Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

Department of Chemical Engineering

VISION

To become an academy of excellence in technical education and human resource development.

MISSION

♣ To develop engineering graduates of high repute with professional ethics.

♣ To excel in academics and research through innovative techniques.

♣ To facilitate the employability, entrepreneurship along with social responsibility.

♣ To collaborate with industries and institutes of national recognition.

♣ To inculcate lifelong learning and respect for the environment.

QUALITY POLICY

To promote excellence in academic and training activities by inspiring students for becoming competent professionals to cater industrial and social needs.

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

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Department of Chemical Engineering

PROGRAM EDUCATIONAL OBJECTIVES

Graduates will be able to,

1. Model and simulate the chemical processes by using advanced software.

2. Do Economic design and demonstrate safety and environmental aspects in chemical processes.
3. Understand the impact of Chemical Engineering solutions within realistic constraints in global and societal context.

PROGRAM OUTCOMES

After completion of the Program, graduates will,

1. Apply knowledge of science, mathematics and engineering fundamentals to the solution of problems of chemical engineering.

2. Identify and integrate the major elements to formulate and solve chemical engineering problems.

3. Design a system, component or process to meet desired objectives within realistic constraints such as economic, environmental, social, political, ethical, manufacturability, sustainability, health and safety aspect

4. Conduct experiments using research based knowledge and research method safely to analyze and interpret data to provide valid conclusions.

5. Create and use the appropriate techniques, resources, modern engineering tools and advanced software's necessary for model prediction and simulation of chemical engineering processes.

6. Apply reasoning informed by contextual knowledge to assess impact of contemporary issues as societal, health, safety, legal, cultural and consequent responsibilities relevant to chemical engineering practices.

7. Understand the impact of engineering solution in a global, economic, environmental, societal context and need for sustainable development.

8. Understand professional ethics, responsibilities and norms of chemical engineering practices.

9. Work effectively as a member in multidisciplinary teams to have better understanding of leadership.

10. Communicate effectively and comprehensively in oral and written form

11. Apply knowledge of chemical engineering and understand management principle to manage projects in multidisciplinary environment.

12. Recognize the need for and have an ability to engage in lifelong learning.

PROGRAM SPECIFIC OUTCOMES

1. Graduates will be able to Model and simulate the chemical processes by using advanced software.

2. Graduates will be able to do Economic design and demonstrate safety and environmental aspects in chemical processes.

3. Graduates will be able to understand the impact of Chemical Engineering solutions within realistic constraints in global and societal context.

BSC-CHE -301 ENGINEERING MATHEMATICS –III

Course Objectives: The objective of the course is to
1. Develop mathematical skills and enhance thinking power of students. 2. Give the knowledge to the students of Linear Differential Equations and its Applications, Laplace transforms, Inverse Laplace Transform, Probability, Numerical Differentiation with an emphasis on the application of solving engineering problems. 3. Prepare students to formulate a mathematical model using Engineering skills & interpret the solution in real world.

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Solve Linear Differential equations with constant coefficient	Understanding
CO2	Make use of Linear Differential Equations to solve the chemical engineering problems.	Application
CO3	Solve basic problems in probability theory, including problems involving the binomial, Poisson, and normal distributions.	Applying
CO4	Solve differential equation Numerically.	Understanding
CO5	Find Laplace transforms of given functions.	Understanding
CO6	Use Laplace transform to solve linear differential equations.	Understanding Application

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1										1			
CO2	2	1										1			
CO3	2	1										1			
CO4	2	1										1			
CO5	2	1										1			
CO6	2	1										1			

BSC-CHE-302 ADVANCED CHEMISTRY

Course Objectives: The objective of the course is to		
1. Provide introduction of solvents in chemical reactions 2. To develop awareness of industrially importance of organic reactions and provide knowledge and concepts of heterocyclic compound. 3. Provide basic understanding of solutions and concentration terms.		
Course Outcomes:		
Cos	**At the end of successful completion of the course the students will be able to**	**Blooms Taxonomy**
CO1	Apply & understand the knowledge of solvents in chemical reactions.	Apply
CO2	Define & apply terms to express concentrations for Nernst and Henry 's law .	Apply
CO3	Describe and explain types of Chemical bonding ,Electrochemistry and terms involved in Surface Chemistry	Understand
CO4	Analyze and understand Reactive Intermediates and Types of Organic Reactions	Analyze
CO5	Explain and classify heterocyclic compounds.	Understand
CO6	Interpret multidisciplinary nature of Biochemistry and Implement Nature bio molecules.	Understand

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2		1										2		
CO2		1										2			
CO3		1										1			
CO4	2														
CO5	2													1	
CO6	3													2	

PCC-CHE-303 MATERIAL SCIENCE & ENGINEERING

Course Objectives: The objective of the course is to		
1. Learning the principles of material testing and imitation and practice apply them to various engineering programs 2. Understand the basics of metal making - separation and manufacture properties and applications 3. Understand the basics of polymers and composites-separation as well their properties and applications.		
Course Outcomes:		
Cos	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	Define Microstructure of the metals with composition	Remember
CO2	Explain the simple phase drawing	Understand
CO3	List the types of failure and explain how you can control them	Apply
CO4	Analyze of stress for cracking	Analyze
CO5	Principles of material testing	Analyze
CO6	Separate the different methods of testing by their machine and their limitations	Evaluate

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1														
CO2											2				1
CO3								2							
CO4									1						
CO5				3											
CO6				1					1						

PCC-CHE-304 FLUID MECHANICS

Course Objectives: The objective of the course is to		
The purpose of this course is to introduce the undergraduate students with the most important Mechanism of Fluid in the process industry and provide proper understanding of Momentum transfer operations.		
Course Outcomes:		
Cos	**At the end of successful completion of the course the students will be able to**	**Blooms Taxonomy**
CO1	Students will learn about Unit systems & Fluid statics with its applications	Remember
CO2	Students will understand the behavior of fluid with Phenomena	Understand
CO3	Student will understand the concept of incompressible fluid, interpret of friction losses.	Apply
CO4	Student will able to recognize the concept of compressible fluid, differentiate the types of flow measuring devices with calculations	Analyze
CO5	Student will able to describe the mechanism of Flow past objects with design parameters.	Understand
CO6	Student will understand the mechanism of Agitation and design calculations.	Understand

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3				1							2			
CO2		1		2											
CO3	1			3											
CO4		3		1						1					1
CO5	1		2											1	
CO6			3											2	

PCC-CHE-305 MECHANICAL OPERATIONS

Course Objectives: The objective of the course is to
1.To develop the fundamental/basics of solid phase. 2.To develop the knowledge of Size reduction of solid and screening of solids. 3.To study the mixing and blending of solid-solid and solid-pastes. 4.To study the filtration and sedimentation for solid-liquid separation. 5.To conceive the different solid-gas separation equipments. 6.To conceive the different liquid-solid and solid-solid separation equipments.

Course Outcomes:

Cos	At the end of successful completion of the course the students will be able to	Blooms Taxonomy
CO1	Learn fundamentals/basics such as characterization of particles	Remember
CO2	Students will be able to understand the basics of size reduction	Understand
CO3	Students will learn basics of mixing and blending and also learn the principles	Remember
CO4	Students will be able to understand the details of filtration and sedimentation	Understand
CO5	Identify industrial applications and principles	Apply
CO6	Identify industrial applications and principles	Apply

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	2	1	1											1
CO2	2	2	1	1											1
CO3	2	1	1	1											1
CO4	2	1	1	1											1
CO5	2	1	1	1											1
CO6	2	1	1	1											1

ESC-CHE-306T COMPUTER PROGRAMMING (C++)

Course Objectives: The objective of the course is to
1.To Understand Introduction to programming languages. 2.To Understand fundamentals of C++ languages. 3.To Understand C++ Programming basics. 4.To Analyze and understand Control Structures. 5.To Apply Arrays and its type. 6.To Analyze and apply Functions.

Course Outcomes:

Cos	At the end of successful completion of the course the students will be able to	Blooms Taxonomy
CO1	Understand Introduction to programming languages.	Understand
CO2	Understand fundamentals of C++ languages.	Understand
CO3	Understand C++ Programming basics.	Understand
CO4	Analyze and understand Control Structures.	Analyze
CO5	Use of Arrays and its types.	Apply
CO6	Analyze and apply Functions.	Analyze

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	2			2									2	
CO2	2	2			2									2	
CO3	2	2			2									2	
CO4	2	2	2	2	2									2	
CO5	2	2	2	2	2									2	
CO6	2	2	2	2	2									2	

CHE 307A AUDIT COURSE-III [ENVIRONMENTAL STUDIES]

Course Objectives: The objective of the course is		
The syllabus of Environmental Studies provides an integrated, quantitative and interdisciplinary approach to the study of environmental systems. The students of Engineering undergoing this course would develop a better understanding of human relationships, perceptions and policies towards the environment and focus on design and technology for improving environmental quality. Their exposure to subjects like understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management and the effects of global climate change, shall help the students to bring a systems approach to the analysis of environmental Problems.		
Course Outcomes:		
COs	**At the end of successful completion of the course, the student will be able to:**	**Bloom's Taxonomy**
CO1	Relate the interdependency of environmental components.	Understand / Apply
CO2	Identify the environmental problems and prevent environmentalpollution	Apply
CO3	Interpret impacts of waste on environmental components.	Analysis
CO4	Analyze environmental change and its social impacts	Analysis

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1								1						
CO2		2							2						
CO3									2						
CO4						1			3						

BSC-CHE-401 APPLIED MATHEMATICS IN CHEMICAL ENGINEERING

Course Objectives: The objective of the course is to

1. Develop mathematical skills and enhance thinking power of students.
2. Give the knowledge to the students of Partial Differential Equations, Partial Differential Equations and its Applications, Numerical Solution of Algebraic and Transcendental Equations, Fourier Series ,Correlation, Regression & Curve Fitting, Numerical solution of First and Higher Order ODEs with an emphasis on the application of solving engineering problems.
3. Prepare students to formulate a mathematical model using Engineering skills & interpret the solution in real world.

Course Outcomes:

Cos	At the end of successful completion of the course the students will be able to	Blooms Taxonomy
CO1	To equip students with the concepts of partial differential equations and how to solve Partial Differential with different methods	Evaluation
CO2	Study physical phenomena using PDE's (in particular using the heat and wave equations).	Application
CO3	Solve System of Algebraic and Transcendental Equations	Understanding
CO4	To represent Periodic Function by using Fourier Series.	Understanding
CO5	Understand the line of best fit as a tool for summarizing a linear relationship.	Understanding
CO6	Work numerically on the ordinary differential equations using different methods.	Understanding

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1										1			
CO2	2	1										1			
CO3	2	1										1			
CO4	2	1										1			
CO5	2	1										1			
CO6	2	1										1			

BSC-CHE-402: ANALYTICAL CHEMISTRY

Course Objectives: The objective of the course is to
1. Provide introduction to analytical procedures, Aspects of analysis, preparation of laboratory samples. 2. To develop awareness of environmental monitoring, water, soil, and air quality and BOD COD determination. 3. Provide basic understanding of Instrumental methods, Molecular spectral methods, Thermal methods chromatographic and other separation methods.

Course Outcomes:

Cos	At the end of successful completion of the course the students will be able to	Blooms Taxonomy
CO1	Apply & understand the knowledge of Analytical procedures. aspects of analysis	Understand
CO2	Define and classify dyes	Analyze
CO3	Describe and explain types polymerization techniques	Understand and apply
CO4	Analyze and understand spectral methods	Understand
CO5	Understand different separation techniques	Understand
CO6	Explain and classify surfactants	Application

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2														
CO2												2			
CO3												2			
CO4	1														
CO5		2													
CO6	1														

PCC-CHE-403 CHEMICAL PROCESS CALCULATIONS

Course Objectives: The objective of the course is to		
1. Perform basic Engg. Calculation 2. Perform Mass balance Calculations on existing processes(Involving single & multiple units) 3. Use basic, applied chemistry/Thermodynamics in material balance calculations 4. Work in team		
Course Outcomes:		
Cos	**At the end of successful completion of the course the students will be able to**	**Blooms Taxonomy**
CO1	Define the basic chemical calculations, conversions and the laws of gases system	Remember
CO2	Explain combustion calculations and reactive, non reactive process	Understand
CO3	Develop material balances on unit operations and processes	Create
CO4	Categorize the bypasses, recycle streams and their importance's	Analyze
CO5	Interpret material balance with and without chemical reactions	Apply
CO6	Formulate simultaneous material and energy balances on various chemical operations	Create

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	2	3	2										1	2
CO2	3	3	3	3										1	2
CO3	3	3	2	2										1	2
CO4	2	2	2	3										1	2
CO5	3	3	3	3										1	2
CO6	3	3	3	3										1	2

PCC-CHE-404 HEAT TRANSFER

Course Objectives: The objective of the course is to		
Introduce the undergraduate students with the most important Heat Transfer in the process industry and provide proper understanding of Heat transfer operations		
Course Outcomes:		
Cos	**At the end of successful completion of the course the students will be able to**	**Blooms Taxonomy**
CO1	Understand conduction, convection & Radiation and solve the problems.	Understand
CO2	Demonstrate steady and unsteady heat conduction in one and three dimension.	Apply
CO3	Apply heat transfer Principles in solving engineering problems that are related to heat transfer.	Apply
CO4	Deal with practical problems in design of heat exchangers, evaporators, packed bed heat exchanger, Boiling & condensation related to chemical processes and perform such calculations manually & by using software.	Analyze
CO5	Analyze the performance of Heat exchange equipments.	Analyze
CO6	Apply heat transfer concepts for application in process safety, biological sciences, energy and environmental sciences.	Apply

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	2	2	1			1				1	1	1		1
CO2	2	2	1	1										1	
CO3	3	2	2	1	1	1		1			1		1		2
CO4	3	3	2		2	1		1				1	2	2	1
CO5		2	3	1	1						2			2	
CO6	2			2		1	2	2			1			2	2

PCC-CHE-405 CHEMICAL ENGINEERING THERMODYNAMICS-I

Course Objectives: The objective of the course is to

1. The students completing this course are expected to understand the nature and role of thermodynamic properties of matter and access thermodynamic property data from appropriated sources.
2. They will recognize and understand the laws and limitation of thermodynamics.
3. They are excepted to understand the behavior of power plants based on Carnot cycle, Rankin cycle and performance of refrigeration and heat pump

Course Outcomes:

Cos	At the end of successful completion of the course the students will be able to	Blooms Taxonomy
CO1	Define & describe the significance of thermodynamic properties of pure fluids & fluids in mixture.	Remember
CO2	Apply the laws of thermodynamics to chemical engineering processes.	Apply
CO3	Analyze & access thermodynamic properties, data from appropriate sources.	Analyze
CO4	Estimate differences in thermodynamic properties using equation of state, charts, tables & computer resources.	Analyze
CO5	Formulate thermodynamic calculations orientated to the analysis and design & efficiency of various energy related chemical processes.	Create
CO6	Interpret thermodynamic data for application in process safety, biological sciences, energy& environmental sciences.	Apply

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	2													
CO2		1	3												
CO3		2		1	3										
CO4				2	3		1						3		
CO5			2		1										1
CO6			1				3				1			2	

ESC-CHE-406P COMPUTING FOR ENGINEERS

Course Objectives: The objective of the course is to		
1. Implement applications of MS OFFICE in field of chemical engineering 2. Get knowledge of variety of sensors which are used in domestic and industrial applications 3. Get awareness of cloud computing and its benefits in chemical engineering field		
Course Outcomes:		
Cos	**At the end of successful completion of the course the students will be able to**	**Blooms Taxonomy**
CO1	To implement applications of MS Office in field of chemical engineering.	Apply
CO2	To get knowledge of variety of sensors which are used in domestic and industrial applications	Understand
CO3	To get awareness of cloud computing and its benefits in chemical engineering field.	Remember

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	2	1		1								2	1	
CO2	2	1	1	1	1								1	1	
CO3	1	1	1		1								2	1	

PCC-CHE-407P FLUID MOVING MACHINERY

Course Objectives: The objective of the course is to		
The student shall be able to understand the fundamental principles, working, performance characteristics and applications of various hydraulic machines like pumps, blowers and compressors.		
Course Outcomes:		
Cos	**At the end of successful completion of the course the students will be able to**	**Blooms Taxonomy**
CO1	To understand basic concepts of pumps and classification of pumps	Understand
CO2	To study performance characteristics liquid flow machineries	Remember
CO3	Explain mathematical calculations of pumps	Understand
CO4	To select appropriate type of pump	Evaluate
CO5	To study performance characteristics of gas flow machineries	Remember

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	2													
CO2		1	1	2											
CO3			3	2	1										
CO4	2	2	1			2									
CO5					1										
CO6			2												

PCC-CHE -501 CHEMICAL REACTION ENGINEERING – I

Course Objectives: The objective of the course is to
1. Write a rate law and define reaction order and activation energy. 2. Demonstrate the ability to quantitatively predict the performance of common chemical reactors using simplified engineering models. 3. Demonstrate the ability to regress the experimental data from which they determine the kinetic model of a multi-reaction system and use this information to design a commercial reactor.

Course Outcomes:

Cos	At the end of successful completion of the course the student will beable to	Blooms Taxonomy
CO1	Ability to size batch reactors, semi batch reactors, CSTRs, PFRs, for isothermal operation given the rate law and feed conditions.	Create
CO2	Ability to define and develop rate equations for homogeneous reactions.	Analyse
CO3	Ability to derive design equations for different types of reactors based on mole and energy balance.	Create
CO4	Ability to relate rate of reaction with design equation for reactor sizing.	Evaluate

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	2	1	2	1	-	-	-	-	2	2	1	1	1	2
CO2	3	2	1	2	1	-	-	-	-	2	2	1	1	1	2
CO3	3	2	1	2	1	-	-	-	-	2	2	1	1	1	2
CO4	3	2	1	2	1	-	-	-	-	2	2	1	1	1	2
CO5															
CO6															

PCC-CHE -502 MASS TRANSFER-I

Course Objectives: The objective of the course is

1. The student completing this course are excepted to understand mass transfer operation with the concept of molecular diffusion, flux rate, theories of mass transfer, mass transfer coefficient, designed for equipment in which two phases are contacted. Application of Navier-Stoke equation in unsteady state convective mass transfer and mass transfer analogy.
2. It gives details about method of conducting mass transfer operation, concepts of driving force, operating line, designing of stages for operations like adsorption, absorption, distillation, extraction, leaching, drying. Also it helps in process design and study of equipment for above mentioned operations. They will understand implication through laboratory experiments performed.

Course Outcomes:

Cos	At the end of successful completion of the course the student will beable to	Blooms Taxonomy
CO1	Define and describe diffusional operation with rate of mass transfer	Remember
CO2	Identify and differentiate various mass transfer operations	Understand
CO3	Use knowledge of mass transfer operations for designing mass transfer coefficient and cascade system	Apply
CO4	Relate mechanism of absorption,adsorption with designing stages and height of packed tower	Analyze
CO5	Select contacting equipment and its design considerations	Evaluate
CO6	Investigate the problems related to mass transfer operations	Create

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	3		3	2										
CO2	1	3	2	3	1										
CO3	2	3	3	3	2						1				
CO4	2	3	3	3	3							1			
CO5	2	3	3	3	3	1	1	1							
CO6	1	2	2	2	2	2	2			1	2	1			

PCC-CHE -503 CHEMICAL ENGINEERING THERMODYNAMICS II

Course Objectives: The objective of the course is to		
This course builds on the preceding course by developing the concept of non-ideal mixing and provides students with the formalism and insights necessary to tackle real industrial problems like liquid-liquid phase splitting, azeotropy, volume change of mixing, heats of mixing etc. Student who have taken this course may be expected to intelligently analyze practically the full spectrum of industrial chemical processes.		
Course Outcomes:		
Cos	**At the end of successful completion of the course the student will beable to**	**Blooms Taxonomy**
CO1	Define and understand the laws associated with ideal and non ideal solutions.	Remembering
CO2	Calculate properties of ideal & real mixtures based on thermodynamics Principles and apply knowledge of problem solving to thermodynamics	Applying
CO3	Explain underlying principles of phase equilibrium in binary Component & multicomponent systems.	Evaluating
CO4	Use activity coefficient models to calculate excess properties of liquids and Thermodynamics aspects of engineering design.	Analyzing
CO5	Estimate equilibrium constant for chemical reactions and criteria for chemical Equilibrium in non-ideal mixtures	Creating
CO6	Understand criteria for phase equilibrium and stability	Understanding

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	3			2										
CO2				2	2		1					2		2	2
CO3	2		1			2									
CO4		2			3								3		
CO5	2							2				1			1
CO6									3			2			

PCE-CHE -504 CHEMICAL EQUIPMENT DESIGN

Course Objectives: The objective of the course is to
1. To introduce the students the Basic concept in design. 2. To introduce the different types of stresses involved, in equipments due to internal and external factors, various types of joints , their fabrication and testing methods. 3. Mechanical design of various types of equipments like pressure vessel, storage vessel,Tall vessel , heat exchanger, evaporator, reaction vessel and their supports.

Course Outcomes:

Cos	At the end of successful completion of the course the student will beable to	Blooms Taxonomy
CO1	Recall their concept in designing the chemical equipments.	Recall
CO2	Interpret causes of failure of chemical equipments.	Interpret
CO3	Model chemical equipments.	Model
CO4	Take part in remedial or preventive measurements to avoid failure of vessel with safe design guidelines.	Take part
CO5	Evaluate and apply their ideas on dimensional analysis to explore the optimum design variables.	Evaluate
CO6	Test the process equipment with prier safety.	Test

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1	2			1					1	1			
CO2	2	1	1	2	1	2	1				1	2	1		
CO3	3		3	2	3	1		1	3	3	2		3	3	
CO4	2		3	1	1	3	1	1	2	2	1	2			3
CO5	2	3	2	2	3	2	2	1	1	3	2	2	1		3
CO6			3	3	2	1	1	1	2	2	1	3		3	

OEC-CHE- 505 APPLICATIONS OF MATLAB

Course Objectives: The objective of the course is to		
1.To familiarize the student in introducing and exploring MATLAB software. 2.To enable the student on how to approach for solving Engineering problems using simulation tools. 3.To prepare the students to use MATLAB in their project works.		
Course Outcomes:		
Cos	**At the end of successful completion of the course the student will beable to**	**Blooms Taxonomy**
CO1	Able to express programming & simulation for engineering problems.	Understand
CO2	Able to find importance of this software for Lab Experimentation.	Remember
CO3	Able to write basic Chemical Engineering problems in Matlab & to use in research by simulation work.	Apply
CO4	Able to connect programming files with GUI Simulink.	Understand

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1		2	2	2	2								2		
CO2		2	2	2	2								2	2	
CO3	2	2	2	2	2								2	2	
CO4			2	2	2										

OEC-CHE- 505 ADVANCED INDUSTRIAL SOFTWARE'S

Course Objectives: The objective of the course is to

1. Emphasize the basic concepts of simulation.
2. Impart the knowledge and awareness to understand the validity and physicochemical interpretation of thermodynamic models and their limitations
3. Develop the skills for plant simulation and optimization, solve chemical engineering problems encountered in chemical industries using professional software's.

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	To remember and understand basic concepts of simulation.	Remembering Understanding
CO2	Understand and apply open source simulation software DWSIM.	Understanding Application
CO3	To remember and analyse the distillation column using Chemsep.	Remembering Analyzing
CO4	To understand basic concepts of Scilab.	Understanding
CO5	To understand basic concepts of SCADA.	Understanding
CO6	Understand and apply the CHEMCAD software for process simulation.	Understanding Application

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1	1	1	1	1							1			
CO2	1	1	1	1	3							2			
CO3	1	1	1	1	3							2			
CO4	1	1	1	1	3							2			
CO5	1	1	1	1	3							2			
CO6	1	1	1	1	3							2			

MP-CHE -506T MINI PROJECT WORK

Course Objectives: The objective of the course is to
1. Development of ability to define and design the problem and lead to its accomplishment properly. 2. Planning: Learn behavioral science by working in a group. 3. To develop student's abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Mini Project.
Course Outcomes:

Cos	At the end of successful completion of the course the student will beable to	Bloom's Taxonomy
CO1	Understand, plan and execute a Mini Project with a team.	Understand
CO2	Implement basic engineering knowledge.	Apply
CO3	Prepare a technical report based on the Mini project.	Analyze
CO4	Deliver technical seminar based on the Mini Project work carried out.	Evaluate

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1									3		2				
CO2	1														
CO3															
CO4															

PCC-CHE-601 PROCESS PLANT UTILITIES

Course Objectives: The objective of the course is to
1. Understand the principles of air, water, steam as plant utilities. 2. Interpret & formulate the Boiler classification and thermal efficiency calculation as design aspects in industries. 3. Principle of compressed & instrumental air, fire with industrial safety.

Course Outcomes:

Cos	At the end of successful completion of the course the student will beable to	Bloom's Taxonomy
CO1	Chemistry of water, color codes and process steam as utilities.	Recall
CO2	Different treatments to boilers feed water in process industries.	Understand
CO3	The type of boilers, Indian boiler act.	Understand
CO4	Interpret & formulate the thermal efficiency calculation of boilers as design aspects in industries.	Analyze & Evaluate
CO5	Principle & working of the compressed, instrumental air in process industries.	Understand
CO6	Causes of Fire & protective measurements in industry.	Apply

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2														
CO2											3				
CO3							2								
CO4									2						
CO5			1												
CO6									1						

PCC-CHE -602 MASS TRANSFER-II

Course Objectives: The objective of the course is
The student completing this course are excepted to understand mechanism of distillation,extraction,leaching,drying,crystallization For designing of equipment in which two phases are contacted.where themodynamic equilibrium,operating line,determination of stages,energy balance,heat requirement calculations are studied. Also it helps in process design and study of equipment for above mentioned operations. They will understand implication through laboratory experiments performed.

Course Outcomes:

Cos	At the end of successful completion of the course the student will beable to	Blooms Taxonomy
CO1	Define and describe mass transfer operations with rate of mass transfer	Remember
CO2	Identify and differentiate various mass transfer operations for selection	Understand
CO3	Use knowledge of mass transfer operations for designing contacting equipment with optimizing parameter	Apply
CO4	Relate mechanism of distillation,extraction,leaching,drying,crystallization with designing stages and height of packed tower	Analyze
CO5	Select the specific operation contacting equipment and its design considerations	Evaluate
CO6	Investigate the problems related to mass transfer operations	Create

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	3		3	2										
CO2	1	3	2	3	1										
CO3	2	3	3	3	2						1				
CO4	2	3	3	3	3							1			
CO5	2	3	3	3	3	1	1	1							
CO6	1	2	2	2	2	2	2			1	2	×			

PCC-CHE -603 PROCESS DYNAMICS & CONTROL

Course Objectives: The objective of the course is to		
Process control plays a very critical role in the context of actual operation of a chemical plant. Most of the core chemical engineering courses focus on the steady state operation. In the real life environment, process is continuously subjected to various disturbances which deviates the operation from the designed steady state. This course specifically prepares students to assess the impact of such disturbances and equip them with the tools available with the chemical engineer to tackle these situations.		
Course Outcomes:		
Cos	**At the end of successful completion of the course the student will beable to**	**Blooms Taxonomy**
CO1	remember Laplace transform and to understand and model the dynamicbehavior of chemical processes based on their time domain, Laplace domain	Remember
CO2	understand basic fundamentals of first and second order process dynamics and its behavior	Understanding
CO3	know about applying fundamental knowledge to design controllers and the control system, the operation of P, I, D and PID controllers and to tune them.	Applying
CO4	evaluate different parameters affecting on the overall transfer function and response of process control system.	Evaluating
CO5	understand stability characteristics for design of process control systems & analyze the frequency response of the control system	Analyzing
CO6	develop the practical skill, team work and ethical thinking to choose right career in allied industries or higher studies	Creating

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3			2	2										
CO2	2	3			1										
CO3	2	2			3								3		
CO4	1			3											2
CO5	1					2	1								
CO6								3	2			2		2	

PCC-CHE -604 CHEMICAL REACTION ENGINEERING – II

Course Objectives: The objective of the course is to

1.The course focuses on non-deal flow and finding of conversion in actual reactors from experiment and different models for finding non ideality in reactors.
2.The course focuses on mixing of fluids, macro fluid concepts and Turbulent Mixing with chemical reaction in stirred tanks.
3.The course develops understanding of heterogeneous solid catalyst, iotherms, different industrial terms related to solid catalyst & finding different characteristics of solid catalysts with its recent trends.
4.The course develops understandings & designing of fluid particle reactions with different models for it.
5.The course describes understanding & designing of fluid-fluid reaction and applications of fluid-fluid reactions rate equation to equipment design.
6.The course covers concept, parameters, mechanisms, applications of catalyst with different catalytic reactors and deactivating catalyst & also describe design. Scale up in reactor.

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Apply knowledge of non-ideal flow and will find conversion in actual reactors from experiment and different models for finding non ideality in reactors.	Apply
CO2	Express basic concepts of mixing of fluids, macro fluid and Turbulent mixing with chemical reaction in Stirred Tanks.	Understand, Analyse
CO3	Express working of catalyst & understand industrial terms related to solid catalyst & find different characteristics of solid catalyst with its recent trends.	Understand, Analyse
CO4	Explain underline principles, understanding & designing of fluid particle reactions with different models for it.	Create
CO5	Understand fluid-fluid reaction, its design and applications of fluid-fluid reactions rate equation to equipment design.	Create
CO6	Explain underline basic concepts, important parameters. Mechanism, applications of catalyst with different catalytic reactors and deactivating catalyst & also described scale up in reactor recent.	Evaluate

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	2	1	2	1	-	-	-	-	2	2	1	1	1	2
CO2	3	2	2	3	1	-	-	-	-	2	2	1	1	1	2
CO3	3	2	1	3	2	-	-	-	-	2	2	1	1	1	2
CO4	3	3	3	1	2	-	-	-	-	2	2	1	1	1	2
CO5	3	3	2	3	2	-	-	1	-	2	2	1	1	1	2
CO6	3	2	3	3	2	-	-	1	-	2	2	1	1	1	2

OEC-CHE -605 INDUSTRIAL ECONOMICS, MANAGEMENT AND ENTREPRENEURSHIP

Course Objectives:		
1. To understand economical aspects in chemical industry. 2. To understand and introduce general common terms related to economics, management and entrepreneurship. 3. To make students to develop skills required for entrepreneurshipdevelopment and leadership.		
Course Outcomes:		
Cos	**At the end of successful completion of the course the student will beable to**	**Blooms Taxonomy**
CO1	Define basic models of behavior of firms and industrial organizations.	Define
CO2	Demonstrate the basic models of industrial economics.	Demonstrate
CO3	Solve analytical problems relating to industrial economics.	Solve
CO4	Analyze the models to important policy areas and under the limitations of different behavioral theories.	Analyze
CO5	Compare the effective utilization of resource materials and chemical processes.	Compare
CO6	Modify the present industrial economics, management status and forecast it with the improved feature.	Modify

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	3	1	2			1					1	1			
CO2	2	1	1	2	1	2	1				1	2			
CO3	3		3	2	3	1		1	3	3	2		1		
CO4	2		3	1	1	3	1	1	2	2	1	2			
CO5	2	3	2	2	3	2	2	1	1	3	2	2		2	
CO6			3	3	2	1	1	1	2	2	1	3			

OEC-CHE -605 PROJECT MANAGEMENT AND SMART TECHNOLOGY

Course Objectives: The objective of the course is to
1. To understand basic concepts project management and application of PM to process industries 2. To understand project feasibility reports and learn about various clearances required to start an industry 3. To learn various project organizations and basics of contracting 4. To learn various tools and techniques used in PM.

Course Outcomes:

Cos	At the end of successful completion of the course the student will beable to	Blooms Taxonomy
CO1	Concepts and knowledge of project management to manage projects inprocess industries	Knowledge
CO2	Prepare feasibility reports.	Prepare
CO3	Understand various clearances required to start industry	Understand
CO4	Prepare project organization charts and contracts	Prepare
CO5	Prepare contracts	Prepare
CO6	Use tools of PM to solve problems	Use

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1					1				1		2	1		1	
CO2					1				1		2	1		1	
CO3					1				1		2	1		1	
CO4					1				1		2	1		1	
CO5					1				1		2	1		1	
CO6					1				1		2	1		1	

ESC-CHE-606 P PROCESS SIMULATION LABORATORY

Course Objectives: The objective of the course is to

1. Introduce the students the Basic concept in Material and Energy Balance.
2. Introduce the different techniques to find optimum pipe diameter
3. Determine the Optimum Insulation thickness for Heat Exchangers & Determination of Optimum Reflux

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Implement basic engineering knowledge to solve problems	
CO2	Understand ,Plan and Execute a chemical processes problems	
CO3	write algorithm for the processs problems	
CO4	Use commercial simulation tool like MATLAB,Scilab,Chemsep to solve chemical engg. problems	

Mapping of POs & COs:

	PO1	PO22	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	2	1	2	2	1									2	2
CO2	3	2	1	1	1								2		
CO3	2	2	2	2	3										
CO4	1	1	2	1	2										1

CHE -607 P INDUSTRIAL PRACTICES AND CASE STUDIES

Course Objectives: The objective of the course is to		
1. Minimize the gap between Institute and Industry 2. Introduce and evaluate the student knowledge during interaction with the industrial culture 3. Make aware the students the importance of communication and safety procedures in the industry		
Course Outcomes:		
Cos	**At the end of successful completion of the course the student will beable to**	**Blooms Taxonomy**
CO1	Understand the difference between class room explanations and real life professional culture.	Understand
CO2	Describe various organizations involved in the chemical industrylike Design , Research , Processing , Production, Market and Demand.	Describe
CO3	Opportunities for Employment and Self-Employment in thechemical sector after graduation.	Opportunities
CO4	Acquire through P & ID"s basic information of sources of rawmaterials, products , by- products of production activities andwhere they can be used.	Acquire
CO5	Understand how industrial establishments are administered.	Understand
CO6	Know the Battery limits, Offsite facilities and the Overall Safety procedures.	Know

Mapping of POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1	1					1		1				3			
CO2	1	1		2	1	1		1	2		2	2	2		
CO3								2	1	2		3			1
CO4	2	1	1	2	1	3			2	2	1	1	1	1	
CO5							1	3	3	3	3	3			
CO6	1		2			2	2					1		2	