

Dr. Vasanttraodada Patil Shetkari Shikshan Mandal's

**Padmabhooshan Vasanttraodada Patil Institute of Technology,
Budhgaon, Sangli - 416304**

(An Autonomous Institute)

Affiliated to

Dr. Babasaheb Ambedkar Technological University, Lonere, Raigad

(Accredited by NAAC)



Department of Chemical Engineering

Curriculum for Second Year Undergraduate Degree Programme

B.Tech. in Chemical Engineering

In accordance with the *National Education Policy (NEP) 2020,*

Including curriculum structure and evaluation scheme

Effective from Academic Year 2026– 27



Dr. Vasanthaodada Patil Shetkari Shikshan Mandal's
**PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF
 TECHNOLOGY, BUDHGAON, SANGLI 416304**

An Autonomous Institute, affiliated to Dr. Babasaheb Ambedkar Technological University, Raigad
Department of Chemical Engineering

S.Y. B.Tech. Semester III Chemical Engineering

With Effect from Academic Year 2026-27

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
		L	T	P	Credit	Scheme	Theory		Practical		
							Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0CHESC201	Numerical Methods in Chemical Engineering	3	1	0	4	ISE1	10	40	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0CHPCC202	Fluid Mechanics	3	0	0	3	ISE1	10	40	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0CHPCC203	Mechanical Operations	3	0	0	3	ISE1	10	40	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0CHPCC204	Process Calculations	3	0	0	3	ISE1	10	40	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0CHMDM205	MDM-I	3	0	0	3	ISE1	10	40	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0CHVEC206	Environmental Studies	2	0	0	2	ISE	50	20	-	-	50
0CHHSSM207	Principles of Management	2	0	0	2	ISE	50	20	-	-	50
0CHPCC208	Fluid Mechanics Laboratory	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0CHPCC209	Mechanical Operations Laboratory	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0CHCEP210	Community Engagement Project	0	0	2	1	ISE	-	-	50	20	50
TOTAL		19	1	6	23						
Total Contact Hours Per Week		26				TOTAL MARKS					850

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director



Dr. Vasantodada Patil Shetkari Shikshan Mandal's
**PADMABHOOSHAN VASANTODADA PATIL INSTITUTE OF
TECHNOLOGY, BUDHGAON, SANGLI 416304**

An Autonomous Institute, affiliated to Dr. Babasaheb Ambedkar Technological University, Raigad

Department of Chemical Engineering

Course Category	BSC	ESC	PCC	PEC	MD M	OE	VSE C	AEC	HSS M	IKS	VEC	RM	CEP	PR	OJT	CC	Total
Credit	-	4	11		3	-	-	-	2	-	2	-	1	-	-	-	23
Cumulative	16	19	11	-	3	-	3	3	2	2	2	-	1	-	-	1	63

Multidisciplinary Minor Bucket offered by Chemical Engineering

MDM-I (SEM – III)	0CHMDM205	Environmental Engineering & Pollution Control
-------------------	-----------	---

*Passing Criteria: - ISE + MSE + ESE \geq 40% Marks and ESE has separate passing \geq 40% Marks.

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Numerical Methods in Chemical Engineering

Course Details:

Class	SY Chemical Semester III			
Course Code and Course Title	0CHESC201 Numerical Methods in Chemical Engineering			
Prerequisite	Engineering Mathematics, Engineering Physics			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 3 Hr/Week	Tutorial 1 Hr/Week	Practical --	
Credit	4			
Evaluation Scheme	ISE I 10 Marks	MSE 20 Marks	ISE II 10 Marks	ESE 60 Marks

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Solve direct and iterative numerical methods to solve systems of linear algebraic equations.	3
CO2	Compute eigen values and eigenvectors of matrices using numerical techniques	3
CO3	Solve single-variable and multi-variable nonlinear algebraic equations using iterative methods.	3
CO4	Perform function approximation, interpolation, and curve fitting for engineering data analysis.	3
CO5	Solve ordinary differential equations using numerical integration techniques.	3
CO6	Apply numerical methods for the solution of partial differential equations arising in engineering problems.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	Solutions of Linear Algebraic Equations: Gauss elimination and LU decomposition, Gauss-Jordan Elimination, Gauss-Seidel and relaxation methods.	6
2	Eigen values and Eigen Vectors of Matrices: Faddeev-Leverrier method, Power method, Householder and Given method.	8
3	Nonlinear Algebraic Equations: Fixed point method, Multivariable successive substitutions, Single variable Newton-Raphson Technique, Multivariable Newton-Raphson Technique.	6
4	Function Evaluation: Least-squares curve fit, Newton's Interpolation formulae, Newton's divided difference interpolation polynomial, Lagrangian interpolation, Cubic spline approximations	6
5	Ordinary Differential Equations: Eulers explicit and, Runge-Kutta methods, Adams-Bashforth formulas.	7
6	Partial differential equations.: Crank-Nicholson method, Laplace equation, Bender-Schmidt method	6
	Total Hours	39

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Textbook:

Sr. No.	Title	Authors	Publisher	Edition	Year of edition
1	Numerical Methods for Engineers	Santosh K. Gupta	New Age Publishers	2 nd	2010
2	Numerical Methods in Engineering & Science	B S Grewal	Khanna Publishers	1 st	2014
3	Numerical Methods	P. Kandasamy, K. Thilagavathi, K. Gunavathi	S.Chand&Company Ltd.	1 st	2005
4	Numerical Methods for Engineers	Steven C. Chapra Raymond P. Canale	McGraw-Hill	6 th	2021

Reference Books:

Sr. No.	Title	Authors	Publisher	Edition	Year of edition
1	Numerical Methods for Chemical Engineering: Applications in MATLAB	Beers K J	Cambridge University Press	1 st	2006
2	Mathematical Modelling and Simulation in Chemical Engineering	Chidambaram M	Cambridge University Press	1 st	2018
3	Introduction to Chemical Engineering Computing	Finlayson B A	Wiley India	2 nd	2018
4	Numerical, Symbolic and Statistical Computing for Chemical Engineers using MATLAB	Ghosh P	PHI Learning	1 st	2018
5	Numerical Methods in Chemical Engineering Using Python® and Simulink®	Nayef Ghasem	CRC Press, Tyler and Francis	1 st	2024

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Fluid Mechanics

Course Details:

Class	SY Chemical Semester III			
Course Code and Course Title	0CHPCC202 Fluid Mechanics			
Perquisite's	Engineering Physics, Engineering Mathematics			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 3 Hr/Week	Tutorial --	Practical --	
Credit	3			
Evaluation Scheme	ISE I 10 Marks	MSE 20 Marks	ISE II 10 Marks	ESE 60 Marks

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Apply unit systems, dimensional analysis, and fluid statics principles to solve fluid problems.	3
CO2	Analyze fluid flow using Reynolds number, Bernoulli's equation, and momentum balance.	3
CO3	Compute friction and energy loss of incompressible fluid flow in pipes	3
CO4	Analyze drag force and fluidization behaviour in packed and fluidized beds.	3
CO5	Apply performance and power requirement criteria to select appropriate pumps, compressors, pipes, and valves for chemical engineering applications.	3
CO6	Apply flow measurement and mixing techniques using industrial flow devices and agitators.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	Unit systems and fluid statics: Physical quantities, conversion of Units, dimensional analysis, Application of dimensional analysis, Fluid statics and its applications: Nature of fluids, Hydrostatic equilibrium, Barometric equation, Hydrostatic equilibrium in centrifugal field, Manometers, Classification of flow, Newtonian and non-Newtonian Fluids, viscosity and momentum flux, viscosities of gases and liquids	6
2	Fluid flow phenomena: Behaviour of flowing fluid, Turbulence, Reynolds experiment, Eddy viscosity, Flow in boundary layers, Laminar and Turbulent flow in Boundary layers, Boundary layer in straight tubes, Boundary layer separation. Basic equations of fluid flow: Mass balance, momentum balance, Bernoulli's equation without, kinetic energy correction factor, correction for fluid friction and Pump work.	7
3	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. Laminar flow of Newtonian fluids in pipes. Average velocity, kinetic energy and Momentum correction factor, Hagen-Poiseuille equation. Turbulent flow in pipes. Velocity distribution for turbulent flow, Effect of roughness, The friction factor chart (Moody's diagram), friction factor in flow through section and from changes in velocity or direction, Effect of fittings and valves, Layer flow with free surfaces.	8
4	Flow past immersed bodies: Drag coefficients, form drag and streamlining, Friction in flow through beds of solids, Ergun's equation, Kozeny- Carman equation, Burke Plummer equation, Fluidization, Mechanism of fluidization, types of fluidization, minimum fluidization velocity, application of fluidization	6

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Unit	Contents	Hrs.
5	Transportation of fluids: Pipes and tubes; valves; accessories; pumps and compressors for transporting different fluids, power requirement for flow; piping layout and economic pipe diameter; vacuum producing devices.	7
6	Flow measuring devices and Agitation of fluids: Orifice meter; Venturimeter; rotameter; Pitot tube; anemometer; non-destructive flow measurement; Mixing and agitation, agitators, types of impellers, calculation of power numbers and mixing indices. Introduction to two phase flow.	5
Total Hours		39

Textbook:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Unit operations of Chemical Engineering.	McCabe W.L. and Smith J.C. and Harriott P.	Mcgraw Hill Book Co., International ed	7 th	2014
2	Chemical Engineering Vol. 1	Richardson J.E. and Coulson J.M.	Pergamon Press	6 th	1999
3	Transport Processes and Unit Operations.	Christie J. Geankoplis	Pearson College Div,	3 rd	1993
4	A Textbook of Fluid Mechanics and Hydraulic Machines' 2010	R.K.Bansal	Laxmi Publication (P) ltd, New Delhi,	9 th	2010

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Momentum Transfer Operations,	Gupta S.K.,	Tata McGraw Hill,	2 nd	1982
2	Chemical Engineering Vol. 4	Richardson J.E. and Coulson J.M.	Pergamon Press	6 th	1999
3	Fluid Flow for Chemical Engineers	Holland & Bragg,	Butterworth-Heinemann Ltd	2 nd	1995
4	Fluid Mechanics,	R. P. Vyas	Denett Publication.	3 rd	2016
5	Chemical Engineering Fluid mechanics,	A. P. Darby and Raj P. Chhabra,	Elsevier/ Butterworth Heinemann Publication,	3 rd	2022

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Mechanical Operations

Course Details:

Class	SY Chemical Semester III			
Course Code and Course Title	0CHPCC203 Mechanical Operations			
Prerequisite	Engineering Mathematics, Engineering Chemistry			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 3 Hr/week	Tutorial --	Practical --	
Credit	3			
Evaluation Scheme	ISE I 10 Marks	MSE 20 Marks	ISE II 10 Marks	ESE 60 Marks

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Implement the principles of screening and size reduction, including properties of solids and performance of various screening equipment.	3
CO2	Apply crushing laws and energy calculations to find the efficiency of size reduction equipment under different operating conditions.	3
CO3	Apply the concepts of drag force, terminal velocity, and Kynch theory to determine particle settling behaviour and sedimentation processes.	3
CO4	Apply mixing principles for performance evaluation of mixers.	3
CO5	Apply filtration principles for selection of industrial filtration equipment.	3
CO6	Select appropriate equipment for solid handling, conveying, separation, and filtration operations in chemical processes.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs
1	Screening of Solids –Properties of solids, Performance of screening equipment / testing sieves, U.S. sieve series, Tyler standard sieve series, sieve shaker, types of screen analysis	5
2	Size Reduction of Solids –Necessity of size reduction, crushing efficiency, energy requirement calculations by using crushing laws. Classification of size reduction equipment: Crushers, Grinders, Ultrafine grinders, Cutters. Dry versus wet grinding. Open and closed-circuit grinding.	6
3	Settling and Sedimentation – Motion of particles in fluid, drag force, drag coefficient. Gravity settling methods, Terminal falling velocity, Stoke’s law and Newton’s law of settling. Gravity sedimentation operations, Sedimentation test, Kynch theory, Determination of thickener area and depth of thickener. Thickeners, Clarifiers, Sedimentation centrifuges. Flotation cell, magnetic separator, cyclone separator, liquid cyclone, electrostatic separator, precipitator, scrubbers, fabric filter, mineral jig.	7
4	Mixing of Solids – Types of Impellers, flow patterns in un-baffled and baffled tanks, Draft tube, mechanically agitated vessel, power requirement in mixing, performance of mixers, Paste and viscous material mixing, solid-solid mixing, Batch and continuous mixers.	7
5	Filtration –Classification of filtration and filters. Theory of filtration Filter media and filter aids. Batch and continuous filters. Plate and frame filter press, filling and washing in a filter press, horizontal pressure leaf filters. Rotary drum vacuum filters. Centrifugal filters-basket type	7

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Unit	Contents	Hrs
6	Handling and Conveying of Solids – Storage of solids, characteristics of bulk solids, Conveyors: Principle, Construction and Working. Advantages, Disadvantages and design calculations of Belt Conveyors, Screw conveyors, Chain & Flight conveyors, Bucket elevators and Pneumatic conveyors.	7
Total Hours		39

Textbook:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Unit Operations in Chemical Engineering	McCabe W. L. & Smith J.C	McGraw Hill Publications.	7 th	2004
2	Chemical Engineering Vol. 2	Coulson J. M. And Richardson J.F	Pergamon Press	7 th	2003
3	Introduction to Chemical Engineering	Badger W. L and Banchemo J.T	McGraw Hill Publications.	1 st	1955
4	Unit operations	George G. Brown	CBS publishers and distributors.	1 st	2005

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Perry's Chemical Engineers' Handbook	Robert H. Perry & Don Green	McGraw Hill Publications	9 th	2019
2	Principles of Unit Operation	Foust A. S	Wiley India	2 nd	2010
3	Mechanical Operations for Chemical Engineers	C.M. Narayanan & B.C. Bhattacharya	Khanna Publishers	1 st	1990
4	Mechanical Operations, Vol. 1	P. Chattopadhyay	Khanna Publishers	1 st	1996

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Process Calculations

Course Details:

Class	SY Chemical Semester III			
Course Code and Course Title	0CHPCC204 Process Calculations			
Prerequisite	Engineering Physics, Chemistry, and Mathematics			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 3	Tutorial –	Practical –	
Credit	3			
Evaluation Scheme	ISE I 10 Marks	MSE 20 Marks	ISE II 10 Marks	ESE 60 Marks

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Apply unit systems, dimensional analysis, and mole concepts to perform accurate calculations involving composition of mixtures, density, and related physical properties.	3
CO2	Apply material balance principles to solve steady-state and unsteady-state systems without chemical reactions.	3
CO3	Analyze complex process systems involving recycle, bypass, and purge streams using process flow diagrams and systematic boundary identification.	4
CO4	Apply stoichiometric principles to perform material balances on reactive systems.	3
CO5	Compute energy balance equations for reactive and non-reactive systems.	3
CO6	Apply gas laws and vapour–liquid equilibrium principles to solve phase equilibrium problems.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	Basic Concepts and Units: Units and dimensions, Unit conversions and consistency, Dimensional analysis, Significant figures and scientific notation, Mole concept, molecular weight, atomic weight, Composition of mixtures: mass %, mole %, volume %, Density, specific gravity.	6
2	Material Balance – No Reaction Introduction to material balance, General mass balance equation, Steady-state and unsteady-state systems, Material balance for: Mixing processes, Separation processes (distillation, filtration, extraction).	8
3	Complex Material Balances: Material balance involving: Recycle, bypass, and purge streams, Multiple unit operations, Process flow diagrams (PFDs), System boundary identification, Industrial case studies	6
4	Material Balance – With Chemical Reactions: Stoichiometry and balanced equations, Limiting and excess reactants, Conversion, yield, and selectivity, Degree of completion of reaction, Material balance for reactive systems	6
5	Energy Balance: Forms of energy (kinetic, potential, internal), General energy balance equation Enthalpy and heat capacity, Energy balance for: Non-reactive systems, Reactive systems, Heat of reaction, formation, combustion, Adiabatic processes	6
6	Phase Equilibria and Thermodynamic Applications: Ideal gas law and real gas behaviour, Gas mixtures and partial pressures, Vapor pressure and phase equilibrium, Humidity and psychrometric calculations, Condensation and evaporation processes.	6
	Total Hours	39

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Textbook:

Sr. No.	Title	Author	Publication	Edition	Year of Edition
1	Stoichiometry	B.I. Bhatt, S.B. Thakore, and S.R. Shah	Mc Graw Hill	6 th	2021
2	Basic Principles and Calculations in Chemical Engineering	D.M. Himmelblau & J.B. Riggs	PHI Publications	8 th	2012
3	Stoichiometry and Process Calculations	K.V. Narayana & Lakshmikutty	PHI Publications	3 rd	2016
4	Elementary Principles of Chemical Processes	R.M. Felder & R.W. Rousseau:	Wiley Publications	4 th	2015

References Books:

Sr. No.	Title	Author	Publication	Edition	Year of Edition
1	Chemical Process Principles	Olaf A. Hougen and Kenneth M. Watson	CBS Publication	2 nd	2004
2	Process Calculations	V. Venkataramani, Anantharaman, & K.M.M.S.	PHI Publications	2 nd	2011
3	Handbook of Chemical Engineering Calculations	Nicholas P Chopey	Mc Graw Hill	4 th	2012

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Environmental Studies

Course Details:

Class	SY Chemical Semester III		
Course Code and Course Title	0CHVEC206 Environmental Studies		
Prerequisite	--		
Teaching Scheme	Lecture/	Tutorial	Practical
Tutorial/ Practical	Theory 2 Hr/Week	--	--
Credit	2		
Evaluation Scheme	ISE 50 Marks		

Course Outcomes (COs):		BL
Upon successful completion of this course, Student will be able to:		
CO1	Explain the components and importance of Environment, ecosystems and Bio-diversity	2
CO2	Discuss the various natural resources and strategies for their management	3
CO3	Explain the sources of pollution, effects and control measures	2
CO4	Apply the knowledge of EIA, EMS and Audits for the preparation of reports.	3

Course Syllabus

Unit	Contents	Hrs.
1.	Introduction to Environmental Studies: Definition, scope and importance, Components of environment, Multidisciplinary nature of environmental studies. Ecosystems- Types, Structure and function, energy flow, food chains and food webs. Biodiversity- Types, Importance and conservation	6
2.	Natural resources and Management: Natural resources- Forest, Water, Mineral food, Energy and Land. Energy resources- Renewable-Wind, Hydropower, Tidal, Ocean thermal, Solar, Biomass, Biogas, Geothermal and Hydrogen. Non-renewable- Coal Petroleum, Natural gas, Nuclear energy, Sustainable management of resources	6

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Unit	Contents	Hrs.
3.	Environmental pollution and climate change: Types of pollution- Water, Air, Solid waste, Soil and Noise, Sources, effects and control measures, Global effects of pollution	6
4.	EIA, EMS, Social issues and legislation Environmental Impact Assessment (EIA)- Purpose and process. Engineering Management Systems (EMS)-Principles and steps, Introduction to Environmental Audit and Green audit	
	Total Hours	24

Textbook /Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Ecological and Environmental studies	S.K.Garg	Khanna publishers	1 st	2006
2	Essentials of Environmental studies	Kurian Joseph and R. Nagendran	Pearson Education, Singapore	2 nd	2004
3	Environmental studies	Dr.Suresh K. Dhameja	Katson books	4 th	2012
4	Environmental studies	Dr.P.D. Raut	Shivaji University, Kolhapur	4 th	2012

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Principles of Management

Course Details: -

Class	SY Chemical Semester III		
Course Code and Course Title	0CHHSSM207 Principles of Management		
Prerequisite	--		
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 2 Hr/Week	Tutorial --	Practical --
Credit	2		
Evaluation Scheme	ISE 50 Marks		

Course Outcomes (COs):		BL
Upon successful completion of this course, Student will be able to:		
CO1	Describe the evolution of management thoughts and the functions of a manager in a modern organization.	2
CO2	Illustrate the planning process and decision-making techniques applicable to engineering projects.	3
CO3	Analyze various organizational structures and the importance of human resource management.	4
CO4	Apply motivation theories, leadership styles, communication practices, and control techniques for effective organizational management.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus

Unit	Contents	Hrs.
1.	<p>Introduction to Management</p> <p>Evolution of Management: Classical, Neo-classical, and Modern approaches (Taylor, Fayol, and Mayo). Management Defined: Functions, roles, and skills of a manager. Ethics & Social Responsibility: Corporate Social Responsibility (CSR) in the Indian context; professional ethics for engineers.</p> <p>Types of Business Organizations: Sole proprietorship, Partnership, Private and Public Limited companies.</p>	6
2.	<p>Planning and Decision Making</p> <p>Nature and Purpose of Planning: Steps in planning; Types of plans (Strategic, Tactical, Operational). MBO: Management by Objectives – process and benefits. Decision Making: Process, types of decisions, and decision-making under certainty/uncertainty. Tools: SWOT analysis and its application in engineering startups.</p>	6
3.	<p>Organizing and Human Resource Management</p> <p>Organizing: Nature and purpose; Formal vs. Informal organization.</p> <p>Structure: Line, Staff, Functional, and Matrix organizations.</p> <p>Authority & Responsibility: Centralization vs. Decentralization; Delegation of authority. HRM Basics: Overview of recruitment, selection, training, and performance appraisal.</p>	6

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Unit	Contents	Hrs.
4.	Leading and Controlling Motivation: Maslow's Hierarchy of Needs and Herzberg's Two-Factor theory. Leadership: Styles (Autocratic, Democratic, Laissez-faire); Situational leadership. Communication: Barriers to effective communication; Professional communication in the workplace. Controlling: The control process; Types of control (Feed-forward, Concurrent, and Feedback); Introduction to Quality Management (TQM).	6
Total Hours		24

Textbook / Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Essentials of Management: An International, Innovation, and Leadership Perspective	Harold Koontz and Heinz Weihrich	McGraw Hill Education	11 th	2020
2	Principles of Management	P.C. Tripathi and P.N. Reddy	Tata McGraw Hill	7th Edition	2021
3	Management	Stephen Robbins and Mary Coulter	Pearson Education	15th Edition	2020
4	Principles of Management	Dinkar Pagare	Sultan Chand & Sons	6th Revised Edition	2018

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Fluid Mechanics Laboratory

Course Details:

Class	SY Chemical Semester III		
Course Code and Course Title	0CHPCC208 Fluid Mechanics Laboratory		
Prerequisite	Prior knowledge of engineering mathematics, physics		
Teaching Scheme Lecture/ Tutorial/ Practical	Theory --	Tutorial --	Practical 2 Hr/Week
Credit	1		
Evaluation Scheme	ISE 50 Marks	ESE 50 Marks	

Course Outcomes (COs):		BL
Upon successful completion of this course, the student will be able to:		
CO1	Apply fluid statics and dynamics using basic experiments.	2
CO2	Evaluate pressure drop in pipes and fittings. .	3
CO3	Analyze flow through packed and fluidized beds.	3
CO4	Assess performance of pumps and blowers.	3
CO5	Measure flow using standard flow meters.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

List of Practical's:

Expt. No.	Experiment List	Duration In Hrs
1	To study the Bernoulli Theorem.	2
2	To study the Reynolds experiment.	2
3	To study the Flow through pipes.	2
4	To study the Flow through expander and reducer.	2
5	To study the Flow through bend and elbow.	2
6	To study the Flow through Packed bed.	2
7	To study the Flow through fluidized bed.	2
8	To study the Centrifugal pump characteristics.	2
9	To study the Reciprocating pump characteristics.	2
10	To determine the Efficiency of blower.	2
11	To determine coefficient of discharge of orifice meter	2
12	To determine coefficient of discharge of venturi meter.	2
13	Calibration of Rotameter.	2

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Textbook:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Unit operations of Chemical Engineering.	McCabe W.L. and Smith J.C. and Harriott P.	McGraw Hill Book Co., International ed	7 th	2014
2	Chemical Engineering Vol. 1	Richardson J.E. and Coulson J.M.	Pergamon Press	6 th	1999
3	Transport Processes and Unit Operations.	Christie J. Geankoplis	Pearson College Div,	3 rd	1993
4	A Textbook of Fluid Mechanics and Hydraulic Machines' 2010	R.K.Bansal	Laxmi Publication (P) ltd, New Delhi,	9 th	2010

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Momentum Transfer Operations,	Gupta S.K.,	Tata McGraw Hill,	2 nd	1982
2	Chemical Engineering Vol. 4	Richardson J.E. and Coulson J.M.	Pergamon Press	6 th	1999
3	Fluid Flow for Chemical Engineers	Holland & Bragg,	Butterworth-Heinemann Ltd	2 nd	1995
4	Fluid Mechanics,	R. P. Vyas	Denett Publication.	3 rd	2016
5	Chemical Engineering Fluid mechanics,	A. P. Darby and Raj P. Chhabra,	Elsevier/ Butterworth Heinemann Publication,	3 rd	2022

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Mechanical Operations Laboratory

Course Details:

Class	SY Chemical Semester III		
Course Code and Course Title	0CHPCC209 Mechanical Operations Laboratory		
Prerequisite	Engineering Mathematics, Engineering Chemistry, Engineering Physics,		
Teaching Scheme Lecture/ Tutorial/ Practical	Theory --	Tutorial --	Practical 2 Hr/Week
Credit	1		
Evaluation Scheme	ISE 50 Marks	ESE 50 Marks	

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Explain the principles of screening and size reduction, including properties of solids and performance of various screening equipment.	2
CO2	Apply crushing laws and energy calculations to evaluate the efficiency of size reduction equipment under different operating conditions.	3
CO3	Analyze particle settling behaviour and sedimentation processes using concepts such as drag force, terminal velocity, and Kynch theory.	4
CO4	Examine the performance of mixing, agitation, and filtration systems for different types of materials and industrial requirements.	4
CO5	Select appropriate equipment for solid handling, conveying, separation, and filtration operations in chemical processes.	2

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

List of Practical's:

Expt. No.	Experiment List	Duration In Hrs
1	To determine effectiveness of a given set of standard screens.	2
2	To determine energy consumption, crushing law constants for jaw crushers.	2
3	To determine energy consumption , crushing law constants for Hammer mill.	2
4	To determine Critical speed of Ball mill & Average particle size of the product obtained in ball mill.	2
5	To calculate Specific Surface Area, Volume Surface Mean Diameter, Mass Mean Diameter, Volume Mean Diameter of a given sample.	2
6	To determine the mixing Index of a mixture in Ribbon Blender.	2
7	To determine specific cake resistance and filter medium resistance for a given system using leaf filter equipment.	2
8	To determine area of batch thickener by conducting batch Sedimentation test.	2
9	To determine separation efficiency by using a froth flotation cell.	2
10	To determine collection efficiency of Cyclone separator for various particle sizes and pressure drop.	2

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Textbooks:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Unit Operations in Chemical Engineering	McCabe W. L. & Smith J.C	McGraw Hill Publications.	7	2004
2	Chemical Engineering Vol. 2	Coulson J. M. and Richardson J.F	Pergamon Press	7	2003
3	Introduction to Chemical Engineering	Badger W. L and Banchemo J.T	McGraw Hill Publications.	1	1955
4	Unit operations	George G. Brown	CBS publishers.	1	2005

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Perry's Chemical Engineers' Handbook	Robert H. Perry & Don Green	McGraw Hill Publications	9	2019
2	Principles of Unit Operation	Foust A. S	Wiley India	2	2010
3	Mechanical Operations for Chemical Engineers	C.M. Narayanan & B.C. Bhattacharya	Khanna Publishers	1	1990
4	Mechanical Operations, Vol. 1	P. Chattopadhyay	Khanna Publishers	1	1996

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Community Engagement Project

Course Details:

Class	SY Chemical Semester III		
Course Code and Course Title	0CHCEP210 Community Engagement Project		
Prerequisite	Eng. Physics, Eng. Chemistry, Design Thinking		
Teaching Scheme Lecture/ Tutorial/ Practical	Theory --	Tutorial --	Practical 2 Hr/Week
Credit	1		
Evaluation Scheme	ISE 50 Marks		

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Understand environmental and social issues to identify community problems through field surveys and visits.	1
CO2	Recognize teamwork, leadership, communication, and ethical responsibility while working with diverse community groups.	2
CO3	Apply feasible and sustainable solutions to address identified community problems using interdisciplinary engineering knowledge.	3
CO4	Evaluate the impact of community interventions and suggest improvements based on knowledge and observations.	2
CO5	Solve community needs and propose practical solutions for identified problems.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	<p>Introduction:</p> <p>Each batch/group of students is expected to work on a Community Project. For a community project group has to consider any problem statement and find solutions to those problems which should be helpful to the community. Students shall identify community needs, planning interventions, implementing solutions, and evaluating outcomes with active participation from both students and community members. Students groups shall submit project report in a systematic technical format about the project. The report shall be checked and evaluated by the concerned teacher (Guide).</p> <p>Focus Areas:</p> <p>The CEP should focus on addressing a specific community or societal issues. Projects may fall under the following themes:</p> <ol style="list-style-type: none"> 1. Education and Awareness: Conduct workshops or awareness drives on topics like digital literacy, environmental sustainability, or career planning for local stakeholders. 2. Technology for Social Good: Develop a simple prototype or solution that addresses a real world problem. 3. Environmental Sustainability: Waste management, Organize clean-up drives, tree plantations, reduce, reuse and recycle campaigns, or energy conservation techniques. 4. Skill Development: Teach basic computer or technical skills to students, staff, or the community. 	26

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Unit	Contents	Hrs.
	<p>Steps:</p> <p>1. Planning Phase:</p> <p>a. Team Formation: A team or group of 3-4 students with a balance of skills and interests.</p> <p>b. Project Selection: Choose a project theme with a clear aim that aligns with the objective of CEP.</p> <p>c. Proposal Submission: Submit a one-page summary of proposed project.</p> <p>2. Execution Phase:</p> <p>a. Phase 1 Activities</p> <ul style="list-style-type: none"> · Conduct initial outreach and engage with the community or target participants. · Implement planned activities with close teamwork and documentation. <p>b. Phase 2 Activities</p> <ul style="list-style-type: none"> · Continue engagement and collect feedback from the participants. · Begin summarizing the outcomes of the project. <p>3. Reporting Phase:</p> <p>a. Create a detailed report containing:</p> <ul style="list-style-type: none"> · Title, objective, and scope of the project. · Activities conducted · Outcomes and community feedback. · Photos/videos of the activities (if permitted). · Challenges faced and how they were addressed. <p>b. Presentation:</p> <ul style="list-style-type: none"> · Each team will present their project to a panel of faculty members or peers, showcasing their efforts and outcomes. 	
	Total Hours	26

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Reference Books:

Sr. No.	Name of Book	Authors	Publisher	Edition	Year of Edition
1	Principles Of Community Engagement	Elizabeth Cohn RN	CDC US	1 st	2016
2	Service-Learning Essentials: Questions, Answers, and Lessons Learned	Barbara Jacoby	John Wiley & Sons	1 st	2014
3	Engineering and Sustainable Community Development	Juan C. Lucena, Jen Schneider, Jon A. Leydens.	Morgan & Claypool Publishers	2 nd	2010
4	Building with the Community: Engineering Projects to Meet the Needs of Both Men and Women	Brian Reed	WEDC, Loughborough University	1 st	2005
5	Community engagement in higher education: trends, practices and policies Analytical report	Thomas Farnell	European Union	1 st	2020

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

MDM-I Environmental Engineering & Pollution Control

Course Details:

Class	SY Chemical Semester III			
Course Code and Course Title	0CHMDM205 Environmental Engineering & Pollution Control			
Prerequisite	Engineering Chemistry			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 3	Tutorial	Practical	
Credit	3			
Evaluation Scheme	ISE 10 Marks	MSE 20 Marks	ISE 10 Marks	ESE 60 Marks

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Explain water quality parameters and standards	2
CO2	Apply principles to design basic wastewater treatment units.	3
CO3	Explain air pollution and dispersion concepts.	2
CO4	Apply methods to select pollution control equipment.	3
CO5	Analyze solid and hazardous waste management methods.	4
CO6	Analyze noise and thermal pollution impacts.	4

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	Water Quality & Chemistry: Standards for drinking and industrial water; pH, BOD, COD, and dissolved solids.	6
2	Wastewater Treatment: Design of primary (sedimentation), secondary (activated sludge), and tertiary treatment units.	6
3	Air Pollution Fundamentals: Atmospheric dispersion models; chemistry of SO _x , NO _x , and CO ₂ .	6
4	Particulate & Gaseous Control: Operation of cyclones, ESPs, and scrubbers; VOC control technologies.	6
5	Solid Waste & Hazardous Waste: Landfill engineering; incineration vs. pyrolysis; radioactive waste management.	6
6	Noise & Thermal Pollution: Industrial noise mapping; cooling tower design; environmental impact assessments (EIA).	6
	Total hrs.	36

Textbook:

Sr. No.	Title	Authors	Publisher	Edition	Year of Edition
1	A Textbook of Environmental Chemistry and Pollution Control	Dara, S.S. & Mishra, D.D.	S. Chand Publishing	Revised	2026
2	Environmental Pollution Control Engineering	Rao, C.S.	New Age International	4	2022
3	Introduction to Environmental Engineering and Science	Masters, G.M. & Ela, W.P.	Pearson Education	3	2008
4	Textbook of Environmental Engineering	Rao, P. Venugopala	PHI Learning	1	2019
5	Environmental Engineering: Fundamentals, Sustainability, Design	Mihelcic, J.R. & Zimmerman, J.B	Wiley	2	2014

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Reference books:

Sr. No.	Title	Authors	Publisher	Edition	Year of Edition
1	Introduction to Environmental Engineering	Davis, M.L. & Cornwell, D.A.	McGraw-Hill	5	2012
2	Wastewater Engineering: Treatment and Resource Recovery	Metcalf & Eddy	McGraw-Hill	5	2014
3	Air Pollution Control Engineering,	De Nevers, N.	McGraw-Hill	3	2016
4	Environmental Engineering: Fundamentals, Sustainability, Design	Mihelcic, J.R. & Zimmerman, J.B.	Wiley	2	2014
5	Principles of Environmental Engineering and Science	Mackenzie, D.	McGraw-Hill	3	2007

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director



Dr. Vasanthaodada Patil Shetkari Shikshan Mandal's
**PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF
 TECHNOLOGY, BUDHGAON, SANGLI 416304**

An Autonomous Institute, affiliated to Dr. Babasaheb Ambedkar Technological University, Raigad
Department of Chemical Engineering

S.Y. B.Tech. Semester IV Chemical Engineering

With Effect from Academic Year 2026-27

Course Code	Course Name	Teaching Scheme				Evaluation Scheme					Total
		L	T	P	Credit	Scheme	Theory		Practical		
							Max	Minimum Marks for Passing	Max	Minimum Marks for Passing	
0CHPCC251	Chemical Engineering Thermodynamics-I	3	1	0	4	ISE1	10	40	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0CHPCC252	Heat Transfer	3	0	0	3	ISE1	10	40	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0CHPCC253	Process Instrumentation and Analytical Techniques	3	0	0	3	ISE1	10	40	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0CHPCC254	Plant Utility and Pollution Control	3	0	0	3	ISE1	10	40	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0CHMDM255	MDM-II	3	0	0	3	ISE1	10	40	-	-	100
						MSE	20				
						ISE2	10				
						ESE	60				
0CHOE256	Open Elective-I	2	0	0	2	ISE	50	20	-	-	50
0CHAEC257	Soft Skills	0	0	2	1	ISE	25	10	-	-	25
0CHVEC258	Universal Human Values	2	0	0	2	ISE	50	20	-	-	50
0CHVSEC259	Computational Techniques Laboratory	0	0	2	1	ISE	-	-	25	10	25
0CHPCC260	Heat Transfer Laboratory	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
0CHPCC261	Instrumentation and Analytical Laboratory	0	0	2	1	ISE	-	-	50	20	50
						ESE	-	-	50	20	50
TOTAL		19	1	8	24	TOTAL MARKS					850
Total Contact Hours Per Week		28									

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandayaji
Dean Academics

Dr. S. S. Mohite
Director



Dr. Vasanttraodada Patil Shetkari Shikshan Mandal's
**PADMABHOOSHAN VASANTRAODADA PATIL INSTITUTE OF
 TECHNOLOGY, BUDHGAON, SANGLI 416304**
 An Autonomous Institute, affiliated to Dr. Babasaheb Ambedkar Technological University, Raigad
Department of Chemical Engineering

Course Category	BSC	ESC	PCC	PEC	MD M	OE	VSE C	AE C	HSS M	IKS	VE C	RM	CEP	PR	OJT	CC	Total
Credit	-	-	15	-	3	2	1	1	-	-	2	-	-	-	-	-	24
Cumulative	16	19	26	-	6	2	4	4	2	2	4	-	1	-	-	1	87

Multidisciplinary Minor Bucket offered by Chemical Engineering

MDM-II (SEM – IV)	0CHMDM255	Introduction to Sustainable Energy Systems
-------------------	-----------	--

Open Elective-I offered by Chemical Engineering

0CHOE256	Introduction to AI in Process Industries
----------	--

***Passing Criteria:** - ISE + MSE + ESE \geq 40% Marks and ESE has separate passing \geq 40% Marks.

List Open Elective for Semester-IV

Sr. No.	Department offering Open Elective to other Departments	Course Code	Course Title
1	Artificial Intelligence and Data Science	0AIOE256	Prompt Engineering
2	Civil Engineering	0CVOE256	Disaster Management
3	Chemical Engineering	0CHOE256	Introduction to AI in Process Industries
4	Computer Science and Engineering	0CSOE256	Information Security
5	Electrical and Computer Engineering	0ECEOE256	Sustainable Power Generation
6	Electronics and Computer Science	0ECSOE256	Intellectual Property Rights
7	Electronics and Telecommunication	0ETOE256	Digital Marketing
8	Instrumentation and Control Engineering	0ICOE256	Industrial Economics
9	Mechanical Engineering	0MEOE256	Industrial Safety

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Chemical Engineering Thermodynamics-I

Course Details:

Class	SY Chemical Semester IV			
Course Code and Course Title	0CHPCC251 Chemical Engineering Thermodynamics-I			
Prerequisite	Process Calculation, Fluid Mechanics			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 3 Hr/Week	Tutorial 1 Hr/Week	Practical --	
Credit	4			
Evaluation Scheme	ISE I 10 Marks	MSE 20 Marks	ISE II 10 Marks	ESE 60 Marks

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Explain the application of the First Law of Thermodynamics to energy changes in closed and open systems.	2
CO2	Interpret the volumetric properties of pure fluids using PVT equations of state.	2
CO3	Compute sensible heat and standard heats of reaction, formation, and combustion.	3
CO4	Calculate entropy changes and lost work using the Second and Third Laws.	3
CO5	Determine thermodynamic parameters for compressible duct flow, turbines, and compression processes.	3
CO6	Describe residual properties of fluids and their estimation using equations of state.	2

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	Introduction to thermodynamics: Dimensions and units; Measures of Amount or size; Force; Temperature; Pressure; Work; Energy; Heat. The first law of thermodynamics: Joule's Experiments; Internal Energy; The First Law of Thermodynamics: Energy balance for closed systems; Thermodynamic state and state functions; Equilibrium; The phase rule; The reversible process; Constant V and constant P processes; Enthalpy; Heat capacity; Mass and energy balances for open systems.	6
2	Volumetric properties of pure fluids: PVT Behaviour of pure substances; the Virial Equation; The Ideal Gas; Application of the Virial Equation; Cubic Equations of State; Generalised Correlations for gases; Generalised correlations for Liquids.	8
3	Heat effects: Sensible Heat Effects, Heat Effects Accompanying Phase Changes of Pure Substances, The Standard Heat of Reaction, The Standard Heat of Formation, The Standard Heat of Combustion, Effect of Temperature on the standard Heat of Reaction.	7
4	The second law of thermodynamics: Statement of the Second law: The Heat Engine; Thermodynamic Temperature Scales; Entropy; Entropy changes of an ideal gas; Mathematical statement of the Second Law; Entropy balance for open systems; Calculation of ideal work; Lost work; The Third Law of Thermodynamics; Entropy from the Microscopic view point.	6
5	Applications of thermodynamics to flow processes: Duct flow of compressible fluids; Turbines (expanders); Compression processes.	6
6	Thermodynamic Properties of Fluids: Property Relations for Homogeneous phase; Residual Properties; Residual properties by equations of state; Generalised property correlations for gases.	6
	Total Hours	39

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Textbook/ Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Chemical Engineering Thermodynamics	J. M. Smith, H.C. Van Ness, and M.M. Abbott	Tata McGraw Hill	6 th	2003
2	Chemical Engineering Thermodynamics	Y. V. C. Rao	University Press	1 st	2003
3	Chemical and Engineering Thermodynamics	Stanley I. Sandler	John Wiley & Sons	3 rd	1998
4	A Text Book of Chemical Engineering Thermodynamics	K.V. Narayanan	PHI Learning Pvt. Ltd	1 st	2013
5	Chemical Thermodynamics for Process Simulation	J. Gmehling, M. Kleiber, B. Kolbe, and J. Rarey	Wiley VCH	2 nd	2019

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Heat Transfer

Course Details:

Class	SY Chemical Semester IV			
Course Code and Course Title	0CHPCC252 Heat Transfer			
Prerequisite	Engineering Physics, Mathematics			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 3 Hr/Week	Tutorial Hr/Week	Practical --	
Credit	3			
Evaluation Scheme	ISE I 10 Marks	MSE 20 Marks	ISE II 10 Marks	ESE 60 Marks

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Describe heat transfer mechanisms and the concepts of steady-state and unsteady-state heat conduction.	2
CO2	Solve problems related to natural and forced convection heat transfer systems using the principles of convective heat transfer.	3
CO3	Apply heat transfer principles to condensation and boiling processes and determine heat transfer coefficients.	3
CO4	Describe basic laws of radiation and determine radiation heat transfer in different systems.	2
CO5	Employ heat transfer principles to determine operating parameters and perform basic design calculations for heat exchange equipment.	3
CO6	Calculate the performance parameters of single-effect and multiple-effect evaporators using mass and energy balance principles.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	Mechanism of Heat Flow and Heat Transfer by Conduction in Solids: Introduction to Conduction, Convection, Radiation. Fourier's law, steady state heat conduction through single and multilayer. walls, cylinder and Sphere, Unsteady state heat conduction, lumped heat capacity system, transient heat flow in a semi-infinite solid, Concept of critical insulation thickness.	7
2	Principles of Heat Flow in Fluids and Heat Transfer to Fluids without Phase Change: Typical heat exchange equipment, co-current and counter current flow. LMTD. Energy balances, overall and individual heat transfer coefficient. fouling factors. Transfer units in heat exchangers. Thermal and hydrodynamic boundary layer. Dimensional analysis method, empirical equations, heat transfer by forced convection in laminar flow, turbulent flow and transition region. Laminar flow heat transfer to flat plate. Analogy equations, heat transfer to liquid metals. Heat transfer by natural convection.	8
3	Heat Transfer to Fluids with Phase Change: Heat transfer from condensing Vapours, drop-wise and film wise condensation, coefficients for film type condensation. Heat transfer to boiling liquids: Types of boiling, Pool boiling of saturated liquid maximum flux and critical temperature drop, minimum heat flux film boiling and subcooled boiling.	7
4	Radiation Heat Transfer: Fundamentals of radiation, wavelength of radiation. Emissivity. Laws of black body radiation, reflectivity, absorptivity of an opaque solids, Kirchhoff's law, Radiation between two surfaces. Calculation of radiation between black surfaces, combined heat transfer by conduction - convection and radiation.	6

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Unit	Contents	Hrs.
5	Heat Exchange Equipment: Types of heat exchangers, single and multi-pass shell and tube exchangers, correction of LMTD. Simple design calculations of heat exchangers, introduction to compact heat exchanger, different types of condensers and boilers, air cooled heat exchangers, Introduction to heat transfer in agitated vessel and packed bed. Extended surface equipments, definition of fin efficiency.	6
6	Evaporation: Liquid characteristics, types of evaporators, capacity, economy, boiling point elevation and Duhring's rule. Enthalpy balance for single effect evaporator, multiple effect evaporators, types, methods of feeding, enthalpy balance of multiple effect evaporator.	5
Total Hours		39

Textbook:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Unit operations of Chemical Engineering.	McCabe W.L. and Smith J.C. and Harriott P.	Mcgraw Hill Book Co., International ed	7 th	2014
2	Chemical Engineering Vol. 1	Richardson J.E. and Coulson J.M.	Pergamon Press	6 th	1999
3	Transport Processes and Unit Operations.	Christie J. Geankoplis'	Pearson College Div,	3 rd	1993
4	Heat Transfer	Sukhatme S.P.	University Press India Ltd.	4 th	2005
5	Heat Transfer: Principles and Applications	Binay K. Dutta	PHI Learning Pvt. Ltd	2 nd	2002

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

References:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Heat transmission	William H. McAdams	Tata McGraw Hill, Series	3 rd	1979
2	Chemical Engineering Vol. 4	Richardson J.E. and Coulson J.M.	Pergamon Press	6 th	1999
3	Heat Transfer	J.P. Holman,	McGraw-Hill series in mechanical engineering	10 th	2010
4	Heat Transfer,	Alan J. Chapman	Macmillan Publishing Company, New York	4 th	2016
5	Principles of Heat Transfer	Frank Kreith& Mark S. Bohn.	Harper and Row Publishers, New York,	7 th	2018

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Process Instrumentation and Analytical Techniques

Course Details: -

Class	SY Chemical Semester IV			
Course Code and Course Title	0CHPCC253 Process Instrumentation and Analytical Techniques			
Prerequisite	Engineering Physics, Engineering Chemistry, Fluid Mechanics			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 3 Hr/Week	Tutorial --	Practical --	
Credit	3			
Evaluation Scheme	ISE I 10 Marks	MSE 20 Marks	ISE II 10 Marks	ESE 60 Marks

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Explain the principles, elements, and static & dynamic characteristics of measurement systems and instruments.	2
CO2	Describe the working and applications of temperature, pressure, flow, and liquid level measuring instruments.	2
CO3	Apply appropriate measurement techniques and analytical methods (spectrophotometry, conductometry, and chromatography) for quantitative analysis.	3
CO4	Apply the principles of conductometry, nephelometry, turbidimetry, and refractometry for quantitative analysis.	3
CO5	Explain the principles, classification, and theoretical concepts of chromatography and spectroscopy.	2
CO6	Apply chromatographic techniques such as gas chromatography (GC) and high-performance liquid chromatography (HPLC) for separation and analysis.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	Introduction of process Instrumentation: Characteristics of Measurement System -Elements of instruments, static and dynamic characteristics, basic concepts of response of first order type instruments, mercury in glass thermometer, bimetallic thermometer, pressure spring thermometer, static accuracy and response of thermometers. Pressure Measurement- Pressure, vacuum and head manometers, measuring elements for gage pressure and vacuum, measuring pressure in corrosive liquids, measuring of absolute pressure, static accuracy and response of pressure gauges.	8
2	Temperature measurement: Introduction, methods of temperature measurement by expansion filled system thermometers, electrical temperature instruments, pyrometers. Calibration of Thermometers.	6
3	Liquid level measurement: Introduction, Methods of liquid level measurement by direct methods, indirect methods, electrical methods, level of dry materials.	6
4	Introduction to instrumental methods of analysis: General Introduction, classification of instrumental methods, spectroscopy, properties of electromagnetic radiation, electromagnetic spectrum.	4
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, numerical.	6

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Unit	Contents	Hrs.
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.	6
Total Hours		36

Textbook:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Industrial Instrumentation & Control	S. K. Singh	Tata McGraw Hill publishing company Ltd, New Delhi	2 nd	2000
2	Principals of industrial instrumentation	D. Pastranabis	Tata McGraw Hill publishing company Ltd, New Delhi	2 nd	2003
3	Instrumental method of chemical analysis	G. R. Chatwal, S.K. Anand	Himalaya Publishing House, Mumbai	5 th	2002.
4	Instrumental methods of analysis	Willard H.H	CBS Publication New Delhi	6 th	1986

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandyaji
Dean Academics

Dr. S. S. Mohite
Director

References Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Industrial Instrumentation	Eckman D.P.	Willey Eastern Ltd, New Delhi,	1 st	1984.
2	Techniques in Instrumentation	A.C. Shrivastav	New Delhi,	1 st	1984.
3	Process Instrumentation, Dynamics and control for Engineers	Ray Choudhuri and Ray Choudhuri	Asian Books Pvt Ltd, New Delhi	1 st	2003.
4	Instrumental Methods of Chemical Analysis	Galen W. Ewing,	Instrumental McGraw Hill Book Company, Singapore	5 th	1990.
5	Principal of Instrumental Analysis	D. A. Skoog.	Southern Pro, Japan	1 st	1984

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Plant Utility and Pollution Control

Course Details:

Class	SY Chemical Semester IV			
Course Code and Course Title	0CHPCC254 Plant Utility and Pollution Control			
Prerequisite	Engineering Chemistry, Fluid Mechanics, Mechanical Operations.			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 3 Hr/Week	Tutorial --	Practical --	
Credit	3			
Evaluation Scheme	ISE I 10 Marks	MSE 30 Marks	ISE II 10 Marks	ESE 50 Marks

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Explain common plant utilities and pollution control systems.	2
CO2	Describe boiler operation, steam generation, waste heat recovery, and steam distribution.	2
CO3	Explain the principles of refrigeration and vacuum generation using refrigerants, pumps, and ejectors.	2
CO4	Identify suitable air pollution control methods and equipment for controlling particulate and gaseous emissions.	2
CO5	Apply appropriate wastewater treatment processes based on water pollutants and wastewater characteristics for effective water pollution control.	3
CO6	Describe suitable solid and hazardous waste management methods for safe handling, treatment, and disposal.	2

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	Identification of common plant utilities: water, compressed air, steam, vacuum, refrigeration, venting, flaring and pollution abating. Water and its quality, storage and distribution for cooling and firefighting.	7
2	Steam generation by boilers: Types of boilers and their operation, Steam generation by utilizing process waste heat using thermic fluids, Distribution of steam in a plant	7
3	Principles of refrigeration: Creation of low temperature using various refrigerants. Creation of low pressure/vacuum by pumps and ejectors.	5
4	Air pollution control methods & equipment: Control methods, Source correction methods, Cleaning of gaseous effluents, Particulate emission control, Selection of a particulate collector, Control of gaseous emissions, Design methods for control equipment.	7
5	Water pollution: Water resources, Origin of wastewater, types of water pollutants and their effects. Waste water sampling, analysis and treatment: Sampling, Methods of analysis, Determination of organic matter, Determination of inorganic substances, Physical characteristics, Bacteriological measurement, Basic processes of water treatment, Primary treatment, Secondary treatment, Advanced wastewater treatment, Recovery of materials from process effluents.	7
6	Solid waste management: Sources and classification, public health aspects, Methods of collection, Disposal Methods, Potential methods of disposal. Hazardous waste management: Definition and sources, Hazardous waste classification, Treatment methods, Disposal methods	6
	Total Hours	39

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandya
Dean Academics

Dr. S. S. Mohite
Director

Textbook:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Refrigeration and Air Conditioning	C.P. Arora	McGraw-Hill	3	2009
2	Chemical Hazards and safety	S.D. Dawande	Dennet& Co publishers	1	2007
3	Environmental Pollution Control Engineering	Rao C. S.	Wiley Eastern Limited, India	2	2006
4	Air Pollution and Control Engineering	Rao M.N. and Rao H.V. N.	McGraw Hill Publishing Ltd	2	2000

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Chemical Engineering Vol. 2 (Unit Operations)	J.M. Coulson, J.F. Richardson	Elsevier	5 th	2002
2	Environmental Engineering	Peavy, Row, Tchobanoglous	McGraw-Hill	1 st	1985
3	Industrial Pollution Control Engineering	C.S. Rao	New Age International	2 nd	2006
4	Boiler Operation Engineering	P. Chattopadhyay	McGraw-Hill	4 th	2017
5	Solid Waste Engineering	William A. Worrell, P. Aarne Vesilind	Cengage Learning	2 nd	2011
6	Hazardous Waste Management	Michael D. LaGrega	Waveland Press	2 nd	2010

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Soft Skills

Course Details:

Class	SY Chemical Semester IV		
Course Code and Course Title	0CHAEC257 Soft Skills		
Prerequisites	Communication Skills		
Teaching Scheme Lecture/ Tutorial/ Practical	Theory --	Tutorial --	Practical 2 Hr/Week
Credit	1		
Evaluation Scheme	ISE 25 Marks		

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Understand the importance of professional and soft skills required for engineering graduates.	2
CO2	Apply effective communication skills for collaboration in professional environments.	3
CO3	Demonstrate knowledge of professionalism, ethics, and workplace values.	3
CO4	Apply management principles and leadership skills in team-based situations.	3
CO5	Utilize negotiation techniques and professional communication	3
CO6	Demonstrate effective presentation, public speaking, and participation in meetings and discussions.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Laboratory Syllabus:

Unit	Contents
1	Fundamentals of Professional Skills: Importance of soft skills for engineering graduates, Types of skills: Technical vs. Non-technical skills, Self-awareness and personality development, Goal setting and career planning, Professional behaviour and workplace etiquette
2	Communication Skills for Collaboration: Basics of communication: Process, barriers, and effectiveness, Verbal and non-verbal communication, Listening skills and interpersonal communication, Team communication and collaboration techniques, Cross-cultural communication
3	Professionalism and Ethics: Concepts of professionalism, Engineering ethics and code of conduct, Workplace values and integrity, Corporate social responsibility (CSR), Case studies on ethical dilemmas
4	Management and Leadership Skills: Introduction to management principles, Leadership styles and qualities of a good leader, Team building and motivation, Conflict management, Decision-making techniques
5	Negotiation and Workplace Communication: Fundamentals of negotiation and persuasion, Negotiation strategies and techniques, Business communication: Emails and telephone etiquette, writing professional emails and reports, Handling difficult conversations
6	Presentation and Public Speaking Skills: Presentation skills for seminars and conferences, use of audio-visual aids, public speaking techniques and speech delivery, Confidence building and overcoming stage fear, Participation in meetings, group discussions, and giving suggestions

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandyaji
Dean Academics

Dr. S. S. Mohite
Director

List of Practical's:

Expt. No.	Experiment List	Duration In Hrs.
1	To acquire the various types of skills which are essential for Engineering graduate.	2
2	To obtained the techniques of communication skills for Collaboration.	2
3	To know the many aspects of professionalism and professional ethics.	2
4	To acquire several aspects of Management and Leadership styles.	2
5	To develop the skills required for the successful negotiation.	2
6	To develop the skills to communicate effectively over the phone and emails	2
7	To acquire presentation skills in seminar, conferences and professional meetings.	2
8	To develop confidence and skills in giving speeches.	2
9	To develop professional working style efficiently and effectively.	2
10	To focus on effective participation in meetings, and making suggestions.	2

Textbook:

Sr. No.	Name of Book	Authors	Publisher	Edition	Year of edition
1	Technical Communication	Meenakshi Raman, Sangeeta Sharma,	Oxford University Press	1 st	2012
2	Business Correspondence and Report writing	R.C. Sharma, Krishna Mohan,	Tata Mcgraw-Hill Publishing Co.	4 th	2010
3	Communication Skills for Engineers	Sunita Mishra C. Muralikrishna	Pearson Education	1 st	2011
4	Body Language- Your Success Mantra	Dr. Shalini Verma	S. Chand	1 st	2006

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Reference Books:

Sr. No.	Name of Book	Authors	Publisher	Edition	Year of edition
1	Basic Communication Skills for Technology	Andrea J. Rutherford	, Pearson Education	2 nd	2007
2	English for Business Communication	Simon Sweeny,	CUP, First South Asian.	1 st	2010
3	Effective Technical Communication	M. Ashraf Rizvi	Tata McGraw-Hill Publishing Company Ltd.	1 st	2005
4	IIMA - The Persuasive Manager: Communication Strategies For 21St Century Managers	M.M. Monippally	IIM Ahmedabad	1 st	2016
5	Advanced Communication Skills	Dr. Gowher Ahmad Naik	LPU Phagwara	1 st	2022

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Universal Human Values

Course Details:

Class	SY Chemical Semester IV		
Course Code and Course Title	0CHVEC258 Universal Human Values		
Prerequisite	--		
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 2 Hr/Week	Tutorial --	Practical --
Credit	2		
Evaluation Scheme	ISE 50 Marks		

Course Outcomes (COs): Upon successful completion of this course, Student will be able to:		BL
CO1	Develop self-exploration and value-based living through natural acceptance, right understanding, and harmonious relationships to resolve personal, familial, and societal problems sustainably.	2
CO2	Apply respect as right evaluation to address societal conflicts and contribute to value-based education.	3
CO3	Recognize the interconnectedness of natural orders and propose responsible human participation for mutual fulfilment in existence.	3
CO4	Apply value-based understanding in domain expertise to propose sustainable solutions for societal and ecological mutual fulfilment.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit No.	Contents	Hrs.
1	Introduction to Value Education: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations,	6
2	Understanding Human being as the Co-existence of the Self and the Body Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self Lecture, Understanding Harmony in the Self, Harmony of the Self with the Body Lecture, Programme to ensure self-regulation and Health	6
3	Harmony in the Family – the Basic Unit of Human Interaction 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in Society, Vision for the Universal Human Order	6
4	Understanding Harmony in the Nature Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.	6
	Total Hours	24

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandyaji
Dean Academics

Dr. S. S. Mohite
Director

Textbooks:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books	2 nd	2019
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books	2 nd	2019
3	Human Values	A.N. Tripathi	New Age International Publishers, New Delhi	1 st	2004

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Jeevan Vidya: Ek Parichaya	A Nagaraj	Jeevan Vidya Prakashan, Amarkantak	1 st	1999
2	The Story of Stuff	Annie Leonard	Free Press Publishers	1 st	2010
3	The Story of My Experiments with Truth	Mohandas Karamchand Gandhi	Navjivan Publishing House Publishers	1 st	1948
4	Small is Beautiful	E. F. Schumacher	Harper Collins/Penguin Publishers	1 st	1993
5	Slow is Beautiful	Cecile Andrews	Penguin Random House Publishers	1 st	2023

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Computational Techniques Laboratory

Course Details:

Class	SY Chemical Semester IV		
Course Code and Course Title	0CHVSEC259 Computational Techniques Laboratory		
Prerequisite	Engineering Mathematics, Engineering Physics		
Teaching Scheme Lecture/ Tutorial/ Practical	Theory --	Tutorial --	Practical 2 Hr/Week
Credit	1		
Evaluation Scheme	ISE 25 Marks		

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Apply Bisection and Regula Falsi methods to solve nonlinear equations	3
CO2	Apply Newton–Raphson method to solve engineering problems involving nonlinear equations.	3
CO3	Solve systems of simultaneous nonlinear equations using numerical methods.	3
CO4	Solve systems of linear algebraic equations using Gauss–Jordan and Gauss–Seidel methods.	3
CO5	Solve ordinary differential equations using Euler and Runge–Kutta methods.	3

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandya
Dean Academics

Dr. S. S. Mohite
Director

List of Practical's: Perform the given below experiments using programming languages and software packages.

Expt. No.	Experiment List	Duration In Hrs
1	To find the height (h) of the tank to which the dipstick is wet with oil using the Bisection Method.	2
2	To find volume of Superheated steam using Cubic Equation of state (EOS) by Newton Raphson Method.	2
3	To find the friction factor in pipe for turbulent flow using Colebrook Equation by the Regula Falsi Method.	2
4	To find the solution of two simultaneous equations by Newton's Method.	2
5	To Solve the linear algebraic equations using Gauss Seidel Method.	2
6	To Solve the linear algebraic equation using Gauss Jordan Method.	2
7	To Solve the Ordinary Differential Equation using Euler's Method.	2
8	To Solve the Ordinary Differential Equation using Runge Kutta Second Order Method	2
9	To Solve the Ordinary Differential Equation using Runge Kutta Fourth Order Method	2
10	To make simple 2D and 3D plot using Scilab	2

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandyaji
Dean Academics

Dr. S. S. Mohite
Director

Textbook:

Sr. No.	Name of Book	Authors	Publisher	Edition	Year of edition
1	Numerical Methods for Engineers	Santosh K. Gupta	New Age Publishers	2nd	2010
2	Numerical Methods in Engineering & Science	B S Grewal	Khanna Publishers	1st	2014
3	Numerical Methods	P. Kandasamy, K. Thilagavathi, K. Gunavathi	S.Chand&Company Ltd.	2 nd	2005
4	Numerical Methods for Engineers	Steven C. Chapra Raymond P. Canale	McGraw-Hill	6 th	2021

Reference Books:

Sr. No.	Name of Book	Authors	Publisher	Edition	Year of edition
1	Numerical Methods for Chemical Engineering: Applications in MATLAB	Beers K J	Cambridge University Press	1st	2006
2	Mathematical Modelling and Simulation in Chemical Engineering	Chidambaram M	Cambridge University Press	1 st	2018
3	Introduction to Chemical Engineering Computing	Finlayson B A	Wiley India	2 nd	2018
4	Numerical, Symbolic and Statistical Computing for Chemical Engineers using Matlab	Ghosh P	PHI Learning	1st	2018
5	Numerical Methods in Chemical Engineering Using Python® and Simulink®	Nayef Ghasem	CRC Press, Tyler and Francis	1 st	2024

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

Heat Transfer Laboratory

Course Details:

Class	SY Chemical Semester IV		
Course Code and Course Title	0CHPCC260Heat Transfer Laboratory		
Prerequisite	Engineering mathematics, physics, and fluid mechanics.		
Teaching Scheme Lecture/ Tutorial/ Practical	Theory --	Tutorial --	Practical 2 Hr/Week
Credit	1		
Evaluation Scheme	ISE 50 Marks	ESE 50 Marks	

Course Outcomes (CO's):		BL
Upon successful completion of this course, the student will be able to:		
CO1:	Conduct experiments to determine thermal conductivity and heat transfer rates in solids such as composite slabs, cylinders, and metal rods.	2
CO2:	Analyze heat transfer under natural and forced convection and evaluate associated heat transfer coefficients.	3
CO3:	Evaluate the performance of heat exchangers (double pipe, shell & tube, finned tube) using temperature measurements and energy balances.	3
CO4:	Investigate heat transfer involving radiation and phase change processes such as emissivity measurement, condensation, and boiling.	3
CO5:	Determine heat transfer characteristics in complex systems such as packed beds and extended surfaces, and interpret experimental data effectively.	4

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

List of Practical's:

Expt. No.	Experiment List	Duration In Hrs
1	Heat transfer in Composite slab.	2
2	Heat transfer in Compound Cylinder.	2
3	Thermal conductivity of metal rod.	2
4	Heat transfer in Natural convection.	2
5	Heat transfer in Forced convection.	2
6	Heat transfer in Double pipe exchanger.	2
7	Heat transfer in Shell and Tube exchanger.	2
8	Measurement of emissivity.	2
9	Heat transfer in Packed bed.	2
10	Heat transfer in Film wise and drop wise condensation.	2
11	Heat transfer in Boiling liquids.	2
12	Finned tube exchanger.	2

Textbooks / Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Unit operations of Chemical Engineering.	McCabe W.L. and Smith J.C. and Harriott P.	Mcgraw Hill Book Co., International edition	7 th	2014
2	Heat Transfer	Sukhatme S.P.	University Press India Ltd.	4 th	2005
3	Heat Transfer: Principles and Applications	Binay K. Dutta	PHI Learning Pvt. Ltd	2 nd	2002

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandyaji
Dean Academics

Dr. S. S. Mohite
Director

Instrumentation and Analytical Laboratory

Course Details:

Class	SY Chemical Semester IV		
Course Code and Course Title	0CHPCC261 Instrumentation and Analytical Laboratory		
Prerequisite	Engineering Physics, Engineering Chemistry, Fluid Mechanics		
Teaching Scheme Lecture/ Tutorial/ Practical	Theory --	Tutorial --	Practical 2 Hr/Week
Credit	1		
Evaluation Scheme	ISE 50 Marks	ESE 50 Marks	

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Apply the principles of fluid flow to measure and calculate flow rates using orifice meter, venturi meter, and rotameter.	3
CO2	Analyze pressure measurement systems and perform calibration of pressure gauges using U-tube manometer and dead weight tester.	4
CO3	Analyze the working and performance of temperature measurement devices such as thermocouples.	4
CO4	Apply analytical techniques using pH meter, conductivity meter, and colorimeter to determine chemical properties of solutions.	3
CO5	Explain the operation and applications of a UV spectrophotometer for qualitative and quantitative analysis.	2

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

List of Practical's:(Any 10 Experiments)

Expt. No.	Experiment List	Duration In Hrs
1	To determine the discharge through an orifice meter.	2
2	To measure the pH of a given solution using a pH meter.	2
3	To measure the flow rate of fluid using a rotameter.	2
4	To determine the discharge of fluid using a venturi meter.	2
5	To determine the concentration of a solution using a colorimeter based on Beer–Lambert law.	2
6	To calibrate a pressure gauge using a dead weight tester.	2
7	To measure pressure difference using a U-tube manometer.	2
8	To measure temperature using a thermocouple.	2
9	To determine absorbance and concentration of a solution using a UV spectrophotometer.	2
10	To measure liquid level using the air purge method.	2
11	To measure the conductivity of a given solution.	2

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandyaji
Dean Academics

Dr. S. S. Mohite
Director

Textbook:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Industrial Instrumentation & Control	S. K. Singh	Tata McGraw Hill publishing company Ltd, New Delhi	2 nd	2000
2	Principals of industrial instrumentation	D. Pastranabis	Tata McGraw Hill publishing company Ltd, New Delhi	2 nd	2003
3	Instrumental method of chemical analysis	G. R. Chatwal, S.K. Anand	Himalaya Publishing House, Mumbai	5 th	2002.
4	Instrumental methods of analysis	Willard H.H	CBS Publication New Delhi	6 th	1986

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

References Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Industrial Instrumentation	Eckman D.P.	Willey Eastern Ltd, New Delhi,	1 st	1984.
2	Techniques in Instrumentation	A.C. Shrivastav	New Delhi,	1 st	1984.
3	Process Instrumentation, Dynamics and control for Engineers	Ray Choudhuri and Ray Choudhuri	Asian Books Pvt Ltd, New Delhi	1 st	2003.
4	Instrumental Methods of Chemical Analysis	Galen W. Ewing,	Instrumental McGraw Hill Book Company, Singapore	5 th	1990.
5	Principal of Instrumental Analysis	D. A. Skoog.	Southern Pro, Japan	1 st	1984

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director

MDM-II Introduction to Sustainable Energy Systems

Course Details:

Class	SY Chemical Semester IV			
Course Code and Course Title	0CHMDM255 -Introduction to Sustainable Energy Systems			
Prerequisite	Engineering Chemistry			
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 3	Tutorial	Practical	
Credit	3			
Evaluation Scheme	ISE 10 Marks	MSE 20 Marks	ISE 10 Marks	ESE 60 Marks

Course Outcomes (CO's): -Upon successful completion of this course, the student will be able to:		BL
CO1	Understand solar thermal systems and photovoltaic principles.	2
CO2	Apply concepts of wind energy systems and turbine performance.	4
CO3	Apply bioenergy conversion techniques for waste-to-energy systems.	3
CO4	Explain ocean and geothermal energy systems.	2
CO5	Analyze hydrogen production, storage, and transport systems.	4
CO6	Analyze hybrid energy systems, microgrids, and energy storage	4

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	Solar Thermal & Photovoltaics: Solar geometry; flat plate collectors; semiconductor physics for PV cells.	6
2	Wind Energy Systems: Betz limit; turbine aerodynamics; onshore vs. offshore site selection.	6
3	Bioenergy & Waste-to-Energy: Thermochemical conversion (gasification); biochemical conversion (anaerobic digestion)	6
4	Ocean & Geothermal Energy: Tidal barrages; OTEC systems; geothermal heat pumps for buildings.	6
5	Hydrogen Economy: Water electrolysis; hydrogen storage (compressed/liquid); transport infrastructure.	6
6	Energy Integration: Hybrid systems; microgrids; energy storage (batteries and pumped hydro).	6
	Total Hours.	36

Textbook:

Sr. No.	Title	Authors	Publisher	Edition	Year of Edition
1	Renewable Energy: Policies, Project Management and Economics (Wind and Solar Power – India)	Thapar, S.	Springer	1 st	2024
2	Renewable Energy: Power for a Sustainable Future	Boyle, G.	Oxford University Press	3 rd	2012
3	Sustainable Energy and the Environment: A Clean Technology Approach	Kaushika, N.D., Reddy, K.S., & Kaushik, K.	Springer	1 st	2016
4	Solar Energy Engineering: Processes and Systems	Kalogirou, S.A.	Academic Press (Elsevier)	2 nd	2014
5	Energy Conversion	Goswami, D.Y. & Kreith, F.	CRC Press	2 nd	2017

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Reference Books:

Sr. No.	Title	Authors	Publisher	Edition	Year of Edition
1	Solar Engineering of Thermal Processes	Duffie, J.A. & Beckman, W.A.	Wiley	4 th	2013
2	Wind Energy Explained: Theory, Design and Application	Manwell, J.F., McGowan, J.G., & Rogers, A.L.	Wiley	2 nd	2009
3	Renewable Energy: Physics, Engg., Environ. Impacts, Economics and Planning	Sorensen, B.	Academic Press	4 th	2010
4	Sustainable Energy: Choosing Among Options	Tester, J.W.	MIT Press	2 nd	2012
5	Renewable Energy Resources	Twidell, J. & Weir, T.	Routledge	3 rd	2015

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandyaji
Dean Academics

Dr. S. S. Mohite
Director

OE-I Introduction to AI in Process Industries

Course Details:

Class	SY Chemical Semester IV		
Course Code and Course Title	0CHOE256 Open Elective I- Introduction to AI in Process Industries		
Prerequisites	Engineering Mathematics		
Teaching Scheme Lecture/ Tutorial/ Practical	Theory 2Hr/Week	Tutorial --	Practical --
Credit	2		
Evaluation Scheme	ISE 50 Marks		

Course Outcomes (COs): -Upon successful completion of this course the student will be able to:		BL
CO1	Explain the basic concepts of Artificial Intelligence and Machine Learning relevant to process industries.	2
CO2	Describe industrial data sources, data collection methods and data handling practices used in process industries	2
CO3	Apply basic AI and ML concepts for prediction, monitoring and fault detection using industrial process data	3
CO4	Explain the role of AI and ML in smart manufacturing and modern process industries	2

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandeyaji
Dean Academics

Dr. S. S. Mohite
Director

Course Syllabus:

Unit	Contents	Hrs.
1	Introduction to Artificial Intelligence and Machine Learning , significance of AI and ML in modern industries, overview of supervised and unsupervised learning, introduction to process industries, sources of industrial data, role of sensors, instrumentation systems, PLC, DCS and SCADA in data generation, and importance of data-driven decision making.	6
2	Types of industrial data , data acquisition and storage, data preprocessing and visualization, training and testing datasets, basic concepts of regression and classification models, interpretation of industrial data, and simple examples of prediction and classification using process data.	7
3	Applications of AI and ML for process monitoring, product quality prediction, predictive maintenance of equipment, fault detection and diagnosis using process data from heat exchangers, pumps, reactors and manufacturing systems, energy consumption analysis in process industries.	7
4	Introduction to Industry 4.0 , smart manufacturing, digitalization of process industries, challenges in implementation of AI and ML and future opportunities of AI and ML in process industries.	5
	Total hours	25

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandyaji
Dean Academics

Dr. S. S. Mohite
Director

Textbooks:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Machine Learning and Artificial Intelligence	Joshi, A. V.	Springer Nature, Singapore	1st Edition	2020
2	Applications of Artificial Intelligence in Process Systems Engineering	Jingzheng Ren and Lichun Dong	Elsevier	1st Edition	2021
3	AI in Chemical Engineering	José A. Romagnoli, Vidhyadhar Manee	CRC Press	1st Edition	2024
4	Introduction to Industrial Internet of Things and Industry 4.0	S. Misra, C. Roy A. Mukherjee	CRC Press	1st Edition	2021

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Industrial Process Automation Systems: Design and implementation	B.R. Mehta, and Y. Jaganmohan Reddy	Butterworth-Heinemann,	1st Edition	2014
2	Artificial Intelligence and Industry 4.0	Hassanien, A. E., and Jain, V. (Eds.)	Academic Press (Elsevier),	1st Edition	2022
3	Data-Driven Science and Engineering: Machine Learning, Dynamical Systems and Control	Brunton, S. L. and Kutz, J. N.	Cambridge University Press,	2nd Edition	2022
4	Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow	Géron, A.	O'Reilly Media, California	3rd Edition	2022

Dr. V. S. Kore
H.O.D.

Dr. K. K. Pandiyaji
Dean Academics

Dr. S. S. Mohite
Director