convert physico-chemical quantities from one system of units to another and identify basis of calculation
			Solve material balance problems without chemical reactions.
			Solve material balance problems with chemical reactions
			Solve material balance problems with recycle, purge and bypass
			Analyze the ideal and real behavior of gases, vapors and liquids
			Solve energy balance problems with and without chemical reaction
23.	20CHC04	MECHANICAL UNIT OPERATIONS	Decide the transport of solids based on their properties.
			Select equipment for industrial application with respect to size reduction.
			Design equipment for industrial application with respect to separation of solids.
			Decide the necessary equipment to screen different particles based on their properties
			Apply different filtration techniques for industrial application
			Identify the suitable technique for blending and mixing of liquids and solids.
24	20CSC07	Basics of Data Structures Lab	Implement the abstract data type.
			Demonstrate the operations on stacks, queues using arrays and linked lists
			Apply the suitable data structures including stacks, queues to solve problems
			Analyze various searching and sorting techniques.
			Choose proper data structures, sorting and searching techniques to solve real world problems
25	20CHC05	FLUID MECHANICS LAB	Identify variable area flow meters and variable head flow meters
			Explain the fluid flow characteristics.
			Demonstrate the Bernoulli principle
			Analyze the flow of fluids through closed conduits, open channels
			Interpret the characteristics of pumps. Analyze the flow in packed beds.

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

SNo	Course		Course Outcomes Statements
	Code	Name	
26.	20CHC06	MECHANICAL UNIT OPERATIONS LAB	Understand mechanical unit operations and their role in process industries.
			Understand the nature of solids, their characterization, handling and the processes involving solids.
			Analyze the performance of size reduction equipment and calculate the power and efficiency requirements.
			Understand the principle, construction and operation of various classification equipment.
			Analyze Solid liquid separation in industrial equipment based on settling, density and centrifugal force.
			Design and operate filtration equipment.
27.	20CHC07	CHEMICAL REACTION ENGINEERING-I	Classify reactions, rate and forms of rate expressions.
			Summarize fundamentals of kinetics and interpret the data including relationships between moles, Concentration, extent of reaction and conversion.
			Explain Batch, CSTR, and PFR performance equations from general material balances for homogeneous and heterogeneous reactions.
			Identify the right reactor among single, multiple, recycle reactors etc
			Determine the effect of temperature on reactor performance for adiabatic and non-adiabatic operation.
			Analyze the non-ideality of reactors.
28.	20CHC08	CHEMICAL TECHNOLOGY	Estimate the chemical industry growth and opportunities.
			Differentiate between unit operation and unit processes.
			Develop flow diagrams of different processes.
			Classify between Inorganic and Organic processes.
			Design processes based on conditions space time, yield, conversion, recycle methods, temperature and pressure.
			Predict the process limitations and propose a model to overcome the limitations.
29.	20CHC09	HEAT TRANSFER	Distinguish between different types of heat transfer
			Calculate heat transfer coefficients for forced and natural convection
			Analyze and understand the concepts of Heat exchangers
			Analyze the heat transfer phenomena in fluids involving phase changes
			Identify the type of evaporator required for a specific purpose and design it
			Explain the impact of radiation shields and laws of radiation.
30	20CHC10	MASS TRANSFER OPERATIONS - I	Apply the concepts of diffusion mass transfer to fluids and solids
			Write the rate equations for mass transfer operations
			Estimate the mass transfer coefficients of mixtures
			Design Absorber/Stripper by equilibrium methods
			Design the cooling tower with the concept of humidification.

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

			Interpret the drying mechanism by estimating total drying period
--	--	--	--

S.No	Course		Course Outcomes Statements
	Code	Name	
31.	20EGM01	INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES	Understand the making of the Indian Constitution and its features.
			Identify the difference among Right To equality, Right To freedom and Right to Liberty.
			Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
			Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
			Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.
32.	20EEM01	INDIAN TRADITIONAL KNOWLEDGE	Understand philosophy of Indian culture
			Distinguish the Indian languages and literature
			Learn the philosophy of ancient, medieval and modern India
			Acquire the information about the fine arts in India
33.	20CEM01	ENVIRONMENTAL SCIENCE	Know the contribution of scientists of different eras.
			Identify the natural resources and realize the importance of water, food, forest, mineral, energy, land resources and effects of over utilization.
			Understand the concept of ecosystems and realize the importance of interlinking of food chains.
			Contribute for the conservation of bio-diversity.
			Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
34.	20CHE01	ENERGY ENGINEERING	Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.
			Classify and explain energy sources
			Summarize the basic principles and fundamentals of non-conventional energy sources
			Summarize the basic principles and fundamentals of conventional energy sources
			Outline the production and future perspectives of bio fuels
			Relate the importance of future energy resources
35	20CHE02	FOOD PROCESSING TECHNOLOGY	Demonstrate the need for energy auditing and conservation
			Understand food demand scenario with respect to world and India
			Explain techniques in food processing
			Design process equipment to achieve the desired quality of food.
			Develop novel food processes that have a minimal effect on food quality
			Select control strategies to maintain food quality

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

			Apply the scientific method to food science problems
--	--	--	--

SNo	Course		Course Outcomes Statements
	Code	Name	
36.	20CHE03	MATERIAL SCIENCE FOR CHEMICAL ENGINEERS	Classify different engineering materials as ferrous and non-ferrous alloys.
			Select materials for design and fabrication of process equipment.
			Understand the significance of mechanical, thermal and optical properties of engineering materials
			Select materials for high and low temperature applications.
			Identify new or alternate materials for development and operation of process industry.
			Characterize material using different experimental techniques.
37.	20CHE04	PULP AND PAPER TECHNOLOGY	Design the operation, maintenance and safety aspects for paper making
			Identify the factors that drive industry trends
			Evaluate different grades of paper and boards based on testing methods
			Select appropriate bleaching technique for required paper quality
			Distinguish the important wood and fiber properties that affect paper quality
			Identify, formulate and solve design problems pertaining to pulp digester
38.	20CHC11	CHEMICAL REACTION ENGINEERING LAB	Compare the performance of ideal reactors.
			Develop rate law for use in reactor design based on reaction data from a reactor.
			Find the conversion of reactants for a particular reaction in different reactors.
			Interpret the kinetics of an exothermic reaction.
			Analyze laboratory reactors through residence time distributions.
			Determine mass transfer coefficient of Solid-Liquid and Liquid-Liquid systems.
39.	20CHC12	HEAT TRANSFER LAB	Demonstrate and evaluate heat transfer by conduction in solids for steady state conditions
			Determine thermal conductivity of different materials of varying geometries
			Estimate heat transfer coefficients and determine effectiveness of pin fin for free and forced convection
			Determine surface emissivity of a test plane and Stefan-Boltzmann's constant and compare with theoretical values
			Determine critical heat flux in pool boiling
			Estimate heat transfer coefficients and determine effectiveness of heat exchangers to analyze their performance

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)

Gandipet, Hyderabad -75

Chemical Engineering Department

Course Outcome Statements for B. Tech (Chemical)-R18

SNo	Course		Course Outcomes Statements
	Code	Name	
1.	18MT CO1	MATHEMATIC S- I	Solve system of linear equations and identify the Eigen values and Eigen vectors in engineering problems.
			Check the series convergence.
			Find the evolutes of the given curves.
			Expand and find extreme values of functions of two variables.
			Understanding the significance of gradient, divergence and curl.
			An ability to solve the problems and interpret in geometrical approach.
2.	18PY C05	PHYSICS	Demonstrate the wave nature of the light and describe the types of lasers and optical fibres and their applications
			Develop the concepts related to electromagnetic behavior
			Demonstrate the important concepts of Quantum Mechanics
3.	18CS C01	Programming for Problem Solving	Identify the computing environments.
			Formulate solutions to problems and represent them using algorithms/ Flowcharts.
			Choose proper control statements and data structures to implement the algorithms.
			Trace the Decompose a problem into modules and use functions to implement the modules programs with test the program solution.
			Develop applications using file I/O.
4.	18EG C01	ENGLISH	The students will understand the nature, process and types of communication and will communicate effectively without barriers.
			The students will write correct sentences and coherent paragraphs.
			The students will know how to condense passages by writing précis and write essays by using accurate grammar and appropriate vocabulary.
			The students will demonstrate advanced writing skills by drafting formal reports.
			The students will apply their reading techniques and analyze reading comprehension passages.
			The students will become effective communicators and will display their advanced skills of reading and writing and use correct grammar and appropriate vocabulary in all contexts.



Prof & Head M. Mukunda Vani
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

SNo	Course		Course Outcomes Statements
	Code	Name	
5	18PY C08	PHYSICS LABORATORY	Understand the concept of errors and find the ways to minimize the errors.
			Demonstrate interference and diffraction phenomena experimentally.
			Understand the applications of magnetic and dielectric materials.
			Know the working of lasers and optical fibres.
			Distinguish between polarized and unpolarized light.
6	18CS C02	Programming for Problem Solving	Identify and setup program development environment.
			Implement the algorithms using C programming language constructs.
			Identify and rectify the syntax errors and debug program for semantic errors.
			Analyze the results to evaluate the solutions of the problems.
			Solve problems in a modular approach using functions.
7	18ME C02	WORKSHOP/ MANUFACTURING PRACTICE	Implement file operations with simple text data.
			Fabricate components with their own hands.
			Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
			Assembling different components, student will be able to produce small mechanisms/devices of their interest.
			Gain practical skills of carpentry, tinsmith, fitting, house wiring
8	18EG C02	ENGLISH LAB	Gain knowledge of different Engineering Materials and Manufacturing Methods.
			Understand trades and techniques used in Workshop and chooses the best material/ manufacturing process for the application
			The students will differentiate the speech sounds in English.
			The students will interact with the software and understand the nuances of pronunciation in English.
			The students will speak with the proper tone, intonation and rhythm and apply stress correctly.
9	18MT CO3	MATHEMATICS– II	The students will demonstrate their listening skills by analyzing the IELTS and TOEFL listening comprehension texts.
			The students will speak with clarity and confidence.
			The students will work in teams and discuss various topics and demonstrate their presentation skills through posters.
			Find the areas, volumes and surface of solids revolution.
			Use Greens, Gauss and Stoke's theorems to find the surface and volume integrals.
			Able to solve solutions of differential equations with initial and boundary value problems.
			Solve the problems on analytic functions, Cauchy's theorem and Cauchy's integral formula.



Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

			Real and complex integrals by using Cauchy's theorems.
			Solve physical and engineering problems.

SNo	Course		Course Outcomes Statements
	Code	Name	
10	18CY C01	CHEMISTRY	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
			Rationalize bulk properties and processes using thermodynamic considerations & Ionic Equilibria.
			List major chemical reactions that are used in the synthesis of molecules.
			Apply the various methods used in treatment of water for domestic and industrial use.
			Discuss the various Engineering materials & Drug synthesis & their applications.
11.	18CE C01	ENGINEERING MECHANICS	Solve problems dealing with forces in plane and space force systems, draw free body diagrams to analyze various problems in equilibrium, for smooth and frictional surface.
			Determine centroid and moment of inertia for elementary, composite areas and bodies.
			Analyze simple trusses for forces in various members of a truss.
			Solve problem in kinematics and kinetics of particles and rigid bodies.
			Analyze body motion using work energy principles, impulse and momentum approach and able to apply the concepts of simple harmonic motion and free vibrations in dynamics.
12.	18ME C01	ENGINEERING GRAPHICS AND DESIGN	Introduction to engineering design and its place in society.
			Exposure to the visual aspects of engineering design.
			To become familiar with engineering graphics standards.
			Exposure to solid modelling.
			Exposure to computer-aided geometric design.
			Exposure to creating working drawings.
13	18EE C01	BASIC ELECTRICAL ENGINEERING	Acquire the concepts of Kirchhoff's laws and network theorems and able to get the solution of simple dc circuits.
			Obtain the steady state response of RLC circuits and also determine the different powers in AC circuits.
			Acquire the concepts of principle of operation of Transformers and DC machines.
			Acquire the concepts of principle of operation of DC machines and AC machines.
			Acquire the knowledge of electrical wiring and cables and electrical safety precautions.
			Recognize importance of earthing and methods of earthing and electrical installations.
14	18EE C02	BASIC ELECTRICAL ENGINEERING LAB	Get an exposure to common electrical components and their ratings.

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

			Make electrical connections by wires of appropriate ratings.
			Understand the circuit analysis techniques.
			Determine the parameters of the given coil.
			Understand the basic characteristics of transformer.
			Understand the basic characteristics of dc and ac machines

SNo	Course		Course Outcomes Statements
	Code	Name	
15	18CY C02	CHEMISTRY LAB	Estimate rate constants of reactions from concentration of reactants/ products as a function of time
			Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
			Synthesize a small drug molecule and Identify the organic compounds.
			Understand importance of analytical instrumentation for different chemical analysis.
			Perform interdisciplinary research such that the findings benefit the common man.
16.	20MTC08	PARTIAL DIFFERENTIAL EQUATIONS AND STATISTICS	Find solution of initial value problems of ODE by Numerical Method.
			Solve Linear and Non-Linear PDE"s.
			Solve One-Dimension Wave and Heat equations and Two Dimension Laplace equation.
			Use the basic probability for fitting the Random phenomenon.
17.	20CSC06	BASICS OF DATA STRUCTURE S	Analyze the random fluctuations of probability distribution and Principles of Least Squares approximations for the given data.
			Identify various data structures, searching & sorting techniques and their applications.
			Describe the linear and non-linear data structures, searching and sorting techniques.
			Apply suitable data structures
			Analyze various searching and sorting techniques.to solve problems.
18	20CHC01	CHEMICAL ENGINEERING THERMODYN AMICS-I	Evaluate the linear and non-linear data structures.
			Understand the fundamental concepts of thermodynamics to engineering applications.
			Understand the relation between the measurable nature of P, V, T and the un-measurable nature of H,U,A, G
			Calculate the thermodynamic properties of real gases by using EOS.
			Understand and analyze the various thermodynamic processes involving ideal gases.
			Analyze the power cycles; refrigeration cycles, and liquefaction processes.
19	20CHC02	FLUID MECHANICS	Apply the energy balance equations to Open and Closed systems and also to evaluate the thermodynamic efficiency of nozzles, turbines and compressors.
			Distinguish different types of fluids, manometers
			Apply Shell balances to illustrate fluid flow phenomena

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

			Identify the concepts of incompressible flow in pipes, channels and associated frictional losses
			Explain the concept of fluidization and flow through packed beds.
			Choose the types of pumps for different fluids under different conditions such as toxic, acidic, slurry type.
			Identify equipment to be used to measure fluid flow based on their properties

SNo	Course		Course Outcomes Statements
	Code	Name	
20	20CHC03	MATERIAL ENERGY BALANCE CALCULATIONS	Convert physico-chemical quantities from one system of units to another and identify basis of calculation
			Solve material balance problems without chemical reactions.
			Solve material balance problems with chemical reactions
			Solve material balance problems with recycle, purge and bypass
			Analyze the ideal and real behavior of gases, vapors and liquids
			Solve energy balance problems with and without chemical reaction
21.	20CHC04	MECHANICAL UNIT OPERATIONS	Decide the transport of solids based on their properties.
			Select equipment for industrial application with respect to size reduction.
			Design equipment for industrial application with respect to separation of solids.
			Decide the necessary equipment to screen different particles based on their properties
			Apply different filtration techniques for industrial application
			Identify the suitable technique for blending and mixing of liquids and solids.
22.	20CSC07	Basics of Data Structures Lab	Implement the abstract data type.
			Demonstrate the operations on stacks, queues using arrays and linked lists
			Apply the suitable data structures including stacks, queues to solve problems
			Analyze various searching and sorting techniques.
			Choose proper data structures, sorting and searching techniques to solve real world problems
23	20CHC05	FLUID MECHANICS LAB	Identify variable area flow meters and variable head flow meters
			Explain the fluid flow characteristics.
			Demonstrate the Bernoulli principle
			Analyze the flow of fluids through closed conduits, open channels
			Interpret the characteristics of pumps 6. Analyze the flow in packed beds.
24	20CHC06	MECHANICAL UNIT OPERATIONS LAB	Understand mechanical unit operations and their role in process industries.
			Understand the nature of solids, their characterization, handling and the processes involving solids.

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

			Analyze the performance of size reduction equipment and calculate the power and efficiency requirements.
			Understand the principle, construction and operation of various classification equipment.
			Analyze Solid liquid separation in industrial equipment based on settling, density and centrifugal force.
			Design and operate filtration equipment.

SNo	Course		Course Outcomes Statements
	Code	Name	
25	20CHC07	CHEMICAL REACTION ENGINEERING -I	Classify reactions, rate and forms of rate expressions.
			Summarize fundamentals of kinetics and interpret the data including relationships between moles, Concentration, extent of reaction and conversion.
			Explain Batch, CSTR, and PFR performance equations from general material balances for homogeneous and heterogeneous reactions.
			Identify the right reactor among single, multiple, recycle reactors etc
			Determine the effect of temperature on reactor performance for adiabatic and non-adiabatic operation.
			Analyze the non-ideality of reactors.
26	20CHC08	CHEMICAL TECHNOLOGY	Estimate the chemical industry growth and opportunities.
			Differentiate between unit operation and unit processes.
			Develop flow diagrams of different processes.
			Classify between Inorganic and Organic processes.
			Design processes based on conditions space time, yield, conversion, recycle methods, temperature and pressure.
			Predict the process limitations and propose a model to overcome the limitations
27.	20CHC09	HEAT TRANSFER	Distinguish between different types of heat transfer
			Analyze and understand the concepts of Heat exchangers
			Analyze the heat transfer phenomena in fluids involving phase changes
			Identify the type of evaporator required for a specific purpose and design it
			Explain the impact of radiation shields and laws of radiation Calculate heat transfer coefficients for forced and natural convection.
28	20CHC10	MASS TRASFER OPERATIONS - I	Apply the concepts of diffusion mass transfer to fluids and solids
			Write the rate equations for mass transfer operations
			Estimate the mass transfer coefficients of mixtures
			Design Absorber/Stripper by equilibrium methods
			Design the cooling tower with the concept of humidification.
			Interpret the drying mechanism by estimating total drying period

29	20EGM01	INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES	Understand the making of the Indian Constitution and its features.
			Identify the difference among Right To equality, Right To freedom and Right to Liberty.
			Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
			Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
			Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

SNo	Course		Course Outcomes Statements
	Code	Name	
30	20EEM01	INDIAN TRADITIONAL KNOWLEDGE	Understand philosophy of Indian culture 2. 3. 4. 5.
			Distinguish the Indian languages and literature
			Learn the philosophy of ancient, medieval and modern India
			Acquire the information about the fine arts in India
			Know the contribution of scientists of different eras
31	20CEM01	ENVIRONMENTAL SCIENCE	Identify the natural resources and realize the importance of water, food, forest, mineral, energy, land resources and affects of over utilization.
			Understand the concept of ecosystems and realise the importance of interlinking of food chains.
			Contribute for the conservation of bio-diversity.
			Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
			Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.
32	20CHE01	ENERGY ENGINEERING	Classify and explain energy sources
			Summarize the basic principles and fundamentals of non-conventional energy sources
			Summarize the basic principles and fundamentals of conventional energy sources
			Outline the production and future perspectives of bio fuels
			Relate the importance of future energy resources
33	20CHE02	FOOD PROCESSING TECHNOLOGY	Demonstrate the need for energy auditing and conservation
			Understand food demand scenario with respect to world and India
			Explain techniques in food processing
			Design process equipment to achieve the desired quality of food.
			Develop novel food processes that have a minimal effect on food quality
			Select control strategies to maintain food quality
			Apply the scientific method to food science problems.



Prof & Head M. Mukunda Vani
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

34	20CHE03	MATERIAL SCIENCE FOR CHEMICAL ENGINEERS	Classify different engineering materials as ferrous and non-ferrous alloys.
			Select materials for design and fabrication of process equipment.
			Understand the significance of mechanical, thermal and optical properties of engineering materials
			Select materials for high and low temperature applications.
			Identify new or alternate materials for development and operation of process industry.
			Characterize material using different experimental techniques.

SNo	Course		Course Outcomes Statements
	Code	Name	
35	20CHE04	PULP AND PAPER TECHNOLOGY	Design the operation, maintenance and safety aspects for paper making
			Evaluate different grades of paper and boards based on testing methods
			Select appropriate bleaching technique for required paper quality
			Distinguish the important wood and fiber properties that affect paper quality
			Identify, formulate and solve design problems Identify the factors that drive industry trends pertaining to pulp digester
36	20CHC11	CHEMICAL REACTION ENGINEERING LAB	Compare the performance of ideal reactors.
			Develop rate law for use in reactor design based on reaction data from a reactor.
			Find the conversion of reactants for a particular reaction in different reactors.
			Interpret the kinetics of an exothermic reaction.
			Analyze laboratory reactors through residence time distributions.
			Determine mass transfer coefficient of Solid-Liquid and Liquid-Liquid systems.
37	20CHC12	HEAT TRANSFER LAB	Demonstrate and evaluate heat transfer by conduction in solids for steady state conditions
			Determine thermal conductivity of different materials of varying geometries
			Estimate heat transfer coefficients and determine effectiveness of pin fin for free and forced convection
			Determine surface emissivity of a test plane and Stefan-Boltzmann's constant and compare with theoretical values
			Determine critical heat flux in pool boiling
			Estimate heat transfer coefficients and determine effectiveness of heat exchangers to analyze their performance
38	18CH C10	CHEMICAL REACTION ENGINEERING I	Classify reactions, rate and forms of rate expressions.
			Summarize fundamentals of kinetics and interpret the data including relationships between moles, Concentration, extent of reaction and conversion.
			Explain Batch, CSTR, and PFR performance equations from general material balances for homogeneous and heterogeneous reactions.



Prof & Head M. Mukunda Vani
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.

			Identify the right reactor among single, multiple, recycle reactors etc.
			Apply the concepts of heat effects on reactions.
			Analyze the non-ideality of reactors.
39	18CH C11	MASS TRANSFER I	Apply the concepts of diffusion mass transfer to liquids and solids.
			Estimate the mass transfer coefficients.
			Design gas absorber by equilibrium method to find the number of theoretical stages.
			Estimate the number of theoretical stages of distillation column using McCabe- Thiele and PonchanSavarit methods.
			Explain extractive distillation and azeotropic distillation.

SNo	Course		Course Outcomes Statements
	Code	Name	
40	18CH C 12	HEAT TRANSFER	Distinguish between different types of heat transfer
			Analyze and understand the concepts of Heat exchangers
			Calculate the rate of heat transfer with and without change of phase
			Identify the type of evaporator required for a specific purpose and design it
			Explain the impact of radiation shields and design aspects of furnaces.
41	18CH C 13	PARTICLE AND FLUID-PARTICLE PROCESSING	Identify and describe fluid-particle systems in terms of their basic physical properties
			Explain size reduction energy requirements, estimate performance of equipment, selection and sizing of equipment.
			Find drag force and terminal settling velocity for single particles.
			Determine pressure drop in fixed and fluidized beds.
			Apply separation techniques sedimentation, flocculation to separate a solid fluid mixtures
			Analyze filtration data and select systems based on requirements, estimate filtration area for given requirements, understand filter aids and their usage
42	18CH E 01	WATER CONSERVATION AND MANAGEMENT (Core Elective I)	Identify the water storage methods in practice based on available sources and supply.
			Understand the water quality parameters and analysis methods.
			Classify the basic characteristics of water and their testing methods.
			Explain the objectives of water harvesting and recycling methods.
			Make use of water conservation methods at work place, agriculture, service and process industry.
43	18CH E 02	RENEWABLE ENERGY (Core Elective I)	Describe the environmental aspects of non-conventional energy resources compared with various conventional energy systems, their prospects and limitations.
			Explain the use of solar energy and the various components used in the energy production with respect to applications.
			Find out the need of Wind Energy and the various components used in energy generation and know the classifications.
			Understand the concept of Biomass energy resources and their

			classification, types of biogas Plants applications
			Summarize the knowledge of Ocean energy, tidal energy, Geothermal energy.
			Understand the Fuel cells principles and applications.
44	18CH E 03	EXPERIMENTAL AND ANALYTICAL TECHNIQUES (Core Elective I)	Build basic knowledge of analytical techniques
			Distinguish the applicability of Microscopy techniques
			Identify the suitable spectroscopy methods
			Select the electro-analytical techniques
			Infer the role of different separation techniques

SNo	Course		Course Outcomes Statements
	Code	Name	
45	18CH E 04	POLYMER SCIENCE AND TECHNOLOGY (Core Elective II)	Explain the basic concepts of polymers, polymerization techniques and behavior in polymers
			Distinguish different types of polymerization.
			Determine the molecular weight of polymers by different techniques
			Familiarize with various processing techniques for polymers, rubbers and fibers
			Summarize the manufacturing and characterization of various industrially important polymers
46	18CH E 05	GREEN TECHNOLOGY (Core Elective II)	Describe the principles of green chemistry
			Identify manufacturing processes for waste minimization
			Identify technologies to reduce the level of emissions
			Understand the importance of eco-friendly solvents
			Apply principles of green chemistry to design greener processes
47	18CH E 06	CATALYSIS (Core Elective II)	Explain the basic concepts of catalysis
			Summarize the methods of preparation and characterization of catalysts
			Analyze the role of heat and mass transfer in the catalytic reactor design
			Distinguish the performance of catalytic reactors
			Identify the role of catalysts in the environmental protection
			Explain the commercial aspects of catalytic reactors
48	18CH C16	CHEMICAL REACTION ENGINEERING – II	Identify and characterize solid catalysts
			Explain the kinetics for solid catalyzed reactions
			Interpret the kinetics of fluid and particle reactions
			Identify regions of mass transfer control and reaction rate control in fluid-fluid reactions
			Apply the concepts to Gas fluid and catalytic reactors
49	18CH C17	MASS TRANSFERS- II	Understand the concept of different mass-transfer operations and their concerned equipment used in the chemical industries.
			Interpret the importance and the role of liquid–liquid extraction and leaching in Separation Process



Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

50	18CH C 18	PROCESS CONTROL	Articulate the process of adsorption and the equipment used in chemical industry
			Calculate the enthalpies and interpret psychometric charts and design of cooling towers and drying equipment.
			Distinguish among micro-filtration, ultra-filtration, nano-filtration, and reverse osmosis
			Characterize and analyze the dynamic behavior of linear systems (First and Second order)
			Build block diagrams for simple chemical processes
51	18CH E 07	FLUIDIZATION ENGINEERING (Core Elective III)	Analyze stability, speed of response, frequency response, of simple feedback control systems
			Analyze and tune process controllers
			Empirically identify process dynamics

SNo	Course		Course Outcomes Statements
	Code	Name	
51	18CH E 07	FLUIDIZATION ENGINEERING (Core Elective III)	Determine the minimum fluidization velocity and optimum operating fluidization velocity.
			Design the fluidized bed in terms of pressure drop across the bed
			Construct the distributors, TDH, height, diameter, power consumption of compressor for air.
			Distinguish between boiler and furnaces, methods of starting up.
			Estimate the amount of chemicals required to control the emission like SO ₂ .
52	18CH E 08	PETROCHEMICAL TECHNOLOGIES (Core Elective III)	Explain the composition, applications and formation theories of crude
			Summarize the refining process of crude oil.
			Classify Ethylene derivatives and summarize their manufacturing processes.
			Outline Propylene and C4 derivatives and explain their manufacture processes.
			Classify higher paraffin derivatives and outline manufacturing processes.
53	18CH E 09	BIOCHEMICAL ENGINEERING (Core Elective III)	Identify Aromatic derivatives sources and separation methods for aromatics.
			Describe the basic structure and function of cells & relate cell function to products and processes useful to man
			Explain classification, growth concepts and various types of interactions in microbes
			Illustrate the significance of enzymes as biocatalysts and immobilized enzymes.
			Identify and explain the basic features of bioreactors
54	18CH E 10	SUGAR TECHNOLOGY (Core Elective IV)	Describe the principles of the various separation procedures involved in the downstream processing of products
			Summarize the principles of Fermentation technology and products from Industrial biotechnology
			Apply Principles and skills of work in sugar cane milling, processing and refining in practical settings.
			Determine the composition of different types of sugars by volumetric and gravimetric methods.

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

			Explain the unit operations for effective processing of cane juice, <u>Batch and continuous methods</u>
			Identify the concepts of quality assurance and control in industry as per <u>Indian regulations and practices</u> .
			Summarize the methods to reclaim by-products.
55	18CH E11	PULP AND PAPER TECHNOLOGY (Core Elective IV)	Design the operation, maintenance and safety aspects for paper making.
			Identify grade paper and boards based on different testing methods.
			Select appropriate bleaching technique for required paper quality.
			Differentiate the important wood and fibre properties that affect paper quality.
			Identify, formulate and solve design problems pertaining to pulp digesters.

SNo	Course		Course Outcomes Statements
	Code	Name	
56	18CH E 12	FOOD TECHNOLOGY (Core Elective IV)	Explain techniques in food processing
			Design process equipment to achieve the desired quality of food.
			Develop novel food processes that have a minimal effect on food quality
			Select control strategies to maintain food quality.
			Apply the scientific method to food science problems
57	18EE0 05	WASTE MANAGEMENT (Open Elective I)	Understand the various processes involved in allied disciplines of engineering
			Infer the regulations of governance in managing the waste
			Distinguish the nature of waste materials concerned to the particular branch of engineering
			Explore the ways and means of disposal of waste material
			Identify the remedies for the disposal of a selected hazardous waste material
58	18ME 004	ENTREPRENEURSHIP (Open Elective I)	Understand the concept and essence of entrepreneurship.
			Identify business opportunities and nature of enterprise.
			Analyze the feasibility of new business plan.
			Apply project management techniques like PERT and CPM for effective planning and execution of Projects
			Use behavioral, leadership and time management aspects in entrepreneurial journey
59	18ME 006	NANO MATERIALS AND TECHNOLOGY (Open Elective I)	Understand the basic concepts, developments and challenges in nanotechnology.
			Describe the methods of evaluating magnetic and electronic properties, microstructure by SPM and atomic force microscopy
			Apply heterogeneous methods and characterization techniques of zero & one dimensional nanostructure
			Evaluate various Nano material fabrication techniques.
			Analyze Nano materials and Nano biomaterials for obtaining solutions to societal problems.



Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

60	18ME 007	INTELLECTUAL PROPERTY RIGHTS (Open Elective I)	Understand the evolution of IP, working of organization's at global level to protect and promote IP
			Familiarize with the patent filing process at national and international level.
			Draw the logical conclusion of research, innovation and patent filing.
			Compare different kinds of IP and their patenting system.
			Understand the techno-legal-business angle of IP, infringement and enforcement mechanisms for protection.
61	18CSO 09	BASICS OF ARTIFICIAL INTELLIGENCE (Open Elective I)	Identify various search strategies to solve problems
			Compare and contrast knowledge representation schemes
			Apply Bayesian Networks and Dempster Shafer theory for reasoning.
			Explain the role of agents and interaction with the environment.
			Determine different learning paradigms
			Explain robotic architectures and expert systems.

SNo	Course		Course Outcomes Statements
	Code	Name	
62	18CH C 21	TRANSPORT PHENOMENA	Develop expressions for velocity, temperature and concentration profiles using shell balances
			Identify analogy between momentum, mass and energy transport
			Formulate and solve one-dimensional transport problems by using the conservation equations
			Apply equations of change to solve flow problems
			Understand transport phenomena in turbulent flows
63	18CH C 22	PROCESS TECHNOLOGY AND ECONOMICS	Explain various sources and processes of manufacture of various industrially important chemicals
			Apply unit operations to draw block diagrams/ process flow diagrams of the processes used for manufacture of industrially important chemicals
			Find out energy sources, requirement of raw materials and operating conditions of petrochemicals
			Outline the application of industry relevant fuels
			Apply various economic equations to evaluate project viability
64	18CH C 23	PROCESS INSTRUMENTATION	Identify instruments required in process industry based on their purpose and function
			Compare the range of operation and working of different temperature measuring instruments
			Interpret the different pressure measuring instruments based on their application
			Select the required flow and level measuring instruments for process industry
			Apply the different methods of composition analysis for industrial analysis
	18CH E 13	MINERAL PROCESSING TECHNOLOGY	Explain the principles governing a range of processes applied in the mineral industry
			Identify typical unit processes and flow-sheets for production of



Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

65		(Core Elective V)	a number of metals
			Apply basic engineering principles to the design of mineral processes
			Develop conceptual designs for simple extraction processes
			Summarize the operation of beneficiation units for coal and mineral
66	18CH E 14	CORROSION ENGINEERING (Core Elective V)	Explain and predict various corrosion mechanism based on the corrosion theories.
			Distinguish and identify various types of corrosion
			Explain and apply corrosion testing methods
			Identify and apply various corrosion prevention techniques
			Apply modern theories and techniques to predict and prevent corrosion
67	18CH E 15	SCALE-UP METHODS (Core Elective V)	Explain principles of scale-up
			Apply dimensional analysis technique for scale up problems
			Deduce the scale up of mixers and heat exchangers
			Outline the scale up of chemical reactors
			Design the distillation columns and packed towers scale up process

SNo	Course		Course Outcomes Statements
	Code	Name	
68	18ME O 11	MODERN MANUFACTURING PROCESSES (Open Elective II)	Understand the opportunities, challenges brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits.
			Apply the concept, architecture and process of digital manufacturing.
			Evaluate real-life scenarios and recommend the appropriate use of 3D printing technology
			Compare various non-traditional machining processes.
			Demonstrate the procedure for the fabrication of micro-Electronic devices.
69	18EE O 02	ENERGY MANAGEMENT SYSTEMS (Open Elective II)	Know the current energy scenario and importance of energy conservation.
			Understand the concepts of energy management.
			Evaluate the performance of existing engineering systems
			Explore the methods of improving energy efficiency in different engineering systems
			Design different energy efficient devices.
70	18ME O 03	RESEARCH METHODOLOGIES (Open Elective II)	Define research problem.
			Review and assess the quality of literature from various sources.
			Understand and develop various research designs.
			Analyze problem by statistical techniques: ANOVA, F-test, Chi-square.
			Improve the style and format of writing a report for technical paper/Journal report.
71	18CE O 02	DISASTER MITIGATION AND MANAGEMENT	Identify and understand the fundamental terminologies in disaster management.
			Distinguish between the Hydro-meteorological disasters and

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

		T (Open Elective-II)	apply the concepts of structural and nonstructural mitigation measures.
			Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.
			Analyze various mechanisms and consequences of human induced disasters.
			Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels.
72	18CS O 10	MACHINE LEARNING USING PYTHON (Open Elective II)	Define the basic concepts related to Python and Machine Learning.
			Apply Python packages for data visualization.
			Text and time series data analysis using NLP toolkit.
			Evaluate and interpret the results of the various machine learning techniques.
			Solve real world problems using deep learning Describe the feature engineering methods, regression techniques and classification methods. framework
73	18CH C 24	PROCESS INSTRUMENTATION AND CONTROL LAB	Evaluate the performance of a U-tube manometer
			Assess the discharge efficiency of an orifice meter
			Analyze step response of simple feedback control systems
			Determine frequency response of control systems
			Analyze the behavior of a control system using different modes of control when subjected to a permanent disturbance
			Apply closed loop and open loop techniques to tune process controllers

SNo	Course		Course Outcomes Statements
	Code	Name	
74	18CH C 25	PROCESS MODELING AND SIMULATION LAB	Develop chemical engineering process models based on fundamental laws of mass and energy transfer
			Dynamically simulate and interpret two heated tanks, using MATLAB
			Dynamically simulate and analyze continuous reactors in Series
			Apply ASPEN software for simulation of batch Distillation using MATLAB
			Adapt ASPEN software to perform steady state simulation of valves
			Utilize ASPEN software to design Plug flow reactor
75	18CH C 26	PROJECT: PART I	Summarize the literature review to identify and formulate engineering problems
			Design the experiments/ process /mathematical model by selecting the engineering tools/components for solving the identified problem
			Develop skills of problem solving, interpreting analysis and evaluation
			Illustrate written and oral communication skills through project report and presentation

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

			Demonstrate the knowledge, skills, attitude and ethics of a professional engineering graduate
			Adapt to the working environment of Industry/Institute by working as a team
76	18CH E 16	CHEMICAL PROCESS SAFETY (Core Elective VI)	Evaluate effect of chemical hazards and risks of toxicants.
			Analyze chemical incidents and possible consequences to plant facilities, workers, and the general public.
			Integrate safety concepts into chemical plant design.
			Analyze fire and explosion hazards.
			Apply ethics during process plant operation
77	18CH E 17	FERTILIZER TECHNOLOGY (Core Elective VI)	Identify the different nutrients and significance of feed stocks for the production of various nitrogenous fertilizers.
			Apply different manufacture methods for various phosphorous fertilizers.
			Explain production methods for potassium and mixed complex fertilizers
			Explain the need, application techniques and uses of new variety of fertilizers.
			Summarize effluent treatment methods and impact of fertilizers on environment.
78	18CH E 18	CHEMICAL PROCESS SYNTHESIS (Core Elective VI)	Analyze alternative processes and equipment
			Synthesize a chemical process flow sheet that would approximate the real process
			Design best process flow sheet for a given product
			Perform economic analysis related to process design
			Evaluate project profitability
79	18 PY O 01	HISTORIES OF SCIENCE AND TECHNOLOGY (Open Elective III)	Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
			Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
			Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
			Make use of the advancements in the field of science and technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems.
			Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.
S No	Course		Course Outcomes Statements
	Code	Name	
80	18ME O 11	MODERN MANUFACTURING PROCESSES (Open Elective II)	Understand the opportunities, challenges brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits.
			Apply the concept, architecture and process of digital manufacturing.
			Evaluate real-life scenarios and recommend the appropriate use of 3D printing technology
			Compare various non-traditional machining processes.
			Demonstrate the procedure for the fabrication of micro-Electronic devices.



Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

81	18EE O 02	ENERGY MANAGEMENT SYSTEMS (Open Elective II)	Know the current energy scenario and importance of energy conservation.
			Understand the concepts of energy management.
			Evaluate the performance of existing engineering systems
			Explore the methods of improving energy efficiency in different engineering systems
			Design different energy efficient devices.
82	18ME O 03	RESEARCH METHODOLOGIES (Open Elective II)	Define research problem.
			Review and assess the quality of literature from various sources.
			Understand and develop various research designs.
			Analyze problem by statistical techniques: ANOVA, F-test, Chi-square.
			Improve the style and format of writing a report for technical paper/Journal report.
83	18CE O 02	DISASTER MITIGATION AND MANAGEMENT (Open Elective-II)	Identify and understand the fundamental terminologies in disaster management.
			Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and nonstructural mitigation measures.
			Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.
			Analyze various mechanisms and consequences of human induced disasters.
			Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels.
84	18CS O 10	MACHINE LEARNING USING PYTHON (Open Elective II)	Define the basic concepts related to Python and Machine Learning.
			Apply Python packages for data visualization.
			Text and time series data analysis using NLP toolkit.
			Evaluate and interpret the results of the various machine learning techniques.
			Solve real world problems using deep learning Describe the feature engineering methods, regression techniques and classification methods. framework
85	18CH C 24	PROCESS INSTRUMENTATION AND CONTROL LAB	Evaluate the performance of a U-tube manometer
			Assess the discharge efficiency of an orifice meter
			Evaluate the performance of a U-tube manometer
			Assess the discharge efficiency of an orifice meter
			Analyze step response of simple feedback control systems
			Determine frequency response of control systems
			Analyze the behaviour of a control system using different modes of control when subjected to a permanent disturbance
			Apply closed loop and open loop techniques to tune process controllers

SNo	Course		Course Outcomes Statements
	Code	Name	
86	18EG O 02	GENDER SENSITIZATION (Open Elective III)	Understand the difference between “Sex” and “Gender” and be able to explain socially constructed theories of identity.
			Recognize shifting definitions of “Man” and “Women” in relation to evolving notions of “Masculinity” and “Femininity”.
			Appreciate women’s contributions to society historically, culturally and politically.
			Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.
			Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.
87	18EG O 01	TECHNICAL WRITING SKILLS (Open Elective III)	Understand the channels of communication and define nature and aspects of Technical communication
			Compare and contrast technical communication to that of general communication while constructing error free sentences applying features of technical writing.
			Analyze data, draw inferences to write Journal articles and conference papers and to compose business letters.
			Evaluate data to draft technical reports and technical proposals
			Design a technical presentation by understanding the nuances of presentation skills and also transfer data from verbal to graphic and vice versa.
88	18CSO 03	IoT AND APPLICATIONS (Open Elective III)	Understand Internet of Things and its hardware and software components.
			Interface I/O devices, sensors & communication module.
			Hypothesizing real time IoT based projects.
			Remotely monitor data and control devices.
			Advance towards research based IoT in the field of biotechnology
89	18CSO 04	BASICS OF DATA SCIENCE USING R (Open Elective III)	Summarize the basics of R and in-built data visualization packages. 2. 3. 4. 5. 6.
			Describe the data analysis using Bayesian and stochastic modeling.
			Relate Gibbs, Z- sampling distributions and compare the binomial, chi-square, wilcoxon and Fisher’s exact tests in hypothesis testing.
			Explore the ANOVA in Regression analysis and classify the multivariate data.
			Experiment with the biological data using R tool and apply clustering algorithms to biological data.
			Identify R commands for data manipulation and database technologies for datasets of bioinformatics
90	18CH C 27	TECHNICAL SEMINAR	Summarize the literature review in order to identify and formulate the engineering problem
			Show preparedness to study independently and apply acquired technical skills to variety of real time problem scenarios
			Develop the required critical thinking ability and analytical skills for evaluation of the selected problem
			Illustrate the written and oral communication skills through a seminar report and presentation
			Demonstrate the required knowledge, skills, attitude and ethics as a professional engineering graduate

Prof & Head M. Mukunda Vani
 Dept. of Chemical Engineering
 Chaitanya Bharathi Institute of Technology
 Gandipet, Hyderabad-75.

			Work in a team by adapting to the working environment
--	--	--	---

SNo	Course		Course Outcomes Statements
	Code	Name	
91	18CH C 28	PROJECT: PART II	Summarize the literature review to identify and formulate engineering problems
			Design the experiments/ process /mathematical model by selecting the engineering tools/components for solving the identified problem
			Develop skills of problem solving, interpreting analysis and Illustrate written and oral communication skills through project report and presentation evaluation
			Demonstrate the knowledge, skills, attitude and ethics of a professional engineering graduate
			Adapt to the working environment of Industry/Institute by working as a team
92	18CH O 01	NUCLEAR ENGINEERING	Identify the radioactive elements as nuclear fuel.
			Illustrate techniques for enrichment of fuel materials.
			Outline properties and irradiation effects on materials for design of cladding and other incore structures.
			Understand concepts of heat removal, control and safety needs
			Summarize safe handling, storage and reprocessing of spent fuel for operation of nuclear reactors.
93	18CH O 02	PAINT TECHNOLOGY	Identify the suitable paints for domestic and industry purpose
			Study more about specific paint manufactures.
			Outline main ingredients of paints, their manufacture and properties.
			Explain the usage of different types of solvents for both industrial paints and domestic paints and also about paint solid structures (Resins).
			Identify the suitable application methods for powder and liquid paints.
94	18CH O 03	PHARMACEUTICAL TECHNOLOGY	Outline the grades of chemicals, identify the Impurities & limit tests.
			Summarize the preparation, tests, properties of Pharmaceuticals & fine Chemicals.
			Develop flow sheets for Manufacturing Pharmaceuticals.
			Develop flow sheets for Manufacturing Chemicals.
			Demonstrate theoretical knowledge about tablet & Capsule making.
			Know various sterilization methods.



Prof & Head M. Mukunda Vani
Dept. of Chemical Engineering
Chaitanya Bharathi Institute of Technology
Gandipet, Hyderabad-75.