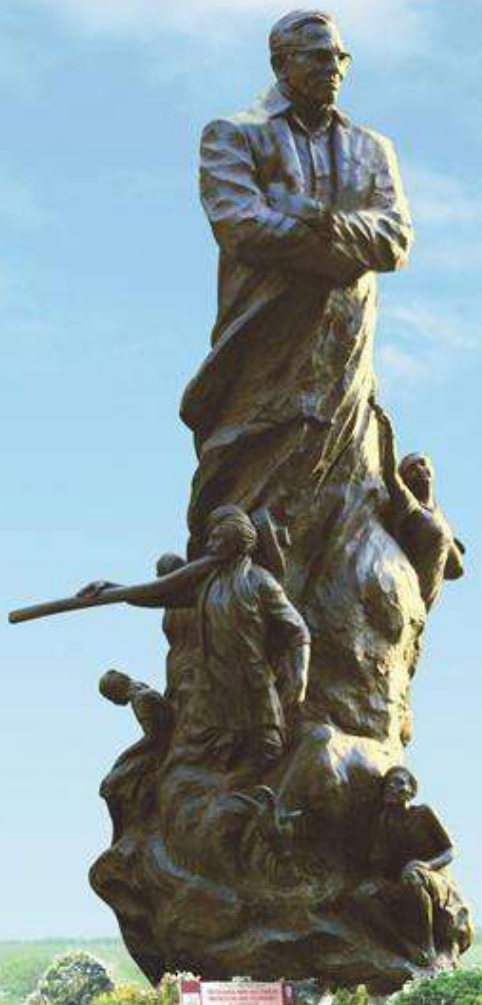
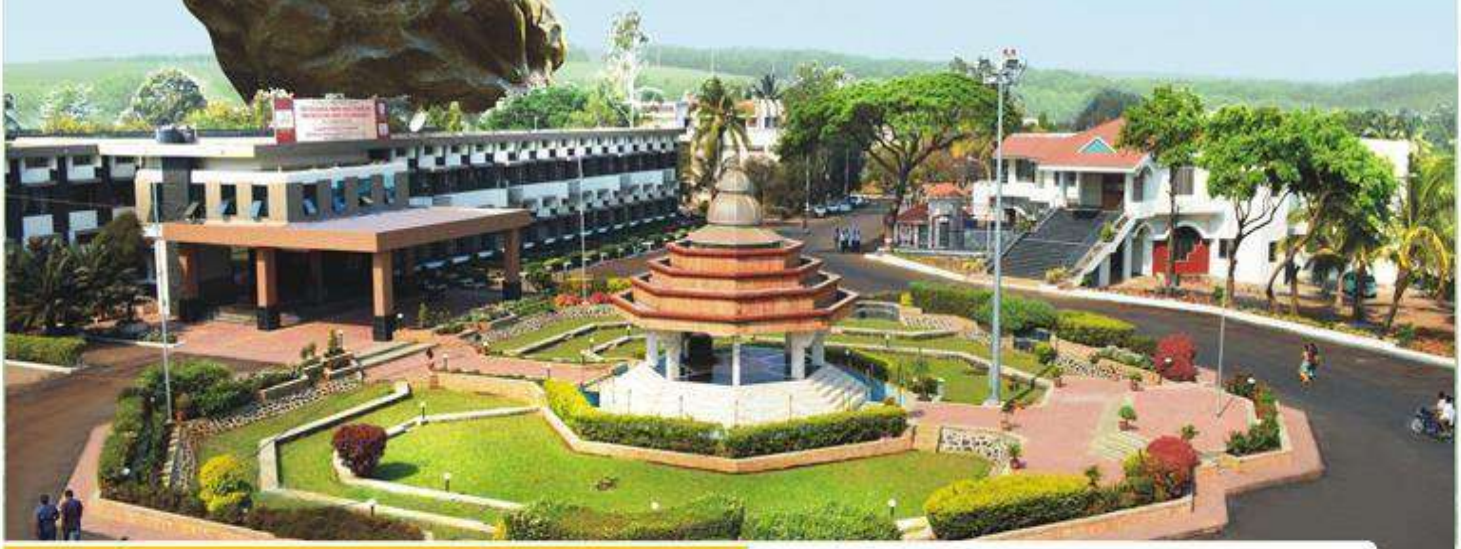
(An Autonomous Institute)
Shree Warana Vibhag Shikshan Mandal's
Tatyasaheb Kore Institute of Engineering And Technology, Warananagar
NBA Accredited Institute

Department of Chemical Engineering



S. Y. B. Tech. Chemical Engineering 2024-25



S. Y. B. Tech. In Chemical Engineering

Structure and Syllabus under Autonomy as per the NEP Policy 2020

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

Department of Chemical Engineering

❖ **Vision of the Department–**

To be a recognized program of chemical engineering with quality education, innovation and skill sets for meeting the needs of Industry and Society.

❖ **Mission of the Department –**

M1. To uphold the Chemical Engineering professional standards, with sound skills and ethical values.

M2. To facilitate all round development for boosting the abilities in internship, service sector, higher studies and entrepreneurship.

M3. To establish strong linkage and partnership with industry as well as research institutes of National repute to promote research activities.

M4. To provide technical education through innovative applications to rural fields.

M5. To enhance lifelong learning in chemical engineering with due respect to safety, environment and society.

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

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.

Tatyasaheb Kore Institute of Engineering and Technology * Department of Chemical Engineering * Warananagar - ESTD - 1983 * Autonomous Institute

SWVSM'S

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

An Autonomous Institute

Abbreviations

Sr.No.	Acronym	Definition
1	ISE	In-Semester Examination
2	ISE-I	In-Semester Examination-I
3	ISE-II	In-Semester Examination-II
4	ESE	End Semester Examination
5	ISA	In-Semester Assessment (Term Work)
6	L	Lecture
7	T	Tutorial
8	P	Practical
9	CH	Contact Hours
10	C	Credit

Course/ Subject Categories

Sr. No.	Acronym	Definition
1	PCC	Professional Core Course
2	MDM	Multidisciplinary Minor
3	OE	Open Electives
4	HSSM	Humanities Social Science and Mgmt
5	ELC	Experiential Learning Courses
6	VSEC	Vocational and Skill Enhancement Course
7	AEC	Ability Enhancement Course

Course/ Subject Code

Year of Syllabus Change at F. Y. B. Tech.	UG/PG	Subject Category with number	Space	Branch	Semester	Course Number		Theory/ Lab /POE/ Tutorial
23	**UG**	**PCC**	**-**	**CH**	**3**	**0**	**1**	See Guideline

Course Term work and POE Code

CH	3	0	1	T/P / A
Branch Code	Semester	Course Number		T- Term work P- POE A- Audit Course

Second Year B. Tech. In Chemical Engineering

Structure and Syllabus
under
Autonomy as per the NEP Policy 2020

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

Second Year B. Tech. (Chemical Engineering)

Semester-III

((To be implemented from 2024 - 25)

Credit Scheme as per NEP Policy

S. Y. B. Tech. Chemical Engineering Sem -III

Sr. No.	Category	Sub Category	Course Code	Name of Course	Teaching Scheme			C	CH	Examination & Evaluation Scheme			
					L	T	P			Component	Marks	Min for Passing	
1	Programme Course	PCC	23UGPCC-CH301	Fluid Mechanics	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
2		PCC	23UGPCC-CH302	Mechanical Operations	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
3		PCC	23UGPCC-CH303	Mathematics for Chemical Engineers	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
4		PCC	23UGPCC-CH304	Industrial Chemistry	2*	--	--	1	2	ESE	60	24	40
										ISE	40	16	
5		PCC	23UGPCC-CH305	Computer Techniques in Chemical Engineering	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
6	Multi-Disciplinary Courses	MDM	23UGMDM1-CH306T	Material Science Engg.	1	1	--	2	2	ISA	50	20	20
7	Humanities Social Science and Management	Entrepreneurship/Economics/ Management Courses	23UGEEC1-CH3071L	Leadership & Management	2	--	--	2	2	ISA	25	10	10
8		Value Education Course (VEC)	23UGVEC1-CH3081T	Personal Values and Ethics	1	1	--	2	2	ISA	25	10	10
9	Experiential Learning Courses	Comm. Engg. Project (CEP)/Field Project (FP)	23UGCCP-CH309T	Community Connected Project	1	1	--	2	2	ISA	25	10	10
10	Programme Course	PCC	23UGPCC-CH301LP	Fluid Mechanics Lab	--	--	2	1	2	ISA	25	10	20
										POE	25	10	
11		PCC	23UGPCC-CH302LP	Mechanical Operation Lab	--	--	2	1	2	ISA	25	10	20
										POE	25	10	
12		PCC	23UGPCC-CH304LP	Industrial Chemistry Lab	--	--	2	1	2	ISA	25	10	20
										POE	25	10	
13		PCC	23UGPCC-CH305T	Computer Techniques in Chemical Engineering Lab	--	--	2	1	2	ISA	25	10	10
					19	**3**	**8**	**21**	**30**		**800**	**320**	**320**

Note: In theory examination, there will be separate passing of ESE and ISE.

*** Additional contact hours are provided for the courses without any credit**

For Material Science And Engg. course demonstration of the experiments based on course shall be conducted during tutorial hrs.

Tatyasaheb Kore Institute of Engineering and Technology, Warananagar

Second Year B. Tech. (Chemical Engineering)

Semester-IV

((To be implemented from 2024 - 25)

Credit Scheme as per NEP Policy

S. Y. B. Tech. Chemical Engineering Sem - IV

Sr. No.	Category	Sub Category	Course Code	Name of Course	Teaching Scheme			C	CH	Examination & Evaluation Scheme			
					L	T	P			Component	Marks	Min for Passing	
1	Programme Course	PCC	23UGPCC-CH401	Heat Transfer	3*	--	--	1	3	ESE	60	24	40
										ISE	40	16	
2		PCC	23UGPCC-CH402	Chemical Process Calculations	3*	--	--	1	3	ESE	60	24	40
										ISE	40	16	
3		PCC	23UGPCC-CH403	Chemical Engineering Thermodynamics–I	3*	--	--	2	3	ESE	60	24	40
										ISE	40	16	
4		PCC	23UGPCC-CH404	Process Instrumentation and Instrumental Methods of Analysis	2*	--	--	1	2	ESE	60	24	40
										ISE	40	16	
5	Multidisciplinary Courses	MDM	23UGMDM2-CH405T	Corrosion Engineering	1	1	--	2	2	ISA	50	20	20
6		OE	23UGOE1-CH4061	Green Technology	3	--	--	3	3	ESE	60	24	40
										ISE	40	16	
7	Skill Courses	Vocational and Skill Enhancement Course (VSEC)	23UGVSEC1-CH407LP	Fluid Moving Machinery Lab	1	--	2	2	3	ISA	25	10	20
										POE	25	10	
8	Humanities Social Science and Management	Ability Enhancement Course	23UGAEC1-CH4081T	Modern Indian Language	1	1	--	2	2	ISA	25	10	10
		Entrepreneurship/Economics/ Management Courses	23UGEEC2-CH4091L	Human Resource Management	2	--	--	2	2	ISA	25	10	10
9		Value Education Course (VEC)	23UGVEC2-CH4101L	Ethics and Moral Philosophy	2	--	--	2	2	ISA	25	10	10
10	Programme Course	PCC	23UGPCC-CH401LP	Heat Transfer Lab	--	--	2	1	2	ISA	25	10	20
										POE	25	10	
11		PCC	23UGPCC-CH404LP	Process Instrumentation and Instrumental Methods of Analysis Lab	--	--	2	1	2	ISA	25	10	20
										POE	25	10	
12		PCC	23UGPCC-CH402T	Chemical Process Calculations	--	1	--	1	1	ISA	25	10	10
13	Audit Course	A	23UG-CH411A	Audit Course – (Environmental studies)	--	--	--	--	--	--	--	--	--
					21	2	6	21	30		800	320	320

* Additional contact hours are provided for the courses without any credit

Humanities Social Science and Management (HSSM) Course Basket Sem –III			
Entrepreneurship / Economics Course (EEC-1)			
Category	**Sub Category**	**Course Code**	**Name of Course**
Humanities Social Science and Management	**EEC - 1**	23UGEEC1-CH3071L	Leadership & Management
		23UGEEC1-CH3072L	Entrepreneurship
		23UGEEC1-CH3073L	Project Management
Value Education Course (VEC-1)			
Category	**Sub Category**	**Course Code**	**Name of Course**
Humanities Social Science and Management	**VEC-1**	23UGVEC1-CH3081T	Personal Values and Ethics
		23UGVEC1-CH3082T	Respect and Empathy
		23UGVEC1-CH3083T	Leadership and Ethical Decision Making

Humanities Social Science and Management (HSSM) Course Basket Sem – IV			
Ability Enhancement Course (AEC-1)			
Category	**Sub Category**	**Course Code**	**Name of Course**
Humanities Social Science and Management	**AEC -1**	23UGAEC1-CH4081T	Hindi
		23UGAEC1-CH4082T	Marathi
		23UGAEC1-CH4083T	Gujarati
Entrepreneurship / Economics Course (EEC-2)			
Category	**Sub Category**	**Course Code**	**Name of Course**
Humanities Social Science and Management	**EEC - 2**	23UGEEC2-CH4091L	Human Resource Management
		23UGEEC2-CH4092L	Event Management
		23UGEEC2-CH4093L	Plumbing and Electrical Skill
Value Education Course (VEC-2)			
Category	**Sub Category**	**Course Code**	**Name of Course**
Humanities Social Science and Management	**VEC-2**	23UGVEC2-CH4101L	Ethics and Moral Philosophy
		23UGVEC2-CH4102L	Social Responsibility and Citizenship
		23UGVEC2-CH4103L	Values in Education Policies and Practice

Multidisciplinary Minor (MDM) Courses Basket
Branch: Chemical Engineering

Piping Engineering

Sr. No	Semester	Course Code	Category	Name of Course	Teaching Scheme			C	CH	Examination & Evaluation Scheme			
					L	T	P			Component	Marks	Min for Passing	
1	III	23UGMDM1-CH306T	MDM - 1	Material Science Engg.	1	1	--	2	2	ISA	50	20	20
2	IV	23UGMDM2-CH405T	MDM –2	Corrosion Engg.	1	1	--	2	2	ISA	50	20	20
3	V	23UGMDM3-CH505	MDM –3	Pipe Basic & Revision	4	--	--	4	4	ESE	60	24	24
										ISE	40	16	16
4	VI	23UGMDM4-CHE606L	MDM –4	Piping Material	2	--	--	2	2	ISA	50	20	20
5	VII	23UGMDM5-CH705L	MDM –5	Piping System Design & Layout	2	--	--	2	2	ISA	50	20	20
6	VIII	23UGMDM6-CH804L	MDM –6	Piping Insulation	2	--	--	2	2	ISA	50	20	20
					11	**2**	**--**	**14**	**14**		**350**	**150**	**150**

Second Year B. Tech. (Chemical Engineering)

Third Semester Detailed Syllabus

23UGPCC-CH301 FLUID MECHANICS

Teaching Scheme			Evaluation Scheme		
Lectures	:	3* hrs per week	**ISE**	:	40 Marks.
Credits	:	2	**ESE**	:	60 Marks.
Practicals	:	2 hrs /Batch/Week	**ISA**	:	25 Marks.
Credits	:	1	**POE**	:	25 Marks.
Total Credits	:	3	**Total Marks**	:	150 Marks.

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

Description:

This is one of the most important and fundamental course which deals with fluid behavior in static as well in dynamic phase. The study of all governing laws of fluid flow, flow meters, calculation of friction factor and pressure drop withrespect to varying process parameters is included in this course.

Prerequisites	1:	Basic Physics
	2:	Basic Science

Section – I		
Unit 1	**Unit Systems:**	
	Unit systems: Physical quantities, S.I., CGS, FPS Engg. units, Conversion of Units, Units and Equations, dimensional analysis, Application of dimensional analysis, Problems. Fluid statics and its applications: Nature of fluids, Hydrostatic equilibrium, Barometric equation, Hydrostatic equilibrium in centrifugal field, Manometers, Example, U tube	**6 Hrs**
Unit 2	**Fluid Flow Phenomena :**	
	Fluid flow phenomena : Behavior of flowing fluid, Types of flow, Newtonian and non-Newtonian Fluids, viscosity and momentum flux, viscosities of gases and liquids, Turbulence, Reynolds experiment, Flow in boundary layers, Laminar and Turbulent flow in Boundary layers, Boundary layer formation in straight tubes, Boundary layer separation and wake formation Basic equations of fluids flow : Mass balance, mass velocity, momentum balance, Bernoulli's equation without and with friction, kinetic energy correction factor, correction for fluid friction, Pump Bernoulli's equation , Euler's equation, Problems	**7 Hrs**
Unit 3	**Flow of Incompressible Fluids in Conduits and Thin Layers**	
	Flow of incompressible fluids in conduits and thin layers: Shear stress distribution in a cylindrical tube, relation between skin friction and wall shear, the friction factor. Relations between skin friction parameters. Laminar flow in pipes, Laminar flow of Newtonian fluids. Average velocity, kinetic energy correction factor (Derivation), Momentum correction factor (Derivation), Hagen-Poiseullies equation. Turbulent flow in pipes and closed channels. Velocity distribution for turbulent flow, Relations between maximum and average velocities, Effect of roughness, The friction factor chart (Moody's diagram), friction factor in flow through channels of non-circular section, friction from changes in velocity or direction, Effect of fittings and valves, Flow through annuals, Problems.	**7 Hrs**
Section – II		
Unit 4	**Flow of Compressible Fluids:**	
	Flow of compressible fluids: Mach number, continuity equation, Total energy Balance, velocity of sound, ideal gas equations. **Metering of fluids:** Measurement of flowing fluids. Venturimeter, orificemeter, Pitot tube, rotameter, turbine meters, positive displacement meters, magnetic meters: ultrasonic	**6 Hrs**
Unit 5	**Flow Past Immersed Bodies:**	
	Flow past immersed bodies : Drag coefficients of typical shapes, form drag and streamlining, Friction in flow through beds of solids, Erguns equation, Kozeny- Carman equation, Burke Plummer equation, Fluidization, Mechanism of fluidization, minimum fluidization velocity, expansion of -fluidized beds, application of fluidization.	**7 Hrs**
Unit 6	**Agitation of Fluids:**	
	Agitation of fluids: Agitation of liquids, Agitation equipment, flow patterns in agitated vessels, circulation rates, Flow numbers, power consumption, power correlations, power correlations for specific impellers, effect of system geometry and calculations for power	**7 Hrs**

PRACTICALS:

1. Reynold's experiment.
2. Orifice meter.
3. Venturimeter
4. Bernoulli's experiment
5. Flow through annular pipe
6. Flowthrough pipe & pipe fittings.
7. Flow through helical coils
8. Flow through spiral coils
9. Flow through Packed Column
10. Demonstration of – a) Rotameter b) Pitot tube

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											1
CO4		3		1						1				1	
CO5	1		2											2	
CO6			3												

References:

Text Books	
1	Mc Cabe W.L. and Smith J.C. 'Unit operations of Chemical Engg.' VII ed. Mcgraw Hill Book Co., International ed. 1993
Reference Books	
1	Steeter U.L, 'Fluid Mechanics' V ed. Mc graw Hill Book Co., International Edn.1971.
2	Richardson J.E. and Coulson J.M. Chemical Engg. 3rd ed. Vol. 1 Pergamon Press1985.
3	Miohell B.I. Fluid and Particle Mechanics Pergamon Press 1970.
4	Gupta S.K., Momemtum Transfer Operations, Tata McGraw Hill, 1979.
Web Links/ Video Lectures	
1	

23UGPCC-CH302 MECHANICAL OPERATIONS

Teaching Scheme			Evaluation Scheme		
Lectures	:	3* hrs per week	**ISE**	:	40 Marks.
Credits	:	2	**ESE**	:	60 Marks.
Practicals	:	2 hrs /Batch/Week	**ISA**	:	25 Marks.
Credits	:	1	**POE**	:	25 Marks.
Total Credits	:	3	**Total Marks**	:	150 Marks.

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

Description:

This course aims to impart fundamental knowledge of Mechanical unit operations course which provides fundamentals of particles. This course focuses on characteristics, properties, storage and settling of solids. Corse provides knowledgeof separation of solid-solid, solid-liquid and solid-gas

Prerequisites	1:	Basic science courses

	Section – I	
Unit 1	**Properties and Handling of Particulate Solids** Particle characterization, Particle size measuring technologies, Particle size distribution, Mean particle size, Mixed particle sizes and shape, Storage of solids (Bulk and Bin), Angleof repose and angle of friction, Introduction to conveying of solids.	**4 Hrs**
Unit 2	**Size reductions and Screening** Mechanism of size reduction, Energy for size reduction, Crushing laws, Methods of operating crushers, Classification of size reduction equipments, Types of crushing equipment, Factors affecting comminution. Screening: Standard test screens, Standards ofscreen, Screen effectiveness, Comparison of ideal and actual screens, Industrial screening equipment	**12 Hrs**
Unit 3	**Mixing of Solids** The degree of mixing, Rate of mixing, Criteria for mixer effectiveness, Solid-liquid mixing, Solid-Solid mixing.	**4 Hrs**
	Section – II	
Unit 4	**Filtration and Sedimentation** Classification of filtration, Types of filtration, Pressure drop through filter cake, Filter medium resistance, Sp. cake resistance, Washing of cake, Filter media and selection, Compressible filter cakes, , Filtration equipment, Filter press, Vacuum filters, Centrifugal filtration and Filtration calculations, Strainers. Sedimentation: Basic principles, Thickeners, Batch sedimentation test.	**9 Hrs**
Unit 5	**Gas Cleaning** Introduction, Gas cleaning equipment, Gravity separators, Centrifugal separators, Momentum separators, Electrostatic precipitators, Fabric filters, Indusrial applications ofeach equipment	**3 Hrs**
Unit 6	**Benefaction Process in Chemical Engineering** Jig classification, Heavy medium Separation Wilfiley table.	**4 Hrs**

PRACTICALS:

1. Sieve Analysis
2. Screen Effectiveness
3. Jaw Crusher
4. Ball Mill
5. Batch Sedimentation
6. Beaker Decantation
7. Filter Press
8. Leaf Filter
9. Cyclone Separator

Demonstration of following equipment and include in journal

1. Riffled Table
2. Mineral Jig
3. Forth Flotation

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

References:

Text Books	
1	Warren McCabe, Julian Smith, Peter Harriott • Unit Operations of Chemical Engg. 7 th edition, Mcgraw Hill International., 2005,
2	C.M.Narayanan, B.C.Bhattacharyya, Mechanical Operations for Chemical Engineers, Computer AidedAnalysis, Khanna Publishers.New DELHI
3	J.F.Richardson & J.H.Harker with J.R.Backhurst, coulson & Richardson's, Chemical Engineering, vol 2,1st ed., Pergamon Press.
Reference Books	
1	G.C.Sekhar, unit Operations in Chemical Engineering, Pearson education (Singarore) Pte. Ltd
Web Links/ Video Lectures	
1	

23UGPCC-CH303 MATHEMATICS FOR CHEMICAL ENGINEERS

Teaching Scheme			Evaluation Scheme		
Lectures	:	3 hrs per week	**ISE**	:	40 Marks (Duration 1 Hr)
Credits	:	2	**ESE**	:	60 Marks (2.50 Hrs)
Tutorial	:	NA	**ISA**	:	NA
Credits	:	NA	**POE**	:	NA
Total Credits	:	2	**Total Marks**	:	100

Course Objectives: The objective of the course is to

- Develop mathematical skills and enhance thinking power of students.
- Give the knowledge to the students of Linear Differential Equations and its Applications, Laplace transforms, Inverse Laplace Transform ,Probability Distribution, Regression & Curve Fitting Partial Differential equations with an emphasis on the application of solving engineering problems.
- 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	Find Laplace transforms of given functions.	Understanding
CO3	Use Laplace transform to solve linear differential equations.	Understanding Application
CO4	Solve basic problems in probability theory, including problems Involving the binomial, Poisson and normal distributions.	Applying
CO5	Understand the line of best fit as a tool for summarizing a linear relationship	Understanding
CO6	To equip students with the concepts of partial differential equations and how to solve Partial Differential with different methods	Evaluation

Description:

Engineering Mathematics course is offered as the basic science course. This course contains Mathematical methods and techniques that are typically used in engineering to solve engineering problems. This course has six units namely i) Linear Differential Equations(LDE), ii)Laplace Transform iii) Inverse Laplace Transform and its Applications, iv) Probability Distribution
v) Regression & Curve Fitting vi) Partial Differential equations.

Prerequisites:	1:	Trigonometric identities and Logarithmic identities
	2:	Differentiation and integration formulae
	3:	Basic knowledge of probability.

	Section – I	
Unit 1	**Linear Differential Equations:** 1.1 Linear Differential equations with constant coefficients. 1.2 Rules to find complementary function. 1.3 Methods to find particular Integral(e^{ax},$sinax$or$cosax$,x^m,$e^{ax}x^m$, $e^{ax}sinax$ or $e^{ax}cosax$) 1.4 Chemical reactions and solutions (mixture problems).	**7 Hrs**
Unit 2	**Laplace Transform:** 2.1 Laplace transform of elementary functions 2.2 Properties of Laplace transforms 2.2.1 Linearity Property 2.2.2 First Shifting property 2.2.3 Change of scale property 2.3 Laplace transforms of derivatives and integral. 2.4 Multiplication by t^n and division by t 2.5 Evaluation of integrals by Laplace transform.	**7 Hrs**
Unit 3	**Inverse Laplace Transform and its Applications:** 3.1 Definition and important formulae 3.2 First shifting property 3.3 Inverse Laplace transform by method of partial fraction 3.4 Convolution theorem (without proof) 3.5 Inverse Laplace transform of derivatives 3.6 Solution of Linear differential equation with constant coefficients using Laplace transform	**7 Hrs**
	Section – II	
Unit 4	**Probability Distribution:** 4.1 Random variables. 4.2 Discrete Probability distribution. 4.3 Continuous probability distribution. 4.4 Binomial Distribution. 4.5 Poisson Distribution. 4.6 Normal Distribution	**7Hrs**
Unit 5	**Regression & Curve Fitting:** 5.1 Introduction. 5.2 Lines of regression of bivariate data. 5.3 Fitting of Curves by method of Least-squares: 5.3.1 Fitting of Straight lines. 5.3.2 Fitting of exponential curves. 5.3.3 Fitting of second degree Parabolic curves.	**7 Hrs**
Unit 6	**Partial Differential Equations:** 6.1 Formation of partial differential equation. 6.2 Lagrange's method to solve first order linear partial differential equations 6.3. Standard method to solve first order non-linear partial differential equations of the 6.3.1 Form I f(p,q)=0 6.3.2 form II f(z,p,q)=0 6.3.3 form III f(x,p)=g(y,q) 6.3.4 Clairauts form z= px + qy + f(p,q)	**7 Hrs**

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			

References:

Text Books	
1	Higher Engineering Mathematics, Dr. B. S. Grewal, S. Chand and Company, 40th Edition.
Reference Books	
1	Advanced Engineering Mathematics", H. K. Das, S. Chand Publication, 8th Edition.
2	A Text Book of Applied Mathematics",Vol. I and II, P. N.Wartikar and J. N. Wartikar, Vidyarthi Griha Prakashan, Pune.
3	A textbook of Engineering Mathematics, N. P. Bali, Iyengar, Laxmi Publications (P) Ltd, New Delhi
4	Advanced Engineering Mathematics, Erwin Kreyszig, Wiley India Pvt. Ltd

23UGPCC-CH304 Industrial Chemistry

Course Details					
Teaching Scheme			**Evaluation Scheme**		
Lectures	:	03 Hrs per week	**ISE**	:	40 Marks
Credits	:	01	**ESE**	:	60 Marks
Practicals	:	02 Hrs / Batch / Week	**ISA**	:	25 Marks
Credits	:	01	**POE**	:	25 Marks
Total Credits	:	02	**Total Marks**	:	150 Marks

Course Objectives: The objective of the course is to

- Provide introduction of solvents in chemical reactions.
- To develop awareness of industrially importance of organic reactions and provide knowledge and concepts of heterocyclic compound.
- 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** the knowledge of solvents in chemical reactions.	Apply
CO2	**Solve** organic reactions by using reactive intermediates.	Apply
CO3	**Illustrate** terms to express concentrations for Nernst and Henry's law.	Understand
CO4	**Explain** heterocyclic compounds.	Apply
CO5	**Explain** dyes for industrial applications.	Understand
CO6	**Use** appropriate soaps and detergents.	Apply

Description:

This course aims to impart fundamental knowledge of Solvents and solutions, and applied knowledge of dyes, analysis of chemical compounds, types of organic reactions and reactive intermediates, and functions of various soaps and detergents. Students will be expected to communicate knowledge with society and industry.

Prerequisites:	1.	Students should have knowledge about basic chemistry related to reaction mechanism and solvents and solutions.
	2.	Periodic table physical and chemical properties of elements
	3.	Knowledge about compounds used in industry.

Section – I		
Unit 01	**Solvents:** Introduction, Importance of solvents in chemical reactions, Water as universal solvent, Classification of solvents, characteristic properties of solvents - (Melting Point, Boiling Point, Heat of fusion) and vaporization, Dielectric constant, Study of few important non aqueous solvents such as Liquid NH_3, with respect to solvent characters and reactions.	04 Hrs
Unit 02	**Organic Reactions & Reactive Intermediates** Types of Organic Reactions: Addition, Substitution, Elimination, Rearrangement. Reactive Intermediates: Carbocation, Carbanion, - formation, structure & stability. Reactions involving formation of reaction intermediates: Carbocation : Friedal Craft's reactions. Carbanion : Aldol condensation reaction.	05 Hrs
Unit 03	**Solution:** Definition, types, ways of expressing concentration (Normality, Molarity, Molality), Numericals. Solutions of gasses in liquid, Henry's law, Nernst distribution law- statement, explanation, limitations and applications, Numericals.	05 Hrs
Section – II		
Unit 04	**Chemistry of Heterocycles** Introduction, Classification of Heterocycles, Synthesis, properties and uses of - Five Membered Heterocycles: Pyrrole Six Membered Heterocycles: Pyridine Condensed Heterocycles: Quinoline	04 Hrs
Unit 05	**Chemistry of Dyes** Introduction, Qualities of good dye, Witt's Theory i.e. Chromosphere- Auxochrome Theory, Classification of dyes based upon structure & methods of application, Diazotization and coupling for azo dyes, Synthesis and applications of dyes like Methyl orange, Malachite green.	05 Hrs
Unit 06	**Chemistry of Surfactants** Introduction of surfactants, Soaps: Types of Soaps, Structure of Soap molecule, Saponification and its value, Manufacture of soap by Modern process, Detergents: Types, Properties and applications, Cleansing action of detergents, Comparison of Soaps and detergents, synthesis of anionic detergents (DDBS).	05 Hrs

Practicals

Number	Practical/ Experiment/Tutorial Topic	Hrs.
(A)	Physical Experiments	
1	To determine partition coefficient of Benzoic acid in benzene and water.	02 Hrs
2	To determine molecular conditions of iodine in Carbon tetrachloride and water.	02 Hrs
(B)	Organic Spotting: (Minimum Four) compounds with one must be liquid) Identification of organic compounds such as	
3	Acidic (Anyone) Benzoic Acid, Salicylic acid, Oxalic acid, Acetic acid	02 Hrs
4	Phenolic (Anyone) a-Naphthol, p-Naphthol, Phenol	02 Hrs
5	Basic (Any one) o/m/p-nitroaniline, Aniline	02 Hrs
6	Neutral (Any two) Ethanol, Acetone, Acetamide, Benzamide, Acetanilide, Glucose, Naphthalene	02 Hrs
(C)	Iznorganic Quantitative Analysis	
7	Determination of Percentage purity of FAS (Internal Indicator method)	02 Hrs
8	Determination of % purity of H_2S0_4, NaOH, NH_3.	02 Hrs
(D)	Instrumental Analysis	
9	Estimation of Iron by colorimetric method	02 Hrs
10	Estimation of Nickel by colorimetric method	02 Hrs
(E)	Organic Estimations	
11	Estimation of Phenol	02 Hrs
12	Estimation of Aniline	02 Hrs
13	Estimation of Commercial Oxalic Acid	02 Hrs
14	Estimation of Acetone	02 Hrs
(F)	Organic Preparations	
15	Preparation of Aspirin from Salicylic acid	02 Hrs
16	Preparation of Phthalic anhydride from Phthalic acid	02 Hrs

**Suggested list of practicals is given in the above table. Students need to perform minimum 10 practicals to fulfill the ISA evaluation.*

	Text Books
1.	Text book of physical chemistry - Gladstone (Macmillan India Ltd.-I995)
2.	Basic Inorganic Chemistry by Cotton & Wilkinson, John Wiley & sons
	Reference Books
1.	Selected Topics in Inorganic Chemistry by Wahid Malik, G.D.Tuli and R.D. Madan, S. Chand & company, New Delhi
2.	Concise Inorganic Chemistry by 1. D. Lee, ELB
3.	Inorganic Chemistry - A. I. Vogel
4.	Organic chemistry - Volume 1&11-Finar & Finar (English language book society- 1989)
5.	Organic chemistry -- Fieser & Fieser
6.	Organic chemistry -- Bhal & Bhal(S. Chand -2000)
7.	Organic chemistry -- P.L. Soni (S. Chand -1994)
8.	Organic reactions and mechanism - Pitter Sykes (Orient Longman-I 986)
	Physical chemistry -- Puri & Sharma (Shobanlal Nagin Chand - 2005)
	Essentials of Physical chemistry -- Bhal & Tuli (S. Chand & Co. - 2005)
	Principles of Physical chemistry-- Prutton & Maron (oxford & IBH Publishing
	Reference Books for Practicals
1.	Practical organic chemistry -- A. I. Vogel (CBS-1987)
2.	Laboratory experiments for General, Organic and biochemistry 4th Edition, Bettelheim & Lanesberg
3.	Experiments in applied chemistry -Sunita Rattan (S. K. Kataria & Sons- 2002)
	Vogel's Textbook of Quantitative chemical analysis, 5th edition

References:

Web Links/ Video Lectures are to be provided to Theory and· Practical / Experiments, Lectures:

Experiment name-

1. Determination of Viscosity (Lab Name- Viscosity virtual lab)
http://vlab.amrita.edu/?sub=2&brch= 190&sim=339&cnt= 1

2. Experiment name- Water Analysis-Physical Parameter (Lab Name-Inorganic Chemistry virtual lab)
http://vlab.amrita.edul?sub=2&brch=193&sim=575&cnt=1

3. Experiment name-Water Analysis-Chemical Parameter(Lab Name- Inorganic Chemistry virtual lab)
http://vlab.amrita.edul?sub=2&brch= 193&sim= 1548&cnt= 1

4. Experiment name- Acid Base Titration (Lab Name- Inorganic Chemistry virtuallab) .
http://vlab.amrita.edul?sub=2&brch= 193&sim=352&cnt= 1

5. Experiment name- Soil Analysis (Lab Name- Inorganic Chemistry virtual lab)
http://vlab.amrita.edul?sub=2&brch= 193&sim= 1549&cnt= 1

6. Experiment name- Alloy Analysis (Brass) (Lab Name - Inorganic Chem istry virtual lab)
http://vlab.amrita.edul?sub=2&brch= 193&sim= 1255&cnt= I

7. Experiment name - Spectrophotometry (Physical Chemistry virtuallab)
http://vlab.amrita.edul?sub=2&brch=190&sim=338&cnt=1

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	

23UGPCC-CH305 Computer Techniques in Chemical Engineering

Teaching Scheme			Evaluation Scheme		
Lectures	:	3* hrs per week	**ISE**	:	40 Marks
Credits	:	2	**ESE**	:	60 Marks
Practical	:	2 hrs per week	**ISA**	:	25 Marks
Credits	:	1	**POE**	:	-
Total Credits	:	3	**Total Marks**	:	125 Marks

Course Objectives: The objective of the course is to

1.To Understand Introduction to programming languages.
2.To Understand C++ Programming basics.
3.To Analyze and understand Control Structures.
4. To Apply Arrays and Structure.
5. To Analyze and apply Functions.
6. To Understand Object Oriented Programming

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Bloom's Taxonomy
CO1	Understand programming languages and Able to solve engineering problems..	Understand
CO2	Understand C++ Programming basics.	Understand
CO3	Analyze and understand Control Structures.	Analyze an understand
CO4	Apply Arrays and Structure.	Apply
CO5	Analyze and apply Functions.	Analyze an apply
CO6	Understand Object Oriented Programming and Able to solve engineering problems.	Understand

Description:

The course contains basics of C++ programming and application of programming to solve chemical engineering problems.

Prerequisites:		
	1:	Basics of Engineering Chemistry and Engineering Physics
	2:	Engineering Mathematics

Section – I		
Unit 1	**Introduction to C++:** Development of Computer Languages, Translators ,Types of Programs, History of C++, Fundamentals of C++ C++ Character set, Identifiers & keywords, Data types in C++, Constants, Variables, Different Statements, Programs based on Engineering Applications.	**6 Hrs.**
Unit 2	**C++ Programming basics:** Operators in C++ and Types, Input Output Statements, Manipulator Functions and Programs, Programs based on Engineering Applications.	**6 Hrs.**
Unit 3	**Control Structures:** Introduction to Control Structures, Conditional Statements, Loop Statements, Break Statements, Programs based on Chemical Engineering Applications.	**6 Hrs.**
Section – II		
Unit 4	**Arrays and Structure:** Array declarations, passing array to functions, Sorting array, Multidimensional arrays, Programs based on Engineering Applications. Structure: Introduction, Structure declaration, Initialization of Structure, Introduction of Unions, Programs based on Engineering Applications.	**8 Hrs.**
Unit 5	**Functions:** Introduction, Function definition, Types of Functions, Function Prototypes, Header File, Storage Classes, Scope rules. Recursive Functions, Unary Scope resolution Operator, Programs based on Engineering Applications.	**6 Hrs.**
Unit 6	**Object Oriented Programming:** Object Oriented Programming: Introduction to OOP, OOP Characteristics of C++, Classes and Objects, definition, Programs based on Engineering Applications.	**4 Hrs.**

List of Practicals:- (Any 10)

1. Program to find circumference & area of circle,

Program to find no. of months & days

Program to convert degree Fahrenheit to degree Celsius

2. Program to find circumference & area of circle,

Program to find no. of months & days

Program to convert degree Fahrenheit to degree Celsius

3. Program to find circumference & area of circle,

Program to find no. of months & days

Program to convert degree Fahrenheit to degree Celsius

4. Program of based on different manipulator function, (setbase, setprecision, setfill, setw),

5. Program to sum of digits of five digit number,

Program to reverse five digit no

6. Program to calculate roots of quadratic equation,

Program of swap two no. taking third variable,

7. Program of find square of no,

Program to calculate square & square root of given 'n 'numbers

8. Program of Fibonacci No,

Program based on addition and Product of given matrices

9. Calculation of Reynolds number, Calculation of pressure drop, Calculation vapor pressure(using functions)

10. Calculation of friction factor, Calculation flow rates and average velocity in pipes.(using functions)

11. Estimation of average molecular weight & density of gaseous mixture of n Components(using class and objects)

12. Calculation of heat transfer area of heat exchanger for different flow patterns.

Calculation of specific heat of flue gas containing n component gasses (using class and objects)

Mapping of POs & CO

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

References:

	Text Books
1	R.J.Micheli, "C++ Object Oriented Programming", McMillan London 1993
2	Numerical Methods in Engineering - B. S. Grewal
	Reference Books
1	E.Balguruswamy, "Object Oriented Programming in C++", Tata McGraw Hill Publishing Company Ltd. New Delhi 1995
2	H.M Deitel and P.J.Deitel, "C++ how to program" .2nd Edition, Prentice hall, New Jersey, 1998.

23UGMDM1- CH306T Material Science Engineering

Teaching Scheme			Evaluation Scheme		
Lectures	:	1 hrs per week	**ISE**	:	--
Credits	:	1	**ESE**	:	--
Tutorial	:	1 hrs per Batch	**ISA**	:	50 Marks
Credits	:	1	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	50 Marks

Course Objectives: The objective of the course is to

- Learning the principles of material science engineering, imitation and practice apply.
- Understand the basics of manufacture properties and applications.
- Understand the basics of metals, ceramics, polymers and composites as well their properties and applications.

Course Outcomes:

	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Relation between material science and engineering.	Recall
CO2	Calcification of engineering materials.	Understand
CO3	Fundamentals of Phase diagram for the composites.	Applying
CO4	Properties of engineering material	Understand
CO5	Analysis and calculations for stresses	Analyze
CO6	Morphological study of different metals.	Evaluate

Course Contents		
Unit No:1	Fundamentals of Material Science and Engineering: Effect of structure on properties, Process-Structure-Properties-Performance relationship, Selection of material criterions.	**3 hrs**
Unit No:2	Engineering Materials: Classification of metal, ceramic and polymer materials, Phase diagrams of steel, brass, cuprous-nickel, composites material and its applications.	**4 hrs**
Unit No:3	Direct and bending stresses: Introduction, Direct and eccentric loading, limits of eccentricity, core of section for rectangular, circular, section, wind pressure problems on core of the section and stress developed at four corners of section due to eccentric loading, Problems based on direct and eccentric loading.	**4 hrs**
Unit No:4	Failure of material: Introduction, Crystal defects, plastic deformation. Types of mechanical failure, fracture, fatigue and creep, Problems based on deformation of material.	**4 hrs**

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												2			
CO3															
CO4									2						
CO5					2										
CO6					1										

Text Books	
1	The Essence of Materials for Engineers, Robert W. Messler, Jr.
2	Materials Science and Engineering, Raghavan V
Reference Books	
1	Materials Science and Engineering, Van Vlack L.H.
2	Engineering Materials and Applications, Flin R.A., Trojan P.K.
3	Coulson & Richardson 'Chemical Engineering', Volume VI, Pergamen Press .
4	Bhattacharya B.C., 'Selection of materials and fabrication for Chemical Process Equipment, Chemical Engg.', Educational Development Centre, IIT Madras

23UGEEC1-CH3071L Leadership and Management

Teaching Scheme			Evaluation Scheme		
Lectures	:	2 hr per week	ISE	:	--
Credits	:	2	ESE	:	--
Practical	:	-	ISA	:	25 Marks
Credits	:	-	POE	:	--
Total Credits	:	2	Total Marks	:	25 Marks

Course Objectives: The objective of the course is to

1. Understand the roles of managers and historical evolution of various approaches to the study of management
2. Demonstrate the process of planning which can be used as a tool for decision-making in organizations
3. Understand foundational theories and models of leadership.
4. Develop skills in communication, decision-making, and conflict resolution

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Comprehend the principles of management theory	Recall
CO2	Demonstrate the importance of key performance areas in strategic management & decision-making process	Understand
CO3	Students will enhance their ability to communicate effectively as leaders, adapting their communication style to different audiences and situations.	Understand

Description:

Unit 1	**Organization and Management**: Basic concepts of management, Characteristics of management, classification, objectives, Functions of management-planning, organizing, staffing, Organization Structure-linear, Types of organization, functional, line and staff.	6
Unit 2	**Human Resource Management:** Acquisition of manpower-functions and objectives of personnel management, manpower planning, Job analysis and evaluation, Induction, Orientation, Training and development,	6
Unit 3	**Materials management** Purchasing, make or buy decision, stores management, inventory control, spare parts management. **Understanding Leadership:** Meaning, Nature and Scope of Leadership, Functions of Leadership, Principles of Leadership, Styles of Leadership, Factors affecting Leadership,	8
Unit 4	**Skills Development** Need and Importance of Leadership , Communication and interpersonal skills, Qualities of a good leader, Essentials of Effective Leadership Skills **Essentials of Effective Leadership Skills:** Personality, Strategic Planning, Time Management, Team work and Risk Taking. Differences between manager and a leader	8

Mapping of Pos & Cos

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

References:

Text Books	
1	T R Banga S C Sharma Industrial Organization and Engineering Economics Khanna Publications 24th Edition ISBN No. 81-7409-078-9
2	S. Sinek, Start With Why: How Great Leaders Inspire Everyone to Take Actions. Portfolio.
Reference Books	
1	J Wooden. Wooden on Leadership. McGraw-Hill.

23UGEEC1-CH3072 ENTREPRENEURSHIP DEVELOPMENT

Teaching Scheme			Evaluation Scheme		
Lectures	:	2 hr per week	ISE	:	--
Credits	:	2	ESE	:	--
Practical	:	-	ISA	:	25 Marks
Credits	:	-	POE	:	--
Total Credits	:	2	Total Marks	:	25 Marks

Unit	Content	Duration
1	INTRODUCTION: The Entrepreneur: General concept and definition , classification of entrepreneur and Characteristics of entrepreneur	6
2	Institutions supporting business enterprises: Central level institutions - NBMSME, KVIC, The coir board, NSIC, NSTEDB, NPC, EDI, NRDCI, National entrepreneurship Development Institutes. State level Institutions - State Directorate of Industries & Commerce, DIC, SFC, SIDC, SIADB. Other institutions : NABARD, HUDCO, TCO, SIDBI, Business incubators	6
3	Project Planning and Feasibility Studies: The Concept of Project, Project Life Cycle - Project Planning, Feasibility – Project proposal & report preparation	6
4	MSMEs& New Venture Creation: Concept of MSME, Role & Importance of MSMEs, Growth & development of MSMEs in India, Current schemes for MSMEs, Business opportunities in India, Contents of business plans, presenting a business plan	6

Text Books :

The Dynamics of Entrepreneurial Development and Management, Vasanth Desai, Himalaya.

Entrepreneurship Development & Small Business Enterprises – Second Edition, Poornima M. Charantimath , Pearson

23UGEEC1-CH3073 Project Management

Teaching Scheme			Evaluation Scheme		
Lectures	:	2 hr per week	**ISE**	:	--
Credits	:	2	**ESE**	:	--
Practical	:	-	**ISA**	:	25 Marks
Credits	:	-	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	25 Marks

Unit	Content	Duration
1	INTRODUCTION: Characteristics of a project types of projects, Project Management Body of Knowledge (PMBOK), role of project manager and his qualities, project organization and benefits	5
2	PROJECT PLANNING: Customer needs, stake holder concept, project scope, feasibility study and report, baseline plan, SWOT analysis, project organization structure and hierarchy, project teams, formation, attitude and aptitude	5
3	STRUCTURE: Project selection methods, break even analysis, DCF methods, project implementation, estimation	5
4	PROCUREMENT: Vendor selection methods, supply chains, quality, quality circles, quality control and quality assurance, cause and effect analysis, ISO and concepts of total quality management and six sigma,	5
5	Project control Project scope, project change request, and control of schedule, resources, cost and quality, project communications, channels, means, meetings, project reports,	4

Books

1. Kamaraju Ramakrishna, "Essentials of Project Management", PHI Learning, NewDelhi,2010
2. Chitkara, "Construction Project Management", Tata McGraw-Hill, New Delhi.
3. Harold Kerzner,"Project Management", Wiley, NewYork

23UGVEC1-CH3081T Personal Values and Ethics

Teaching Scheme			Evaluation Scheme		
Lectures	:	1 hr per week	**ISE**	:	--
Credits	:	1	**ESE**	:	--
Tutorial	:	1	**ISA**	:	25 Marks
Credits	:	1	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	25 Marks

Course Objectives: The objective of the course is to

1. Development of a positive character, empathetic human being, responsible citizen, a compassionate and empathetic being.
2. Introducing the professional ethics and its implementation in professional work.
3. To understand and follow the ethical practices in engineering.

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Define morals, values also demonstrate respecting others and developing civic virtue describe commitment, describe how to live peacefully.	Recall
CO2	Inculcating a positive work culture respecting professional ethics and describe various theories of professional ethics.	Understand
CO3	Developing a sense of right and wrong leading to practical ethical behavior and summarize ethical responsibilities of the engineers.	Understand

Description:

This course explores the integration of values in engineering practices. It covers theoretical foundations, policy analysis, and practical applications in professional carrier. Students will critically examine how values influence professional decisions and outcomes, and develop strategies to implement value-driven carrier.

Unit 1	**Introduction to Value Education:** Right Understanding; Relationship and Physical Facility; Understanding Value Education; Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity –the Basic Human Aspiration-Current Scenario and Method to Fulfill the Basic Human Aspirations.
Unit 2	**Introduction to Professional Ethics**: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.
Unit 3	**Professional Practices in Engineering:** Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers – The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walkaway Collapse.

References:

Text Books	
1	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi,2004.
2	Professional Ethics: R. Subramanian, Oxford University Press, 2015.
3	Ethics in Engineering Practice & Research, Caroline Whitbeck, 2nd edition, Cambridge University Press 2015.
4	Human Values and Professional ethics, Jayashree Suresh, B.S. Raghavan, S. Chand Publications, 3rd revised edition 2009.
Reference Books	
1	Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4th edition, Cengage learning, 2015.
2	Business Ethics concepts & Cases: Manuel G Velasquez, 6th edition, PHI, 2008.

23UGVEC1-CH3082T Leadership & Ethical Decision Making

Teaching Scheme			Evaluation Scheme		
Lectures	:	1hrperweek	**ISE**	:	--
Credits	:	1	**ESE**	:	--
Tutorial	:	1 hr per week	**ISA**	:	25 Marks
Credits	:	1	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	25 Marks

Course Objectives: The objective of the course is to

1. Understand what comprises ethical decision making is crucial to today's leaders as both corporate and individual responsibility takes centre-stage in the public eye.
2. Take effective and ethical decisions, corporate leaders must understand the systems in which they lead and how they delimit the possibilities for decision-making.
3. Provide value to its stakeholders is the starting point for ethical considerations.
4. Make Ethical decisions in the context of the personal values individuals bring to their leadership styles.
5. Build moduleon the leadership skills already developed in the core module and helps students recognize how their personal moral approaches effect and determine leadership approaches when confronted with ethical dilemmas.
6. Identify this module as key component to explorecase studies and examples of real-world ethical dilemmas.

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Identify and evaluate the main approaches to philosophical ethics	Evaluate
CO2	Articulate and discuss examples of contemporary cross-cultural issues involved in ethical decision-making	Articulate
CO3	Identify the ethical elements of complex business and management situations and analyze these from a variety of approaches	Identify
CO4	Apply knowledge and understanding of ethical decision-making to complex business situations.	Apply
CO5	Critical self-reflect on leadership style in own practice, with justification of his/her reflective process through examples of ethical dilemmas or decision-making	Justify
CO6	Skills to work in effective groups work towards defined outcomes, making appropriate use of the capacities of the group members	Effective

	Description:
	This module prepares students for strategic leadership and transformational roles in organizations. Understanding what comprises ethical decision making is crucial to today's leaders as both corporate and individual responsibility takes center-stage in the public eye. To take effective and ethical decisions, corporate leaders must understand the systems in which they lead and how they delimit the possibilities for decision-making. The purpose of the corporation as an entity which exists to provide value to its stakeholders is the starting point for ethical considerations. This module explores who these stakeholders may be and what role the corporation plays with these various groups and in society in general in a variety of national and cultural contexts. Ethical decisions are made in the context of the personal values individuals bring to their leadership styles. This module builds on the leadership skills already developed in the core module and helps students recognize how their personal moral approaches effect and determine leadership approaches when confronted with ethical dilemmas.

Units		
Unit 1	**Leadership and the importance of ethical decision-making:** What is ethical decision-making? Why is ethical leadership important? Ethical Leadership Definition, Principles & Examples, The traits of an ethical leader, Emotional intelligence and ethical leadership, Tips for leaders who want to make sure their decision-making processes are ethical, The relationship between leadership style and ethical decision-making, How leaders can embed ethical decision-making into organisational cultures, Build a reputation for ethical leadership.	**6 hrs**
Unit 2	**The Decision-Making Process:6 hours** Ethical Decision Making, **Individual Factors**: Moral Philosophies and Values, **Organizational Factors:**The Role of Ethical Culture and Relationships	**6 hrs**

TextBooks	
1	Johnson, Craig E (2013). Meeting the Ethical Challenges of Leadership 5th edition. Sage.
2	Ferrell, O. C., John Fraedrich (2014) Business Ethics: Ethical Decision Making & Cases 10th edition. Cengage.
3	Ethical Leadership: In Pursuit of the Common Good Bill Grace, William J. Grace · 1998
ReferenceBooks and Important Hyperlinks	
1	The Practice of Ethical Leadership: Insights from Psychology Claas Florian Engelke, Richard B. Swegan · 2024
2	A Practical Guide to Ethics: Living and Leading with IntegrityRita Manning, Scott R. Stroud · 2018
3	Reference Document Link (For Practical Purposes): Click here to access Document 1 Click here to access Document 2 Click here to access Document 3

Comm. Engineering Project (CEP)/ Field Project (FP)

23UGCCP-CH309T Community Connected Project

Teaching Scheme			Evaluation Scheme		
Lectures	:	1 hr per week	**ISE**	:	--
Credits	:	1	**ESE**	:	--
Practical/Tutorial	:	1 hr per week	**ISA**	:	25 Marks
Credits	:	1	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	25 Marks

Course Objectives: The objective of the course is:

1. To sensitize the students to the living conditions of the people who are around them.
2. To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability.
3. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
4. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
5. To help students to initiate developmental activities in the community in coordination with public and government authorities.
6. To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Communicate and connect to the surrounding.	Communicate
CO2	Create a responsible connection with the society.	Create
CO3	Involve in the community in general in which they work.	Involve
CO4	Notice the needs and problems of the community and involve them in problem – solving.	Notice
CO5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.	Develop
CO6	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.	Acquire

Description:

The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellow human beings, nature, society, and the world at large. The course will engage students for interactive sessions, open mic, reading group, storytelling sessions, and semester-long activities conducted by faculty mentors.

The course will focus on integrating academic work with community services. It will equip the students to learn to connect knowledge gained in classroom with real life situation by getting hands on experience through community services. It will also foster the development of civic responsibility

Units (Any Two)	
Unit 1	**Plantation and adoption of a tree: (6 hours)** Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature - – Objectives, Visit, case study, report, outcomes.
Unit 2	**Heritage walk and crafts corner: (6 hours)** Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms - – Objectives, Visit, case study, report, outcomes.
Unit 3	**Organic farming and waste management:(6 hours)** Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus – Objectives, Visit, case study, report, outcomes.
Unit 4	**Water conservation: (6 hours)** Knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices – Objectives, Visit, case study, report, outcomes.

References:

Text Books	
1	Textbook Of Environmental Studies by Dr. K. Raghavn Nambiar 2nd Ed.
2	Environment Studies Shivaji University, Kolhapur by Dr. P. D. Raut 2009 Ed.
Reference Books	
1	

Pedagogy – Guidelines: It may differ depending on local resources available for the study as well as environment and climatic differences, location, and time of execution.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

1. Water facilities and drinking water availability	2. Health and hygiene	3. Stress levels and coping mechanisms
4. Health intervention programmes	5. Horticulture	6. Herbal plants
7. Botanical survey	8. Marine products	9. Aqua culture
10. Inland fisheries	11. Animals and species	12. Nutrition
13. Traditional health care methods	14. Food habits	15. Air pollution
16. Water pollution	17. Plantation	18. Soil protection
19. Renewable energy	20. Plant diseases	21. Yoga awareness and practice
22. Health care awareness programmes and their impact	23. Use of chemicals on fruits and vegetables	24. Incidence of Diabetes and other chronic diseases
25. Crop rotation	26. Floury culture	27. Access to safe drinking water
28. Geographical survey	29. Geological survey	30. Sericulture
31. Study of species	32. Food adulteration	33. Organic farming
34. Blood groups and blood levels	35. Human genetics	36. Animal husbandry
37. Mother and child health.	38. Zoological survey	

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups.

Member Secretary
Board of Studies

Chairman
Board of Studies

Chairman
Board of Studies
CHEMICAL ENGG. DEPT.
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

Academic Dean
T.K.I.E.T Warananagar

Dean, Academic
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

Principal
T.K.I.E.T Wrananagar

PRINCIPAL
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist Kolhapur

Tatyasaheb Kore Institute of Engineering & Technology
Department of Chemical Engineering
Autonomous Institute
Warananagar - ESTD - 1983

Second Year B. Tech. (Chemical Engineering)

Fourth Semester Detailed Syllabus

23UGPCC-CH401 HEAT TRANSFER

Teaching Scheme			Evaluation Scheme		
Lectures	:	3* hrs per week	**ISE**	:	40 Marks.
Credits	:	1	**ESE**	:	60 Marks.
Practicals	:	2 hrs /Batch/Week	**ISA**	:	25 Marks
Credits	:	1	**POE**	:	25 Marks.
Total Credits	:	2	**Total Marks**	:	150 Marks.

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

Description

This is one of the most fundamental course which deals with heat flow through various modes of heat transfer viz. Conduction, Convection & Radiation. This course includes all governing principles about evaporation, condensation, correlations, study of individual and overall heat transfer coefficient as well heat exchange equipments and design approach of heat exchangers.

Prerequisites	1:	Basic science
	2:	Concept of Fluid mechanics
	3:	Concepts of thermodynamics

Section – I		
Unit 1	**Mechanism of Heat Flow with Governing Laws**	
	Mechanism of heat flow with governing laws: Conduction, Convection, Radiation. Heat transfer by conduction in solids: Fourier's law, steady state heat conduction through walls, single and multilayer. Heat flow through a cylinder, Sphere, unsteady state heat conduction, equation for one and three dimensional conduction, critical radius of lagging, Problems.	**6 Hrs**
Unit 2	**Principles of Heat Flow in Fluids**	
	Principles of heat flow in fluids: Typical heat exchange equipment, co-current and counter current flow. Energy balances, rate of heat transfer, overall and individual heat transfer coefficient. Calculation of overall heat transfer co-efficients from individual heat transfer coefficients, fouling factors. Transfer units in heat exchangers, Problems.	**7 Hrs**
Unit 3	**Heat Transfer to Fluids without Phase Change**	
	Heat transfer to fluids without phase change: Regimes of heat transfer in fluids, thermal boundary layer, heat transfer by forced convection in laminar flow. Laminar flow heat transfer to flat plate, the Graetz and Peclet number. Average heat transfer coefficient in Laminar flow. Heat transfer by forced convection in turbulent flow, dimensional analysis method., effect of tube length, empirical equations, estimation of wall temperature, analogy equations. Heat transfer in transition region, heat transfer to liquid metals, Problems.	**7 Hrs**
Section – II		
Unit 4	**Heat Transfer to Fluids with Phase Change**	
	Heat transfer to fluids with phase change : Heat transfer from condensing Vapors dropwise and film wise condensation, coefficients for film type condensation, derivation and practical use of Nusselt equation, condensation of superheated vapors, effect of non-condensable gases, Problems. Heat transfer to boiling liquids : Types of boiling, boiling of saturated liquid maximum flux and critical temperature drop, minimum heat flux film boiling and subcooled boiling, Problems.	**6 Hrs**
Unit 5	**Heat Exchange Equipment**	
	Heat exchange equipment: Types of heat exchangers, single and multipass exchangers, correction of LMTD for cross flow. Simple design calculations of heat exchangers, introduction to compact heat exchanger i.e. plate type heat exchanger, different types of condensers and boilers, air cooled heat exchangers, introduction to heat transfer in agitated vessel, definition of fin efficiency, problems.	**8 Hrs**
Unit 6	**Evaporation**	
	Evaporation: Liquid characteristics, types of evaporators, single evaporator capacity, economy, boiling point elevation and Duhring's rule. Heat transfer co-efficients Enthalpy balance for single effect evaporator, multiple effect evaporators, types, methods of feeding, enthalpy balance of multiple effect evaporators, problems. Introduction to heat transfer to packed and fluidized beds: General heat transfer characteristics, Calculation for Heat transfer co-efficient	**6 Hrs**

PRACTICALS: (Minimum 10 Experiments should performed)

1. Emissivity measurement apparatus.
2. Heat Transfer by Natural convection.
3. Heat Transfer by Forced convection.
4. Heat transfer through lagged pipe.
5. Thermal conductivity of metal rod.
6. Double pipe heat exchanger.
7. Shell and tube heat exchanger.
8. Fin tube heat exchanger.
9. Packed bed heat exchanger.
10. Heat transfer through agitated vessel.
11. Climbing Film Evaporator
12. Demonstration of
    a. Compact heat exchanger
    b. Dropwise and filmwise condensation.
    c. Critical heat flux.

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

References:

Text Books	
1	McCabe W.L., Smith J.C. and Harriott P., "Unit Operations in Chemical Engineering", 7th edition McGraw Hill,2005.
2	Sukhatme S.P., "Heat Transfer",5th edition",5th edition., Press India Ltd. University
Reference Books	
1	William H. Mcadams, "Heat transmission", 3rd ed. McGraw Hill Series
2	Alan J. Chapman. "Heat Transfer", 4th ed. Macmilan Publishing Company, New York
3	Frank Kreith & Mark S. Bohn. , "Principles of Heat Transfer", 4th ed. Harper and Row Publishers, New York,
4	Coulson J.M. & Richardson J.F.,"Chemical Engineering" , 3rd ed. Vol.1
5	J.P. Holman. , "Heat Transfer" , 8th ed. Mc-Graw Hill Inc.1997
Web Links/ Video Lectures	
1	

23UGPCC-CH402 CHEMICAL PROCESS CALCULATIONS

Teaching Scheme			Evaluation Scheme		
Lectures	:	3* hrs per week	**ISE**	:	40 Marks.
Credits	:	1	**ESE**	:	60 Marks.
Tutorial	:	1 Hrs.	**ISA**	:	25 Marks.
Credits	:	1	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	125 Marks.

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

Description:

This course aims to impart fundamental knowledge of Basic chemical calculations, Gaseous system calculations, Material balances & Energy balances

Prerequisites	1:	Basic concepts of mathematics, physics and chemistry.
	2:	Knowledge of calculation technique.

Section – I		
Unit 1	**Basic Chemical Calculations**	
	Units and Conversions, Pressure, Temperature, Density, Specific Gravity; Mole Concept, Equivalent Weight, Composition of solids, Liquids and Gases, Mass fraction, Mass percent, Mass Ratios, Mole fraction, Mole percent, Volume fraction and Volume percent, Normality, Morality , Molality Gaseous mixtures, Daltons law, Amagat's law, Average molecular weight, Density of gaseous mixture, Estimation of vapour pressure.	**5 Hrs**
Unit 2	**Material Balances without Chemical Reaction**	
	Material balances; Guidelines for solving material balance problems; Material balance of important industrial operations (Distillation, Absorption and Striping, Extraction and Leaching, Evaporation, Dryer, Mixing, Crystallization etc.); Recycle and Bypass operations, purge	**9 Hrs**
Unit 3	**Material Balances with Chemical Reaction**	
	Definition of terms involved; Generalized approach for solving problems; Material balance problems involving chemical reaction; Minimum air requirement, Excess air requirement ,combustion calculations	**9 Hrs**
Section – II		
Unit 4	**Material Balances with Recycle, Bypass, Purge**	
	Generalized approach for solving problems, Applications of recycle, bypass and purge, Problems involving industrial applications.	**5 Hrs**
Unit 5	**Energy Balances on Non Reactive Processes**	
	Elements of energy balance calculations; Change in pressure at constant temperature; Change intemperature; Phase change operations; Mixing and solutions.	**5 Hrs**
Unit 6	**Energy Balances on Reactive Processes**	
	Heat of reaction Measurement and calculation of standard heat of reaction, Hess law; Heat of formation; Heat of combustion; Effect of temperature on heat of reaction; adiabatic reactions.	**5 Hrs**

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

References:

Text Books	
1	Bhatt B.I. and Thakore S. B. 'Stoichiometry', Fifth Edition, Tata McGraw-Hill Pub
Reference Books	
1	K. V. Narayanan, B. Lakshmi kutty,' Stoichiometry and Process Calculations', PHI Learning Pvt. Ltd. Dec. 2016.
2	Himmelblau D. M. 'Basic Principles and Calculations in Chemical Engineering', Sixth Edition, Prentice-Hall of India Pvt. Ltd., 2004..
3	Felder R. M. and Rousseau R.W, 'Elementary Principles of Chemical Processes', Third Edition, John Wiley and Sons, Inc.2000.
4	V. Venkataramani, N. Anantharaman & K.M. Meera ,Process Calculations 2nd Ed Sheriffa Begum 2011
5	D.C. SIKDAR, Chemical Process Calculations- PHI Learning Private Ltd ,
Web Links/ Video Lectures	
1	

23UGPCC-CH403 CHEMICAL ENGINEERING THERMODYNAMICS-I

Teaching Scheme			Evaluation Scheme		
Lectures	:	3* hrs per week	**ISE**	:	40 Marks.
Credits	:	2	**ESE**	:	60 Marks.
Tutorial	:	--	**ISA**	:	--
Credits	:	--	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	100 Marks.

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

Description:

This course has a limitation to performance of processes and equipment. By use of thermodynamics we can design, analyze and simulate performance of chemical engineering operations. It is also used for formulating and insight necessary to do preliminary analysis of process for the purpose of feasibility.

Prerequisites	1:	Basic chemistry and Basic physics
	2:	Applied mathematics
	3:	Physical chemistry

Section – I		
Unit 1	**Introduction**	
	Introduction: Scope & limitations of thermodynamics, Work energy and Heat, Concept of equilibrium, Entropy, Gibbs free energy, Phase rule, Problems.	**4 Hrs**
Unit 2	**First law of Thermodynamics and other Basic Concepts**	
	First law of Thermodynamics and other basic concepts: Joules experiment, Internal energy, First law for non-flow process, Steady state flow processes, Reversible and irreversible processes, Reversible chemical reaction, Enthalpy, Heat capacity, Constant volume and pressure process	**6 Hrs**
Unit 3	**Volumetric Properties of Pure Fluids**	
	Volumetric properties of Pure fluids: PVT behavior of pure substances, Virial equation of state, Ideal gas temperature, Universal gas constant, Two forms of virial equation, The ideal gas and equations for various processes, Problems, Application of the virial equation, Cubic equation of state. The van-der waal equation of state.	**7 Hrs**
Section – II		
Unit 4	**Second Law of Thermodynamics**	
	Second law of Thermodynamics: Statements, Heat engine, Carnot theorem Carnot's equations, Thermodynamic temperature scale, concept of Entropy, Entropy changes of an ideal gas, Significance of Entropy, Third law of Thermodynamics, Problems.	**6 Hrs**
Unit 5	**Thermodynamic Properties of Fluids**	
	Thermodynamic properties of fluids :Property relations for homogeneous phases, Maxwell's relation, Enthalpy and Entropy as functions of temperature and pressure, Internal energy as functions of pressure, Ideal gas state, Alternate forms for liquids, Internal energy as function of T and V, Gibbs energy as generating function, Residual properties, Two phase systems, Thermodynamic diagrams, P-H diagram ,T-S diagram ,H-S diagram, etc.	**6 Hrs**
Unit 6	**Conversion of Heat into Work by Power Cycles**	**6 Hrs**
	Conversion of heat into work by power cycles: Steam power plant cycle, Internal combustion engines, Jet engines, Rocket engines. Refrigeration and liquefaction: Carnot Refrigerator, Air refrigeration, vapor compression cycles, Choice of refrigerant. Absorption, refrigeration, Heat pump, Liquefaction processes.	

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	

References:

Text Books	
1	J.M. Smith and H.C.VanNess," Introduction to Chemical Engg.", Thermodynamics 7th Edition, International student edition, McGraw Hill publication.
Reference Books	
1	B.F.Dodge,"Chemical Engg. Thermodynamics", International student edition McGraw Hill Publication.
2	D.A.Hougen, K.M.WatsonandR.A.Ragatz,"Chemical Process Principles
3	K.V.Narayanan,"Chemical Engg. Thermodynamics", Prentice Hall India,New
Web Links/ Video Lectures	
1	

23UGPCC-CH404 PROCESS INSTRUMENTATION AND INSTRUMENTAL METHODS OF ANALYSIS

Course Details:					
Teaching Scheme			**Evaluation Scheme**		
Lectures	:	3 hr per week	**ISE**	:	40 Marks
Credits	:	2	**ESE**	:	60 Marks
Practical	:	2 hr per week	**ISA**	:	25 Marks
Credits	:	1	**POE**	:	25 Marks
Total Credits	:	3	**Total Marks**	:	50 Marks

Course Objectives: The objective of the course is to

By the end of this course, students will be able to:
1) To understand classification, parts and characteristics of instruments.
2) To understand basic principle behind measurements and their applicability in chemical processes.
3) To understand differences between various analytical methods.
4) To understand correct analytical method for sample analysis.
5) To understand modern analytical technique like chromatography, its types like gas chromatography, HPLC and its applications.

Course Outcomes:

Cos	**At the end of successful completion of the course the student will be able to**	**Blooms Taxonomy**
CO1	To impart ability to classify and identify parts of instruments with its charactertics. Also impart ability to measure pressure by using various instruments.	Understand
CO2	To impart ability to measure temperature by using various instruments.	Apply
CO3	To impart ability to measure level and flow by using various instruments.	Apply
CO4	To understand conceptual understanding of instrumental methods of analysis with its classification. Also to analyze the chemical industrial samples by using techniques like spectrophotometry & Colorimetry.	Apply
CO5	To analyze the chemical industrial samples by using techniques like nephhelometry, turbiditymetry, refractometry, conductometry etc.	Apply
CO6	To analyze the industrial samples by using techniques like chromatography, gas chromatography, HPLC.	Apply

Description:

This course gives the basics of instrumentation required in chemical industry and the details of pressure, temperature, flow and level measuring instruments. Also it gives the classification and details of instrumental methods of analysis which are used to analyze chemical industrial samples for educational and industrial purposes.

Section -I	
Unit 1	**Introduction**: Basic Concepts and characteristics of measurement system, various elements of instrument, performance characteristics. **Pressure Measurement**: Introduction, methods of pressure measurement by manometers, elastic pressure transducer, force balance pressure gauges, electrical pressure transducers and vacuum measurement. Pressure switches,
Unit 2	**Temperature measurement**: Introduction, methods of temperature measurement by expansion thermometers, filled system thermometers, electrical temperature instruments, pyrometers. Calibration of Thermometers.
Unit 3	**Liquid level measurement**: Introduction, Methods of liquid level measurements by direct methods, indirect methods, electrical methods. Servicing of liquid level measuring instruments. **Flow measurements**: Introduction, methods of flow measurements by inertial flow meters, quantity flow meters, and mass flow meters.
Section –II	
Unit 4	**Introduction to instrumental methods of analysis**: General Introduction, classification of instrumental methods, spectroscopy, properties of electromagnetic radiation, electromagnetic spectrum. **Visible Spectrophotometry & Colorimetry**: Deviation from Beer's law, instrumentation applications. Molar compositions of complexes, examples.
Unit 5	**Conductometry**: Introduction, laws, conductance, measurements, types of conductometric titrations, applications, advantages and disadvantages. **Nephelometry and Turbidimetry**: Introduction, theory, comparison with spectrophotometry, instrumentation, applications. **Refractometry:** Introduction, Abbe refractometer, instrumentation, applications, optical exaltation, numericals.
Unit 6	**Chromatography**: Introduction, types, theoretical principles, theories of chromatography, development of chromatography. **Gas Chromatography**: Introduction, principles of gas chromatography, gas liquid chromatography, instrumentation. **High Performance (Pressure) Liquid Chromatography**: Introduction, principles, instrumentation, apparatus & materials, applications.

References:

Text Books	
1	S.K.Singh, "Industrial Instrumentation & Control", Tata McGraw Hill publishing company ltd, New Delhi, 2000
2	D. Pastranabis, "Principals of industrial instrumentation", 2nd edition, Tata McGraw Hill publishing company ltd, New Delhi, 2003
3	G. R. Chatwal, S.K. Anand, "Instrumental method of chemical analysis", 5th Edition, Himalaya Publishing House, Mumbai 2002.
4	Willard H.H, "Instrumental methods of analysis", 6th Edition, CBS Publication New Delhi 1986
Reference Books	
1	Eckman D.P. "Industrial Instrumentation", Willey Eastern Ltd, New Delhi, 1984.
2	" A.C. Shrivastav "Techniques in Instrumentation", New Delhi, 1984.
3	Ray Choudhuri and Ray Choudhuri "Process Instrumentation, Dynamics and control for Engineers", 1st Edition, Asian Books Pvt Ltd, New Delhi, 2003.
4	Galen W. Ewing, "Instrumental Methods of Chemical Analysis", 5th Edition, McGraw Hill Book Company, Singapore, 1990
5	D. A. Skoog, "Principal of Instrumental Analysis", Southern College Publication, Japan 1984

23UGMDM2-CH4051T Corrosion Engineering

Teaching Scheme			Evaluation Scheme		
Lectures	:	1 hr per week	**ISE**	:	--
Credits	:	1	**ESE**	:	--
Tutorial	:	1	**ISA**	:	50 Marks
Credits	:	1	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	50 Marks

Course Objectives: The objective of the course is to

1. Comprehend corrosion types (e.g., uniform, galvanic, localized) and their mechanisms.
2. Perform and interpret corrosion testing techniques
3. Understand various corrosion prevention and control measures.

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Explain the principles and mechanisms of corrosion, including electrochemical reactions, thermodynamics, and kinetics.	Recall
CO2	Identify and classify various types of corrosion (e.g., uniform, galvanic, pitting, crevice) and understand their underlying mechanisms.	Understand
CO3	Recommend and justify appropriate corrosion control measures, such as material selection, protective coatings, inhibitors, and cathodic protection techniques	Understand

Description:

Corrosion is a natural process that deteriorates materials, typically metals, due to chemical or electrochemical reactions with their environment. Corrosion engineering aims to understand the fundamental mechanisms behind corrosion, predict its occurrence, and develop effective strategies to control and prevent it.

Unit 1	**Introduction:** Cost of Corrosion, Corrosion Engineering , Definition of Corrosion Corrosion Damage Classification of Corrosion **Corrosion Principles** Introduction , Corrosion Rate Expressions Electrochemical Aspects , Electrochemical Reactions Polarization Passivity	**5hrs**
Unit 2	**Forms of Corrosion** Uniform corrosion, Localized corrosion (pitting, crevice corrosion), Intergranular corrosion,Selective leaching, Stress corrosion cracking (SCC),Hydrogen embrittlement	**5 hrs**
Unit 3	**Corrosion Testing** Introduction , Classification , Purpose , Materials and Specimens , Surface Preparation , Measuring and Weighing , Exposure Techniques , Duration Planned-Interval Tests , Aeration , Cleaning Specimens After Exposure 167 4-12 Temperature 169 4-13 Standard Expressions for Corrosion Rate	**5 hrs**
Unit 4	**Corrosion Prevention :** Materials Selection: Metals and Alloys , Metal Purification , Nonmetalics Alteration of Environment : Changing Mediums , Inhibitors Design : Wall Thickness , Design Rules Cathodic and Anodic Protection : Cathodic Protection , Anodic Protection Comparison of Anodic and Cathodic Protection Coatings : Metallic and Other Inorganic Coatings , Organic Coatings ,Corrosion Control Standards , Failure Analysis	**5 hrs**

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

References:

Text Books	
1	Corrosion Engineering (MCGRAW HILL SERIES IN MATERIALS SCIENCE AND ENGINEERING by **Mars Fontana**
2	"Corrosion Engineering: Principles and Practice" by Pierre R. Roberge
Reference Books	
1	"Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering" by R. Winston Revie

23UGOE1-CH4061 Green Technology

Course Details: Green technology					
Teaching Scheme			**Evaluation Scheme**		
Lectures	:	3 hr per week	**ISE**	:	40
Credits	:	3	**ESE**	:	60
Tutorial	:	--	**ISA**	:	--
Credits	:	--	**POE**	:	--
Total Credits	:	3	**Total Marks**	:	100 Marks

Course Objectives

To provide basic knowledge on green technology.
. To understand the principles of green chemistry and eco friendly methodologies.
To create awareness on Cleaner development mechanisms.
To develop concepts on various energy efficient systems and green buildings

Course outcomes

By the end of the course, student will be able to:

CO1	Realize the importance of green technologies in sustainable growth of Industry and society
CO 2	Adopt alternative methods and solvents for green synthesis.
CO 3	Plan and use of selective materials for green buildings
CO 4	Design and implementation of suitable energy efficient processes
CO 5	Develop cleaner production and treatment mechanims for pollution prevention

Unit	Content	Duration
1	**Introduction to green chemistry and technology** Definition and significance of green technology, Twelve principles of green chemistry, Green technology-definition, importance, factors affecting green technology. Sustainable development goals , Environmental, social, and economic dimensions	6hrs
2	**Green synthesis and Solvents** Green methods of synthesis- microwave assisted synthesis, solvent free techniques, Alternative solvents Ionic liquids- general synthesis, applications; super critical fluids- extraction, process and applications, Deep eutectic solvent	5hrs
3	**Cleaner development technologies** Cleaner development mechanisms, role of industry; reuse, reduce and recycle, raw material substitution; wealth from waste; carbon credits, carbon trading, carbon sequestration, eco labelling.	5hrs
4	**Renewable Energy Sources:** Solar energy: Photovoltaics, solar thermal systems, Wind energy: Turbines, offshore wind farms, Hydroelectric power, Biomass and biofuels, Geothermal energy	7hrs
5	**Green Transportation and** Emerging Technologies **Green Transportation :** Electric vehicles (EVs) , Sustainable fuels **Emerging Technologies** : Smart grids and energy storage, Internet of Things (IoT) in green technology	6hrs
6	**Green Buildings**	7hrs

	Definition- Features and benefits, Sustainable construction materials Fundamental planning decisions for energy efficient building- site selection, buildings forms and orientations.	

REFERENCE BOOKS/TEXT BOOK:

1. Khan B.H, Non conventional energy resources, Tata McGraw-Hill, New Delhi 2006.
2. Rashmi Sanghi and M.M. Srivastava, Green Chemistry-Environment Friendly Alternatives, Narosa Publishing House, New Delhi 2009.
3. Paul L. Bishop, Pollution prevention –Fundamentals and Practices, McGraw-Hill- international 2000
. 4. N. Vinutha bai, R. Ravindra, Energy efficient and green technology concepts, International Journal of Research in Engineering and Technology p 253-258, Volume: 03 Special Issue: 06 , 2014, eISSN: 2319-1163 pISSN: 2321-7308.
5. "Introduction to Green Technology" by Mark W. Zupan

23UGVSEC1-CH407LP FLUID MOVING MACHINERY

Teaching Scheme			Evaluation Scheme		
Lectures	:	1 hrs per week	**ISE**	:	NA
Credits	:	1	**ESE**	:	NA
Practicals	:	2 hrs /Batch/Week	**ISA**	:	25 Marks
Credits	:	1	**POE**	:	25 Marks
Total Credits	:	2	**Total Marks**	:	50 Marks

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 ableto	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

Description:

This course aims to impart fundamental knowledge for experiments based on pumps, blowers and compressors.

Prerequisites	1:	Fluid mechanics

Section – I

Unit 1	**Pump Introduction** Pump Introduction, classification of pumps, Types of Centrifugal pumps & Positive Displacement Pumps, comparison, advantages and disadvantages, Selection criterion of pumps, operating conditions, operating difficulties, and maintenance of pumps.	**7 Hrs**
Unit 2	**Centrifugal Pumps** Construction of Pump, impellers, casings, volute pumps with vortex chamber, diffuser vanes, Theory of centrifugal pump, Work done, developed head, efficiency pump, minimum speed for functioning of pump, multistage centrifugal pumps, pumps in series, pumps in parallel, specific speed of centrifugal pump, model testing suction lift, priming, cavitation, effect of cavitation, NPSH, calculation of horse power requirement, operating characteristics, Affinity Law, problem	**10 Hrs**

Section – II

Unit 3	**Positive Displacement Pumps** Reciprocating pumps, volumetric efficiency, single acting, double acting, work done by reciprocating pumps, slip of reciprocating pump, variation in velocity and acceleration in suction and discharge line.	**7 Hrs**
Unit 4	**Fans** Fans characteristics, operating pressure conditions, types of blowers, centrifugal blower, positive displacement blower, types of compressors, centrifugal compressor, reciprocating compressor, equations for blower and compressors adiabatic compression, isothermal compression, compressor efficiency, power equations, vacuum pumps, its working and principle, steam jet ejector.	**6 Hrs**

PRACTICALS:

1. To Study the Performance of Centrifugal Pump with Constant Speed.
2. To Study the Performance of Centrifugal Pump with Varying Speed.
3. To Study the Performance of Reciprocating Pump with Constant Speed.
4. To Study the Performance of Reciprocating Pump with Varying Speed.
5. To Study the Performance of Gear Pump.
6. To Study the Performance of Vacuum Pump.
7. To Study the Performance of Centrifugal Blowers.
8. Demonstration of fans and Compressor.
9. Study of Peristaltic pumps.

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												

References:

Text Books /Reference Books	
1	Fluid Mechanics by R.P. Vyas, Central Techno Publications, Nagpur.
2	Design for Chemical and Petrochemical Plants, Ernest E.Ludwig, Volume I&II, Gulf publishing Company.
3	Pumps: G.K. Sahu, New age international publishers.
Web Links/ Video Lectures	
1	

23UGAEC1-CH4081T - Modern Indian Language (Hindi)

Teaching Scheme			Evaluation Scheme		
Lectures	:	1 hrs per week	ISE	:	NA
Credits	:	1	ESE	:	NA
Practicals	:	1 hrs /Batch/Week	ISA	:	25 Marks
Credits	:	1	POE	:	--
Total Credits	:	2	Total Marks	:	25 Marks

Section – I

इकाई-1	इकाई-1 सामान्य रोजगार परक ज्ञान। पारिभाषिक शब्दावली । ।(परिशिष्ट के अनुसार).	5hrs
इकाई-2	इकाई-2 इकाई–2. अनुवाद स्वरूप; संक्षेप में परिचय। अपठितमराठी/अंग्रेजीपरिच्छेद का हिंदीअनुवाद।	5hrs
इकाई-3	1. हिंदी अनुवादक। 2. अनुसंधान अधिकारी। 3. निवेदक। 4. क्रीडा समालोचक। 5. भंडारी)store keeper)	5hrs
इकाई-4.	रोजगार परक पत्र लेखन। 1. नौकरी के लिए आवेदन पत्र। 2. पदाधिकारियों के नाम पत्र। (बैंक व्यवस्थापक, प्राचार्य, निजी क्षेत्र के संदर्भ में पत्राचार(	5hrs

- अंतर्गत मूल्यमापन के लिए

प्रश्न पत्र का स्वरूप तथा अंक वितरण

प्रश्न 1.रोजगार परक अंग्रेजीपारिभाषिक शब्दों का हिंदी नामकरण।-अंक)10(
परिशिष्ट) 1 के अनुसार ।(

प्रश्न 2.अपठित मराठी / अंग्रेजी परिच्छेद का हिंदी में अनुवाद ।(अंक-10(

प्रश्न 3.रोजगार परकपदों परटिप्पणियां।(3मेंसे 21-अंक)(0(

प्रश्न 4.रोजगार परक पत्र लेखन।अंक)-10(

अ) नौकरी के लिए आवेदन पत्र लिखिए।

आ) पदाधिकारियों के नाम पत्र।

संदर्भ ग्रंथ सूची :-

1. मीडिया कालीन हिंदी स्वरूप एवं संभावनाएं,डा. अर्जुन चव्हाण, राधाकृष्ण प्रकाशन नई दिल्ली।
2. सामान्य हिंदी, संपादक जी. के. चोपड़ा, यूनिक पब्लिकेशर्स, नई दिल्ली।
3. प्रयोजनमूलक व्यवहारिक हिंदी ओमप्रकाश सिंहल, जगतराम एंड संस,अंसारी रोड, नई दिल्ली।
4. हिंदी भाषा में रोजगार के अवसर, प्रा.विकास पाटील, ए.बी.एस.पब्लिकेशन, वाराणसी।
5. हिंदी की मानक वर्तनी,कैलाशचंद्र भाटिया, प्रभात प्रकाशन, नई दिल्ली।
6. प्रयोजनमूलक हिंदी डा.श्रीमती आशा मोहन,साहित्य सरोवर प्रकाशन, प्रभु नगर, आगरा।
7. हिंदी व्याकरण,डॉ. के. पी.शहा, अजब डिसटीब्यूटर्स,कोल्हापुर।
8. सामान्य हिंदी एवं संक्षिप्त व्याकरण,ब्रजकिशोर प्रसाद सिंह,प्रकाशक-यूनिकॉर्न बुक्स, दरियागंज, नई दिल्ली।

****

Teaching Scheme			Evaluation Scheme		
Lectures	:	2 hr per week	**ISE**	:	--
Credits	:	2	**ESE**	:	--
Practical	:	-	**ISA**	:	25 Marks
Credits	:	-	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	25 Marks

Course Objectives: The objective of the course is to

1. The student will be able comprehend various functions of
2. The student will be able to describe and explain in her/his own words, the relevance and importance of Human Resources Management at workplace
3. The student will be able to apply and solve the workplace problems through Human Resources Management intervention

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Gain practical experience in the field of Human Resource Concepts, functions and theories.	Recall
CO2	Acquire the conceptual insight of Human Resource and various functions of HR	Understand
CO3	Apply personnel, managerial and welfare aspects of HR	Understand
CO4	Develop a greater understanding about HR practices, analyse the trends in the field of HR	Understand
CO5	Gain practical experience in the field of Human Resource Concepts, functions and theories.	Understand

Description:

This course examines the principles and practices of managing human resources in organizations. Topics include recruitment and selection, training and development, performance management, compensation and benefits, employee relations, and strategic HRM.

Prerequisites:

A basic understanding of business principles, organizational behavior, and management practices is often recommended.

Unit 1	**Introduction** Human Resource Management and Personnel Management, The Importance of Human Resource Management, Models of Human Resource Management, Evolution of Human Resource Management, HRM in India, The Factors Influencing Human Resource Management	**6hrs**
Unit 2	Human Resource Planning and Recruitment and Selection: Importance of HR Planning, Manpower Planning to HR Planning, Factors Affecting HR Planning, Benefits of HR Planning, HRP Process Importance of Recruitment, Recruitment Policies, Factors Influencing Recruitment, Recruitment Process, Sources, and Evaluation of Recruitment Process.	**6 hrs**
Unit 3	Learning, Training, and Development: Training, Learning and Development, Learning Theories, The Future of Training, Learning, and Development, Process of training and Techniques of Training	**6 hrs**
Unit 4	Performance Management and Appraisal Objectives of Performance Management, Performance Management and Performance Appraisal, Common Problems with Performance Appraisals, Performance Management Process, Types of Performance Rating Systems, Future of Performance Management.	**6 hrs**
Unit 5	Module -5 Human Resource Management Innovations Introduction, Human Resource Management and Innovations, Factors Affecting the Innovation Process in Organisations, Characteristics of Human Resource Management Innovations, Conditions Necessary for Successful HRMI Implementation,	**6 hrs**

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

References:

Text Books	
1	**Books** Human Resource Management: Text and Cases | 10th Edition K Aswathappa, Sadhana Dash , McCgraw Hill ,2023
2	Human Resource Management: Theory and Practices, Amitabha Sengupta, Sage Publication India Pvt. Ltd,2019
Reference Books	
1	Human Resource Management: Theory and Practices, R. C. Sharma, Nipun Sharma, Sage Publication India Pvt. Ltd,

23UGEEC2-CH4092L EVENT MANAGEMENT

Teaching Scheme			Evaluation Scheme		
Lectures	:	2 hrs per week	ISE	:	--
Credits	:	2	ESE	:	--
Tutorial	:	--	ISA	:	25 Marks
Credits	:	--	POE	:	NA
Total Credits	:	2	Total Marks	:	25 Marks

Course Objectives: The objective of the course is to

To provide an in-depth understanding of the necessity of events, event management skills, legal aspects.

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Give the knowledge to the students of event management and identify its key components	
CO2	Explain the importance of event planning and execution	
CO3	Understand the team building in event management	
CO4	Develop the marketing and advertising skill	
CO5	Identify the legal aspects of event management	

Description:

Prerequisites	1:	

Section I		
Unit 1	**Introduction to Event Management:**	
	Meaning and Definition of Event Management, Significance of EM in various industries, Scope and opportunities in the field of EM, Understanding the key components of EM.	**5 Hrs**
Unit 2	**Conduct of an Event:**	
	Significance of proper event planning, role of event planning in establishing objectives, creating budgets, and managing resources, Challenges in Event Planning-constraints, budget limitations, logistical issues, etc. SWOT Analysis. Roles & Responsibilities of Event Managers for Different Events.	**9 Hrs**
Section II		
Unit 3	**Public Relation:**	
	Significance & Benefits of effective team management, Importance of clear communication and delegation of tasks. Public Relation Strategy & Planning. Brain Storming for idea generation-Writings for Public Relations. Meaning and definition of Event Marketing, Role of marketing and advertising in attracting attendees and promoting events.	**10Hrs**
Unit 4	**Event Management Procedure & Legal Aspects:**	
	Principles for holding an Event, General Details, Permissions- Policies, Government and Local Authorities. Taxes Applicable. Introduction to legal components of event management.	**6 Hrs**

Evaluation based on Presentation/Group Discussion/Event/Assignment

Mapping of POs & COs:

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

References:

Reference Books	
1	Singh, R., Meeting Conference Association, Event and Destination Management, Kanishka Publishers and Distributors, 2006
2	Hoyle, L. H., Dorf, D.C., & Jones, T. J. A., Convention Management and Service. Educational institute of AH & MA., 1995
3	Montgomery, R. & Strick S .K., Meetings, Conventions, and Expositions: An Introduction to the Industry, John Wiley & Sons Inc., 1995
4	Event Planning by Jude Allen
5	The Art of Successful Event Management by Taruz Busrur Event Marketing and Advertising-Product Launch and Branding by National Institute of Event Management
6	Event Marketing and Management by Sanjaya Singh and Sanjay Saggere

23UGVEC2-CH4101L Ethics and Moral Philosophy

Course Details:					
Teaching Scheme			**Evaluation Scheme**		
Lectures	:	2 hr per week	**ISE**	:	--
Credits	:	2	**ESE**	:	--
Practical	:	-	**ISA**	:	25 Marks
Credits	:	-	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	25 Marks

Course Learning Outcomes

- Awareness of ethical issues and basic ethical approaches.
- Improved writing skills and understanding of ethical conflict.
- To enable the students to create an awareness on Engineering Ethics and Human Values,
- To instill Moral and Social Values and Loyalty and to appreciate the rights of others.

Unit	Content	Duration
1	HUMAN VALUES Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring	7
2	Human Value Cont- Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self Confidence – Character	7
3	ENGINEERING ETHICS Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy –	10

Book

Govindarajan M, Natarajan S, Senthil Kumar V. S, Engineering Ethics, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS/TEXT BOOK:

Ethics in Engineering practice and Research (2nd Edition) by Caroline Whitbeck

Cambridge Ethics in Engineering MW Martin and R Schinzinger MC Graw Hill

LEARNING OBJECTIVES:

- To enhance learners communication skills in both social and professional contexts.
- To sensitize students to their communicative behavior by allowing the learners, understand the basics and the importance of Technical Communication.

To equip learners with the professional skills by giving training in writing various tasks like letters, technical reports and e-mails etc

REFERENCE BOOKS/TEXT BOOK:

1. Muralikrishna C., Sunita Mishra "Communication Skills for Engineers" 2nd edition, Pearson, New Delhi 2010
2. Vyas Manish A., Yogesh L. Patel, "Tasks for the English Classroom", MacMillan, New Delhi, 2012.

23UGVEC2-CH4102L Social Responsibility and Citizenship

Teaching Scheme			Evaluation Scheme		
Lectures	:	2 hrs per week	**ISE**	:	-
Credits	:	2	**ESE**	:	-
Practical	:	-	**ISA**	:	25
Credits	:	--	**POE**	:	-
Total Credits	:	2	**Total Marks**	:	25

Course Objectives: The objective of the course is

1. To impart knowledge on various provisions of Citizen and Citizenship acts and highlight the significance of CSR
2. To Highlight the Citizenship Issues in India and significance.
3. To enable the students to examine the development of the idea of Citizen and Responsibility .
4. To Advocating Social responsibility and Protection of Citizens to take good care of people and the earth
5. To facilitate the student to gain in depth knowledge in the concepts and models of Corporate Social Responsibility (CSR) and Advocating environmental sustainability.

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Bloom's Taxonomy
CO1	Impart knowledge on various provisions of Citizen and Citizenship acts and highlight the significance of CSR	
CO2	Highlight the Citizenship Issues in India and significance.	
CO3	Enable the students to examine the development of the idea of Citizen and Responsibility.	
CO4	Advocating Social responsibility and Protection of Citizens to take good care of people and the earth	
CO5	facilitate the student to gain in depth knowledge in the concepts and models of Corporate Social Responsibility (CSR) and Advocating environmental sustainability.	

Description:

Social Responsibility - showing concern for the consequences of a person's or institution's acts as they affect interests of other people and the environment. To responsibly be sure that what we have today will be here in the future. Global Citizenship - A global citizen is someone who is aware of and understands the wider world and their place in it. Global citizenship is all about encouraging our pupils to develop the knowledge, skills and values they need to engage with the world. And it's about the belief that we can all make a difference

Prerequisites:		

Section – I		
Unit 1	**Citizenship in India:**	
	Concept of Citizen: Subject-Slave-Citizen: a Comparison, Aspirational Citizenship, Citizenship in India: Milestones- Citizenship and Partition of India (Nehru and Liyaqat Ali Khan Pact), **Citizens and Constitutional Provisions**: The Citizenship Act, 1955, The Citizenship (Amendment) Act, 1986, 2003, 2005 and National Register of Citizens (NRC).	**6 Hrs.**
Unit 2	**Citizenship Issues in India:** **Citizenship Issues in India:** Process of acquiring Citizenship,Dual Citizenship: Needs and Demands- Impact of Globalization, Advantages of Dual Citizenship,IPC and Citizens Rights: First Information Report, Arrest, Detention, Bail Provisions, Sedition Act Fundamental Rights and Duties, Socio-Economic and Cultural Rights.	**7 Hrs.**
Unit 3	**Social responsibility**	**7 Hrs.**
	Citizen and Responsibility: Constitutional Provisions,Social responsibility and Protection of Citizens: Women ,Children and Old aged People Protection , Rights of Forest Dwellers, and Displaced People (War, Natural Calamities and Rehabilitation), Universal Declaration of Human Rights,Social responsibility and health	
Unit 4	**Corporate Social Responsibility:**	**6 Hrs.**
	Corporate Social Responsibility: -International Framework for Corporate Social Responsibility: Millennium Development Goals, Sustainable Development Goals- Relationship between CSR and MDGs. United Nations (UN) Global Compact 2011 - UN guiding principles on business and human rights - OECD ,CSR policy tool - ILO tripartite declaration of principles on multinational enterprises and social policy	

Mapping of POs & CO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	If applicable		
													PSO1	PSO2	PSO3
CO1					-	2	-	-	-	-	-	-	-	-	-
CO2					-	2	-	-	-	-	-	-	-	-	-
CO3					-	3	-	2	-	-	-	-	-	-	-
CO4					-	3	-	3	-	-	-	-	-	-	-
CO5					-	**2.5**	-	**2.5**	-	-	-	-	-	-	-
CO	**-**	**-**	**-**	**-**	**-**	2	**-**	2	**-**	**-**	**-**	**-**	**-**	**-**	**-**

References:

Text Books/References: Books	
1	Introduction to The Constitution of INDIA - 26th/Ed. - 2024 - 3rd Reprint - Revised by Durga Das Basu
2	Governance In India And Social Justice by Priyanka Tiwari Navnath Mishra (Author, Contributor)
3	Indian Polity for UPSC (English)|7th Edition| by M Laxmikanth (Author)
4	Corporate Social Responsibility in India : A Practitioner's Perspective by Nirbhay Lumde
5	Corporate Social Responsibility: Concept, Cases and Trends,1E by Prabhakaran Paleri

23UGVEC2-CH4103L Values in Education Policies and Practice

Teaching Scheme			Evaluation Scheme		
Lectures	:	2 hr per week	**ISE**	:	--
Credits	:	2	**ESE**	:	--
Practical	:	-	**ISA**	:	25 Marks
Credits	:	-	**POE**	:	--
Total Credits	:	2	**Total Marks**	:	25 Marks

Course Objectives: The objective of the course is to

By the end of this course, students will be able to:

1. Understand the theoretical foundations of values in education.
2. Analyze the role of values in shaping educational policies.
3. Evaluate the impact of value-driven practices in educational settings.
4. Develop strategies for integrating values into educational practice.
5. Critically reflect on their own values and how these influence their approach to education.

Course Outcomes:

Cos	At the end of successful completion of the course the student will be able to	Blooms Taxonomy
CO1	Articulate key theories and concepts related to values in education.	Understand
CO2	Conduct critical analyses of educational policies from a values perspective.	Understand
CO3	Design and implement educational practices that reflect core values.	Understand
CO4	Demonstrate improved decision-making skills based on ethical considerations.	Apply
CO5	Engage in reflective practice to continuously align their educational approaches with their values.	Apply

Description:

This course explores the integration of values in educational policies and practices. It covers theoretical foundations, policy analysis, and practical applications in educational settings. Students will critically examine how values influence educational decisions and outcomes, and develop strategies to implement value-driven education.

Unit 1	**Introduction to Values in Education:** Definitions and importance of values in education, Historical perspectives ,Key theories and concepts **Theoretical Foundations:** Ethical theories and their application in education, Moral development theories, Cultural and societal influences on educational values.
Unit 2	**Values and Educational Policies:** Analysis of national and international education policies, Case studies of value-driven educational reforms, The role of policymakers and stakeholders. **Values in Curriculum Design:** Principles of value-based curriculum development, Integration of values across different subjects, Evaluating value-based curriculum.
Unit 3	**Values in Teaching and Learning :** Pedagogical approaches to teaching values, Creating a values-rich classroom environment, Assessing students' value development **Equity and Inclusion:** Values of equity, diversity, and inclusion in education, Strategies for promoting inclusive education, Addressing value conflicts in diverse classrooms.

Unit 4	**Global Perspectives on Values in Education:** Comparative analysis of values in education across different countries, Global education initiatives promoting values, Challenges and opportunities in global education contexts. **Values and Educational Leadership:** Role of educational leaders in fostering a value-driven school culture, Ethical decision-making in educational leadership, Case studies of value-based leadership.
Unit 5	**Practical Applications and Case Studies:** Implementing values in school policies and practices, Real-world examples of value-based education, Lessons learned from successful implementations. **Reflective Practice and Continuous Improvement:** Reflective practice techniques for educators, Strategies for continuous improvement in value-based education , Developing a personal action plan.

References:

Text Books	
1	"The Ethics of Teaching" by Kenneth A. Strike and Jonas F. Soltis
2	"Values Education and Lifelong Learning: Principles, Policies, Programmes" by David N. Aspin, Judith D. Chapman, and Michael Hatton
3	"Moral Classrooms, Moral Children: Creating a Constructivist Atmosphere in Early Education" by Rheta DeVries and Betty Zan
Reference Books	
1	"Educational Leadership and Moral Literacy: The Dispositional Aims of Moral Leaders" by Patrick M. Jenlink and Karen Embry Jenlink
2	"Teaching with Integrity: The Ethics of Higher Education Practice" by Bruce Macfarlane

Member Secretary
Board of Studies

Chairman
Board of Studies

Chairman
Board of Studies
CHEMICAL ENGG. DEPT.
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

Academic Dean
T.K.I.E.T Warananagar

Dean, Academic
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist. Kolhapur

Principal
T.K.I.E.T Warananagar

PRINCIPAL
Tatyasaheb Kore Institute of Engg.
& Technology (Autonomous)
Warananagar, Dist Kolhapur

Tatyasaheb Kore Institute of Engineering & Technology * Department of Chemical Engineering * Warananagar - ESTD - 1983 * Autonomous Institute