

## Course outcome

Name of the Faculty: Prof. Lathika Chandramohan      Class: SE  
Name of the Course: **CH201** (Engineering Mathematics-III)

Sem: III

CO code	Course Outcome
CH201.1	Apply the concept of Laplace Transform and inverse Laplace transform to solve initial value problems.
CH201.2	Demonstrate ability to manipulate matrices and compute eigenvalues and eigenvectors.
CH201.3	Apply concepts of probability and probability distribution.
CH201.4	Apply concepts of sampling theory and correlation, regression to engineering problems.
CH201.5	Use complex variable theory, applications of harmonic conjugate to get orthogonal trajectories and analytic functions.
CH201.6	Create the curve by complex transformation from z plane to w plane.

Name of the Faculty: Prof. A.V. Pawar      Class: **SE**  
Name of the Course: CH202 (Industrial and Engineering Chemistry I)

Sem: **III**

CO code	Course Outcome
CH202.1	Explain different theories of chemical bonding, organometallic chemistry, mechanism and application of Photochemical processes.
CH202.2	Explain the Stability of Coordination compounds, Kinetics and energy profile diagrams of reactions
CH202.3	Apply the knowledge of metal carbonyls and their properties
CH202.4	Explain the role of metalloproteins in biological processes
CH202.5	Apply the knowledge to carry out organic estimations, gravimetric analysis and handle different instruments in the laboratory.
CH202.6	Predict reaction intermediate formation and photochemical reaction.

Name of the Faculty: Prof. U.W. Khandalkar      Class: **SE**

Sem: **III**

Name of the Course: **CH203** (Fluid Flow Operations)

CO code	Course Outcome
CH203.1	Discuss the importance of the subject in Chemical Process Industries.
CH203.2	Compute pressure or pressure drop, flow rates etc.
CH203.3	Evaluate pressure drop and flow rates in conduits for Incompressible as well as compressible fluids.
CH203.4	Compute viscosity using different methods such as Stokes Law, Capillary viscometer.
CH203.5	Evaluate power requirements in agitation, power requirement for pumps and proper selection of pumps.
CH203.6	Discuss selections of valve used for chemical process industry

## Course outcome

Name of the Faculty: Dr. C.K. Mistry                      Class: **SE**                      Sem: **III**

Name of the Course: **CH204 (Chemical Engineering Thermodynamics-I)**

CO code	Course Outcome
<b>CH204.1</b>	Apply the first Law of Thermodynamics on non-flow and flow Chemical Engineering processes
<b>CH204.2</b>	Compute the thermal efficiencies of various conversion devices using Second Law of Thermodynamics and entropy concepts
<b>CH204.3</b>	Evaluate Exergy analysis of energy systems.
<b>CH204.4</b>	Compute properties of real fluids using different models of equations of state and other mathematical models
<b>CH204.5</b>	Compute property changes of non-ideal gas systems using departure functions
<b>CH204.6</b>	Use thermodynamic charts and diagrams for estimation of various thermodynamic properties

Name of the Faculty: Prof. N.S. Sawale                      Class: **SE**                      Sem: **III**

Name of the Course: **CH205 (Process Calculations)**

CO Code	Course Outcome
<b>CH205.1</b>	Apply various systems of units and conversion from one system to another and chemical composition, chemical arithmetic and various gas laws.
<b>CH205.2</b>	Identify the material balance of various unit operations for steady state operations and unsteady operations with recycle, bypass and purge.
<b>CH205.3</b>	Analyse degrees of freedom for various units.
<b>CH205.4</b>	Compute material balance of chemical reactions including recycle, bypass and purge.
<b>CH205.5</b>	Evaluate energy balances on various process equipments with and without reactions and also NCV and GCV.
<b>CH205.6</b>	Apply mass and energy balances for various unit operations and also for flow sheeting calculations.

Name of the Faculty: Prof. P.R. Angre                      Class: **SE**                      Sem: **III (R-19)**

Name of the Course: **CH206 (Basic Chemical Engineering lab)**

CO code	Course Outcome
<b>CH206.1</b>	Apply basic principles of chemistry and chemical engineering to solve and analyze complex industrial problems
<b>CH206.2</b>	Apply mathematical skills to perform calculations on data obtained and use required formulas to do the same
<b>CH206.3</b>	Evaluate sampling methods, required sampling size and reduce measurement errors for accurate experimental design
<b>CHL206.4</b>	Estimate experimental data by different data analysis methods on PC using MS Excel for investigating complex problems
<b>CHL206.5</b>	Examine and interpret the results obtained from experiments
<b>CHL206.6</b>	Design new laboratory experiments to study industrial problems which will benefit society and environment by following strict ethical standards

## Course outcome

Name of the Faculty: Dr. Sunita Shinde      Class: **SE**      Sem: **III**

Name of the Course: **CH207 (Industrial and Engineering Chemistry-I Lab)**

CO code	Course Outcome
<b>CH207.1</b>	Explain different theories of chemical bonding, organo metallic chemistry, mechanism and application of Photochemical processes.
<b>CH207.2</b>	Explain the Stability of Coordination compounds, Kinetics and energy profile diagrams of reactions
<b>CH207.3</b>	Apply the knowledge of metal carbonyls and their properties
<b>CH207.4</b>	Explain the role of metallo proteins in biological processes
<b>CH207.5</b>	Apply the knowledge to carry out organic estimations, gravimetric analysis and handle different instruments in the laboratory.
<b>CH207.6</b>	Evaluate and apply reaction intermediate formation and photochemical reaction.

Name of the Faculty: Prof. U.W. Khandalkar      Class: **SE**      Sem: **III**

Name of the Course: **CH208 Chemical Engg. Lab I (FFO Lab.)**

CO code	Course Outcome
<b>CH208.1</b>	Discuss the importance of the subject in Chemical Process Industries.
<b>CH208.2</b>	Compute pressure or pressure drop, flow rates etc.
<b>CH208.3</b>	Evaluate pressure drop and flow rates in conduits for Incompressible as well as compressible fluids.
<b>CH208.4</b>	Compute viscosity using different methods such as Stokes Law, Capillary viscometer.
<b>CH208.5</b>	Evaluate power requirements in agitation, power requirement for pumps and proper selection of pumps.
<b>CH208.6</b>	Discuss selections of valve used for chemical process industry

Name of the Faculty: Dr. N.S. Kolhe/Dr. C.K. Mistry      Class: **SE**      Sem: **III**

Name of the Course: **CH209 (Chemical Technology Laboratory : Skill Based Laboratory)**

CO code	Course Outcome
<b>CH209.1</b>	Identify the major Chemical Process Industries and Industrially Important Products and explain the Natural Product Industries.
<b>CH209.2</b>	Explain the Laboratory Preparation of Industrially Important Chemical Compounds and Products.
<b>CH209.3</b>	Outline the processes used for the Manufacture of Acids and Fertilizers.
<b>CH209.4</b>	Explain the Manufacturing Processes used in the Chloro-Alkali Industries.
<b>CH209.5</b>	Explain the Basic Building Blocks of the Petrochemical Industry.
<b>CH209.6</b>	Discuss the Synthesis of Important Heavy Organic Chemicals and Intermediates and outline the processes used for the Synthesis of Polymers.

## Course outcome

Name of the Faculty: Prof. Lathika Chandramohan      Class: **SE**      Sem: **III**

Name of the Course: CH210 - Engineering Mathematics-III (T)

CO code	Course Outcome
CH210.1	Apply concept of Laplace Transform and inverse Laplace transform to solve initial value problems.
CH210.2	Demonstrate ability to manipulate matrices and compute eigen values and eigen vectors.
CH210.3	Apply concept of probability and probability distribution.
CH210.4	Apply concept of sampling theory and correlation, regression to engineering problems.
CH210.5	Explain the complex variable theory, applications of harmonic conjugate to get orthogonal trajectories and analytic functions.
CH210.6	Create the image of the curve by complex transformation from z plane to w plane.

Name of the Faculty: Prof. V.A. Bokade      Class: **SE**      Sem: **IV**

Name of the Course: CH211 Engineering Mathematics-IV

CO code	Course Outcome
CH211.1	Demonstrate ability of using Fourier series in solving PDE.
CH211.2	Demonstrate ability of using Fourier Transform in solving PDE.
CH211.3	Use finite Differences Approximations to solve boundary value problem using Finite Differences Approximations.
CH211.4	Identify the applicability of theorems and evaluate the contour integrals.
CH211.5	Evaluate the contour integrals using residues.
CH211.6	Apply the knowledge for any further course on optimization.

Name of the Faculty: Prof. A.V. Pawar      Class: **SE**      Sem: **IV**

Name of the Course: CH212 Industrial and Engineering Chemistry II

CO code	Course Outcome
CH212.1	Explain the role of different conductivity cells and different titrimetric methods and solvent extractions.
CH212.2	Identify the organic and inorganic biological compound by the use of spectrophotometer
CH212.3	Apply the knowledge of the colloidal phenomenon in food industry and pesticides.
CH212.4	Identify the significance of rearrangement reactions, active methylene group
CH212.5	Predict and synthesize different products by learning reaction mechanism.
CH212.6	Apply the knowledge of Qualitative (Analysis) and Quantitative (estimations) methods in the laboratory.

## Course outcome

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Name of the Faculty: Dr. Arati Barik

Class: **SE**

Sem: **IV**

Name of the Course: **CH213**Chemical Engineering Thermodynamics-II

CO code	Course Outcome
<b>CH213.1</b>	Apply the First law and Second law of Thermodynamics.
<b>CH213.2</b>	Analyze the problems of phase equilibrium and reaction equilibrium.
<b>CH213.3</b>	Evaluate the refrigerant flow rate for a given duty of refrigeration.
<b>CH213.4</b>	Evaluate the compressor sizes and loads for refrigeration.
<b>CH213.5</b>	Utilize the calculations of phase equilibria and apply it as a fundamental concept for design of mass transfer equipment.
<b>CH213.6</b>	Apply the methods for estimation of Thermodynamic properties.

Name of the Faculty: Prof. N.S. Sawale

Class: **SE**

Sem: **IV**

Name of the Course: **CH214** Solid Fluid Mechanical Operations

CO code	Course Outcome
<b>CH214.1</b>	Apply and analyze the concept of particle size analysis and size reduction.
<b>CH214.2</b>	Apply and analyze the concept of flow through packed bed, fluidization and filtration
<b>CH214.3</b>	Identify the scope of subjects in Chemical Industry
<b>CH2014.4</b>	Discuss and analyze the concept of sedimentation and gas- solid separation.
<b>CH214.5</b>	Apply the concept of solid mixing, solid storage & conveying, size enlargement.
<b>CH214.6</b>	Plan to use the basic knowledge in particle technology (particle size, shape, specific surface) and concept of particle size measurement and distribution

## Course outcome

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Name of the Faculty: Mr. Anand Ingle

Course Code: CH215

Course Name: Numerical Methods in Chemical Engineering

Course	Numerical Methods in Chemical Engineering	Course Code	CH215	Course Teacher	Prof. Anand A. Ingle
<b>Course Outcomes (CO)</b>					
CH215.1	Solve linear algebraic equations.				
CH215.2	Solve nonlinear algebraic equations.				
CH215.3	Solve using Curve fitting				
CH215.4	Solve Ordinary Differential equations				
CH215.5	Solve Partial Differential equations				
CH215.6	Solve Chemical engineering problems with numerical analysis techniques.				

Name of the Faculty: Dr. N.S. Kolhe

Class: **SE**

Sem: **IV**

Name of the Course: **CH216** (Skill Based Laboratory: Design Calculation of Auxiliary Plant Equipment)

CO code	Course Outcome
<b>CH216.1</b>	Discuss unit conversion and apply to chemical engineering problems.
<b>CH216.2</b>	Identify the basic function and design of steam trap.
<b>CH216.3</b>	Understand the pressure vessels and its design.
<b>CH216.4</b>	Explain various characteristics and power requirement of pumps.
<b>CH216.5</b>	Explain use of Psychrometric chart for properties of water and steam.
<b>CH216.6</b>	Discuss the theoretical concepts from process calculation

## Course outcome

Name of the Faculty: Dr. Sunita Shinde      Class: **SE**      Sem: IV

Name of the Course: **CH217 Industrial and Engineering Chemistry-II Lab**

CO code	Course Outcome
<b>CH217.1</b>	Explain the role of different conductivity cells and different titrimetric methods and solvent extractions.
<b>CH217.2</b>	Identify the organic and inorganic biological compound by the use of spectrophotometer
<b>CH217.3</b>	Apply the knowledge of colloidal phenomenon in food industry and pesticides.
<b>CH217.4</b>	Identify the significance of rearrangement reactions, active methylene group
<b>CH217.5</b>	Predict and synthesize different products by learning reaction mechanism.
<b>CH217.6</b>	Apply the knowledge of Qualitative (Analysis) and quantitative (estimations) methods in the laboratory.

Name of the Faculty: Dr. N.S. Kolhe/Prof. Y.A. Karpe      Class: **SE**      Sem: IV

Name of the Course: **CH218 (Solid Fluid Mechanical Operation - Laboratory)**

CO code	Course Outcome
<b>CH218.1</b>	Apply the concept of size analysis & screen effectiveness
<b>CH218.2</b>	Analyze the light & heavy material through cyclone separator
<b>CH218.3</b>	Explain the concept of reduction of large particles into a small size.
<b>CH218.4</b>	Explain the sedimentation in effluent treatment plant.
<b>CH218.5</b>	Identify the importance of liquid & solid material by way of filtration.
<b>CH218.6</b>	Utilize and access the equipments for preparation of paint.

## Course outcome

Name of the Faculty: Prof. Anand A. Ingle

Class: **SE**

Sem: **IV**

Course Code: CH219

Course Name: Numerical Methods in Chemical Engineering Lab

Course	Numerical Methods in Chemical Engineering Lab	Course Code	CHL402	Course Teacher	Prof. Anand A. Ingle
<b>Course Outcomes (CO)</b>					
CH219.1	Solve linear algebraic equations.				
CH219.2	Solve nonlinear algebraic equations.				
CH219.3	Solve using Curve fitting				
CH219.4	Solve Ordinary Differential equations				
CH219.5	Solve Partial Differential equations				
CH219.6	Solve Chemical engineering problems with numerical analysis techniques.				

Name of the Faculty: Prof. V.A. Bokade

Class: **SE**

Sem: **IV**

Name of the Course: CH220 Engineering Mathematics-IV (T)

<b>CO code</b>	<b>Course Outcome</b>
CH220.1	Demonstrate ability of using Fourier series in solving PDE.
CH220.2	Demonstrate ability of using Fourier Transform in solving PDE.
CH220.3	Explain boundary value problem using Finite Differences Approximations.
CH220.4	Identify the applicability of theorems and evaluate the contour integrals.
CH220.5	Evaluate the contour integrals using residues.
CH220.6	Apply the knowledge of optimization for any further course on optimization.



## Course outcome

Name of the Faculty: Dr. C.K. Mistry

Class: **TE**

Sem: **V**

Name of the Course: **CH301** (Advanced Material Science –Department Optional Course 1)

CO code	Course Outcome
<b>CH301.1</b>	Identify various types of advanced materials such as polymers, ceramics and composites.
<b>CH301.2</b>	Evaluate and utilize the properties of various polymeric, ceramic and metallic materials and discuss their applications in various fields.
<b>CH301.3</b>	Select and analyze different types of composite materials, their properties and applications.
<b>CH301.4</b>	Explain the fabrication of various composite materials.
<b>CH301.5</b>	Outline the types of nanotubes and nanosensors and their applications.
<b>CH301.6</b>	Evaluate the thin film coating methods and discuss their applications in various fields.

Name of the Faculty: Prof. Y. A. Karpe

Class: **TE**

Sem: **V**

Name of the Course: **CH302** (Mass Transfer Operation -I)

CO code	Course Outcome
<b>CH302.1</b>	Analyze the fundamentals of the relationship between fluid flow, convection heat transfer and mass transfer.
<b>CH302.2</b>	Apply the concept and operation of various types of gas-liquid contacts equipment.
<b>CH302.3</b>	Discuss the desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability and sustainability.
<b>CH302.4</b>	Evaluate NTU, HTU, HETP and height of packed bed used for Absorption and Humidification operations.
<b>CH302.5</b>	Demonstrate knowledge of mass transfer by applying principles of diffusion, mass transfer coefficients, and interphase mass transfer.
<b>CH302.6</b>	Evaluate the time required for drying and design of drying equipments.

## Course outcome

Name of the Faculty: Dr. N.S. Kolhe

Class: **TE**

Sem: **V**

Name of the Course: **CH303** HEAT TRANSFER OPERATIONS

CH303.1	Demonstrate rate of heat transfer by all three modes of heat transfer.
CH303.2	Apply basic principles involved in mechanism and calculation of heat transfer rates.
CH303.3	Explain the most common types of unsteady state operations of heat transfer.
CH303.4	Explain heat transfer through extended surfaces
CH303.5	Design Heat Exchangers
CH303.6	Explain radiation in heat transfer

Name of the Faculty: Prof. Nishant Sawale

Class: **TE**

Sem: **V**

Name of the Course: **CH304** (Chemical Reaction Engineering I)

<b>CO code</b>	<b>Course Outcome</b>
CH304.1	Analyze the kinetics of homogeneous systems
CH304.2	Explain different methods of analysis of experimental data
CH304.3	Apply the knowledge to develop kinetics models for different types of homogeneous reactions.
CH304.4	Apply the knowledge to develop the design equations of various reactors (Batch, PFR & CSTR).
CH304.5	Discuss the different arrangement of reactors in series and parallel.
CH304.6	Identify the effect of temperature on reactor performance for adiabatic and non-adiabatic operation and predict the kinetic model to design the reactors for adiabatic and non-isothermal operations.

## Course outcome

Name of the Faculty: Dr. Arati Barik

Class: **TE**

Sem: **V**

Name of the Course: **CH305** (Transport Phenomena)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH305.1</b>	The student understands transport properties and analyze the mechanisms of molecular momentum, energy and mass transport.
<b>CH305.2</b>	The students can establish and simplify appropriate conservation statements for momentum, energy and mass transfer processes.
<b>CH305.3</b>	The students can formulate the differential forms of the equations of change for momentum, heat and mass transfer problems
<b>CH305.4</b>	The students can solve various industrial problems based on momentum, energy and mass transfer analysis.
<b>CH305.5</b>	The students understand conservation principles and appropriate boundary conditions in transport processes.
<b>CH305.6</b>	The student can apply conservation principles, along with appropriate boundary conditions for designing and optimizing parameters of industrial equipment based on different transport processes.

Name of the Faculty: Prof. Sreedevi Nair

Class: **TE**

Sem: **V**

Name of the Course: **CH306** (Skill Based Lab. : Professional Communication and Ethics II)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH306.1</b>	Plan and Prepare effective business/technical documents which will in turn provide solid foundation for their future managerial roles.
<b>CH306.2</b>	Strategize their personal and professional skills to build a professional image and meet the demands of the industry.
<b>CH306.3</b>	Emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations.
<b>CH306.4</b>	Deliver persuasive and professional presentations.
<b>CH306.5</b>	Develop creative thinking and interpersonal skills required for effective professional communication.
<b>CH306.6</b>	Apply codes of ethical conduct, personal integrity and norms of organizational behaviour.

## Course outcome

Name of the Faculty: Prof. Y. A. Karpe

Class: **TE**

Sem: **V**

Name of the Course: **CH307** (MTO-I Laboratory)

CO code	Course Outcome
<b>CH307.1</b>	Demonstrate the fundamentals of the relationship between fluid flow, convection heat transfer and mass transfer operation.
<b>CH307.2</b>	Compile and compare the concept and operation of various types of gas-liquid contacts equipment.
<b>CH307.3</b>	Evaluate the efficiency of cooling tower.
<b>CH307.4</b>	Evaluate NTU, HTU of cooling tower and height of packed bed used for Absorption and Humidification operations.
<b>CH307.5</b>	Identify the rate of diffusion and mass transfer coefficients.
<b>CH307.6</b>	Evaluate the time required for drying and design of drying equipment.

Name of the Faculty: Dr. N.S. Kolhe

Class: **TE**

Sem: **V**

Name of the Course: **CH308** (HTO Laboratory)

CO code	Course Outcome
<b>CH308.1</b>	Explain to determine the heat transfer coefficient in under unsteady state.
<b>CH308.2</b>	Explain to determine the overall & individual and shell side heat transfer coefficient of vertical heat exchanger
<b>CH308.3</b>	Explain to determine the thermal conductivity of the given metal test piece.
<b>CH308.4</b>	Explain to determine the emissivity of given test plate
<b>CH308.5</b>	Explain to determine the overall & individual heat transfer coefficient in an agitated vessel under steady state conditions.
<b>CH308.6</b>	Explain to determine overall & individual heat transfer coefficient of double pipe heat exchanger.

## Course outcome

Name of the Faculty: Prof. Nishant Sawale      Class: **TE**      Sem: **V**

Name of the Course: **CH309** (CRE I Laboratory)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH309.1</b>	Evaluate rate constant and order of reaction at room temperature using differential & integral method of analysis.
<b>CH309.2</b>	Evaluate activation energy using Arrhenius, Collision and Transition state theory.
<b>CH309.3</b>	Identify conversion in batch reactor at time t
<b>CH309.4</b>	Identify theoretical and experimental conversion in Plug flow and mixed flow reactor.
<b>CH309.5</b>	Identify conversion in PFR – CSTR combination and evaluate order of reaction when reaction is pseudo first order.
<b>CH309.6</b>	Predict order of reaction using half life method and will be able to study acidic hydrolysis.

Name of the Faculty: Prof. Y. A. Karpe      Class: **TE**      Sem: **VI**

Name of the Course: **CH310** Pollution Control Technology

<b>CO code</b>	<b>Course Outcome</b>
<b>CH310.1</b>	Identify sources, types of pollutants and determine their impact on the environment, related laws and standards.
<b>CH310.2</b>	To understand sampling, measurement of various water pollutants, natural purification process, design various waste water treatments methods.
<b>CH310.3</b>	Analyze sampling, measurements, meteorological aspects air pollutant dispersion, its control and equipment's used for air pollution control
<b>CH310.4</b>	To manage solid waste and noise pollution control.
<b>CH310.5</b>	Analyze and select appropriate treatment process for specific effluents emerging from chemical industries.
<b>CH310.6</b>	To minimize use of resources in chemical industries.

## Course outcome

Name of the Faculty: Dr. Arati Barik

Class: **TE**

Sem: **VI**

Name of the Course: **CH311** Mass transfer Operations –II (MTO-II)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH311.1</b>	Analyze equilibrium in all separation process
<b>CH311.2</b>	Identify and understand various mass transfer equipments and their operation
<b>CH311.3</b>	Design various mass transfer equipments such as distillation column, extraction column and adsorption equipments etc.
<b>CH311.4</b>	Select and analyze the separation operation which will be economical for the process
<b>CH311.5</b>	Evaluate and optimize the process parameters
<b>CH311.6</b>	Demonstrate membrane separation processes, their principles and working

Name of the Faculty: Prof. Prajakta Angre

Class: **TE**

Sem: **VI**

Name of the Course: **CH312** (Process Engineering and Economics)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH312.1</b>	Understand the functions of process engineering and various approaches of chemical process design.
<b>CH312.2</b>	To calculate different types of interests and annual depreciation costs using different methods.
<b>CH312.3</b>	To draw various flow diagrams and carry out process design of piping and various flow moving devices.
<b>CH312.4</b>	To carry out process design of multicomponent distillation and absorption columns using various approaches.
<b>CH312.5</b>	Evaluate basic design aspects of major process equipment, carry out their quick cost estimation and demonstrate their knowledge of different types of costs and capital cost estimates.
<b>CH312.6</b>	Demonstrate their knowledge of cash flow in an industrial operation and perform break-even and profitability analysis using different methods.

## Course outcome

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Name of the Faculty: Prof. Nishant Sawale      Class: **TE**      Sem: **VI**

Name of the Course: **CH313** Chemical Reaction Engineering–II (CRE- II)

<b>CO code</b>	<b>Course Outcome</b>
CH313.1	Explain the kinetics & mechanism of various heterogeneous reactions & design consideration of reactors used during different operating conditions.
CH313.2	Apply the knowledge of design of solid catalyzed fluid phase reactors.
CH313.3	Demonstrate the concept of Non catalytic heterogeneous reactions.
CH313.4	Apply the knowledge of design of reactors for non catalytic reactions.
CH313.5	Demonstrate the concept of kinetics of fluid - fluid reactions.
CH313.6	Explain the concept of residence time distribution (RTD) in non-ideal reactors.

Name of the Faculty: Prof. Umakant W. Khandalkar      Class: **TE**      Sem: **VI**

Name of the Course: **CH314** Piping Engineering (Department Optional Course 2)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH314.1</b>	Recognize role of piping engineer.
<b>CH314.2</b>	Understand Pipe Material selection.
<b>CH314.3</b>	Choose the piping fundamentals, codes and standards
<b>CH314.4</b>	Select piping system components.
<b>CH314.5</b>	Examine piping system.
<b>CH314.6</b>	Choose and Design different piping drawing.

## Course outcome

Name of the Faculty: Prof. Y. A. Karpe  
Name of the Course: **CH315** (PCT Laboratory)

Class: **TE**

Sem: **VI**

CO code	Course Outcome
<b>CH315.1</b>	Evaluate the Physical characteristics of different samples.
<b>CH315.2</b>	Identify various pollutants sources and evaluate adverse effects, Environmental Legislation
<b>CH315.3</b>	Identify meteorological aspects air pollutant dispersion, Sampling and measurement, Control Methods and Equipment.
<b>CH315.4</b>	Analyze Sampling, measurement of various water pollutant techniques.
<b>CH315.5</b>	Identify and design various Waste Water Testing techniques like BOD, COD, etc.
<b>CH315.6</b>	Apply the Environmental Engineering concepts to control management of various types of pollutants.

Name of the Faculty: Dr. Arati Barik

Class: **TE**

Sem: **VI**

Name of the Course: **CH316** (MTO-II Laboratory)

CO code	Course Outcome
<b>CH316.1</b>	Analyze equilibrium in all separation process
<b>CH316.2</b>	Identify and understand various mass transfer equipment and their operation
<b>CH316.3</b>	Design distillation column
<b>CH316.4</b>	Select and analyse the separation operation which will be economical for the process
<b>CH316.5</b>	Evaluate and optimize the process parameters
<b>CH316.6</b>	Demonstrate crystallization and adsorption processes principle and working

Name of the Faculty: Prof. Nishant Sawale

Class: **TE**

Sem: **VI**

Name of the Course: **CH317** (CRE-II Laboratory)

CO code	Course Outcome
<b>CH317.1</b>	Explain the concept of Residence time distribution
<b>CH317.2</b>	Demonstrate the Pulse input and Step input methods for RTD measurement.
<b>CH317.3</b>	Discuss the difference between batch and semi batch reactor.
<b>CH317.4</b>	Demonstrate the concept of the major resistance offered to overall reaction rate.
<b>CH317.5</b>	Explain the concept of non-catalytic and heterogeneous catalytic reactions & Esterification reaction
<b>CH317.6</b>	Explain the concept of adsorption isotherm



## Course outcome

Name of the Faculty: Prof. Prajakta Angre

Class: **TE**

Sem: **VI**

Name of the Course: **CH318** (Process Engineering and Economics Tutorial)

CO code	Course Outcome
<b>CH318.1</b>	Understand the functions of process engineering and various approaches of chemical process design.
<b>CH318.2</b>	To calculate different types of interests and annual depreciation costs using different methods.
<b>CH318.3</b>	To draw various flow diagrams and carry out process design of piping and various flow moving devices.
<b>CH318.4</b>	To carry out process design of multicomponent distillation and absorption columns using various approaches.
<b>CH318.5</b>	Evaluate basic design aspects of major process equipment, carry out their quick cost estimation and demonstrate their knowledge of different types of costs and capital cost estimates.
<b>CH318.6</b>	Demonstrate their knowledge of cash flow in an industrial operation and perform break-even and profitability analysis using different methods.

Name of the Faculty: Prof. Umakant W. Khandalkar

Class: **TE**

Sem: **VI**

Name of the Course: **CH319** Skill Based Lab. : Piping Design Engineering Laboratory

CO code	Course Outcome
<b>CH319.1</b>	To apply piping standards in design of complex piping networks.
<b>CH319.2</b>	To solve complex engineering problem of selection of appropriate material for pipes and fittings for chemical plants.
<b>CH319.3</b>	To identify, analyze and solve pipe sizing, pump sizing, valve sizing and pipe-valve-pump selection problems.
<b>CH319.4</b>	To design and draw piping networks, piping layout ,P & ID ,isometric drawings and plot plan by considering legal, environmental, societal and ethical aspects.
<b>CH319.5</b>	To use modern IT tools such as MS Excel/Libre office Calc/WPS spreadsheets, DWSIM, AutoCAD 2D and 3D,CAE demo and Edraw Fluid flow for design and analysis of piping networks.
<b>CH319.6</b>	To carry out stress analysis, network analysis, flexibility analysis and surge analysis for chemical plants which will benefit society and environment by following strict ethical standards.

## Course outcome

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Name of the Faculty: Ms. Prajakta Angre

Class: BE

Sem: VII

Name of the Course: **CH401** (Chemical Engineering Equipment Design)

CO code	Course Outcome
<b>CH401.1</b>	Apply the concept of Chemical Engineering equipment design terminologies and equipment testing methods.
<b>CH401.2</b>	Design pressure and high pressure vessel.
<b>CH401.3</b>	Design reaction vessel and agitator.
<b>CH401.4</b>	Design heat exchanger and evaporator.
<b>CH401.5</b>	Design distillation column.
<b>CH401.6</b>	Illustrate and explain the concept of storage tank and types of supports

Name of the Faculty: Prof. Prajakta Angre

Class: BE

Sem: VII

Name of the Course: **CH402** Department Optional Course 3 (Corrosion Engineering)

CO code	Course Outcome
<b>CH402.1</b>	Understand corrosion and its related mechanisms and Basic terminologies.
<b>CH402.2</b>	Classify different forms of corrosion and its conditions.
<b>CH402.3</b>	To describe the Corrosion Protection techniques, Coatings, Anodic protection, Cathodic Protection.
<b>CH402.4</b>	Apply the Methodology, Methods and Materials to prevent the Corrosion
<b>CH402.5</b>	The understanding the modern theory principles behind corrosion.
<b>CH402.6</b>	To describe and demonstrate the Corrosion monitoring and control methods.

## Course outcome

Name of the Faculty: Dr. Arati Barik Class: **BE** Sem: **VII**

Name of the Course: **CH403** Instrumentation Process Dynamics and Control (PDC)

CO code	Course Outcome
<b>CH403.1</b>	Develop model of different dynamic systems.
<b>CH403.2</b>	Compute system response for various changes in input to the system based on application of Laplace Transform
<b>CH403.3</b>	Analyze and select measuring instruments for measuring various process parameters
<b>CH403.4</b>	Design controller for controlling output of a specified system
<b>CH403.5</b>	Compute stability analysis of a feedback control system based on Frequency response (Bode diagram)
<b>CH403.6</b>	Design controller parameters based on Zeigler-Nichols controller tuning method.

Name of the Faculty: Prof. U.W. Khandalkar

Class: **BE**

Sem: **VII**

Name of the Course: **CH404** Department Optional Course 4 (Petroleum Refining Technology)

CO code	Course Outcome
<b>CH404.1</b>	Recognize the significance crude petroleum and petroleum refinery.
<b>CH404.2</b>	Understand and express the overall objectives of fractionate crude petroleum into useful fractions.
<b>CH404.3</b>	Apply important physical properties of petroleum products
<b>CH404.4</b>	Analyze refinery processes to maximize desired petro products
<b>CH404.5</b>	Students will be able to understand upgradation process.
<b>CH404.6</b>	Identify the economic and environmental drivers of petroleum refining.

## Course outcome

Name of the Faculty: Prof. Y.A. Karpe

Class: **BE**

Sem: **VII**

Name of the Course: **CH405** Institute Optional Course 1 (Energy Audit and Management)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH405.1</b>	To identify and describe present state of energy security and its importance.
<b>CH405.2</b>	To identify and describe the basic principles and methodologies adopted in energy audit of an utility.
<b>CH405.3</b>	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.
<b>CH405.4</b>	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities
<b>CH405.5</b>	To analyze the data collected during performance evaluation
<b>CH405.6</b>	To recommend energy saving measures

Name of the Faculty: Ms. Prajakta Angre

Class: **BE**

Sem: **VII**

Name of the Course: **CH406** (Chemical Engineering Equipment Design Lab)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH406.1</b>	Design and pictorially represent Pressure vessel.
<b>CH406.2</b>	Design and pictorially represent High pressure vessel.
<b>CH406.3</b>	Design and pictorially represent Reaction vessel and Agitator
<b>CH406.4</b>	Design and draw internals of Heat exchanger and Evaporator
<b>CH406.5</b>	Design and represent pictorially distillation column.
<b>CH406.6</b>	Sketch the internals of storage tank and types of supports

## Course outcome

Name of the Faculty: Dr. Arati Barik

Class: **BE**

Sem: **VII**

Name of the Course: **CH407** (Instrumentation Process Dynamics and Control Lab.)

CO code	Course Outcome
<b>CH407.1</b>	Analyze the dynamic behavior of a system for various inputs
<b>CH407.2</b>	Determine the characteristic parameters of a system
<b>CH407.3</b>	Analyze the characteristics of control valves
<b>CH407.4</b>	Develop Empirical Model from Process Data
<b>CH407.5</b>	Analyze various measuring devices
<b>CH407.6</b>	Tune the controller parameter

Name of the Faculty: Dr. N.S. Kolhe/Prof. N.S. Sawale

Class: **BE**

Sem: **VII**

Name of the Course: **CH408** (Hazard and Risk Analysis Lab.)

CO code	Course Outcome
<b>CH408.1</b>	Students will be able to apply the knowledge of mathematics, science, engineering fundamentals for identifying causative and initiating factors of accidents.
<b>CH408.2</b>	Students will be able to carry out Hazard and Risk analysis by using principles of sciences and engineering.
<b>CH408.3</b>	Students will be able to develop fire and explosion index and chemical exposure index by analyzing and interpreting of available data.
<b>CH408.4</b>	Students will be able to use IT tools such as RAST-CHEF to understand and evaluate situations causing industrial fire, explosions and evaluate risk.
<b>CH408.5</b>	Students will be able to prepare scenario list- guidance and maximum allowable response time for particular chemical plant/equipment
<b>CH408.6</b>	Students should be able to prepare Risk Assessment Matrix and Risk summary for particular plant to avoid accidents, for betterment of environment, society and communicate it with higher authorities

## Course outcome

Name of the Faculty: Dr. C.K. Mistry

Class: **BE**

Sem: **VIII**

Name of the Course: **CH409** Modeling, Simulation & Optimization (MSO)

CO code	Course Outcome
CH409.1	The students will be able to write and solve models of chemical engineering system.
CH409.2	The students will be able to carry out sequential and equation oriented simulation of complete flow sheets.
CH409.3	The student will be able to optimize typical chemical processes.
CH409.4	The students will able to solve a process simulation.
CH409.5	The students will able to use basics of numerical methods.
CH409.6	The students will able to understand artificial neural network principles.

Name of the Faculty: Dr. N.S. Kolhe

Class: **BE**

Sem: **VIII**

Name of the Course: **CH410** Institute Optional Course 2 (Project Management)

CO code	Course Outcome
CH410.1	Apply selection criteria and select an appropriate project from different options.
CH410.2	Write work break down structure for a project and develop a schedule based on it.
CH410.3	Identify opportunities and threats to the project and decide an approach to deal with them strategically.
CH410.4	Use Earned value technique.
CH410.5	Determine & predict status of the project.
CH410.6	Capture lessons learned during project phases and document them for future reference.

Name of the Faculty: Ms. Prajakta Angre

Class: **BE**

Sem: **VIII**

Name of the Course: **CH411** Department Optional Course 5 Energy System Design

CO code	Course Outcome
CH411.1	Understand the present energy status and major steps to be taken to conserve the energy.
CH411.2	Know the importance of energy management program, how to carry it and follow the same when they will actual start working in industries.
CH411.3	Be aware about best energy efficient practices and will follow the same in future wherever they work.
CH411.4	To carry out Heat exchanger networking and learn other heat integration techniques to conserve the energy.
CH411.5	Identify sources of waste heat in industry, know the techniques to recover and reuse the waste heat and have knowledge about cogeneration technique.
CH411.6	Understand various renewable energy sources, their applications and preference over non-renewable energy sources.

## Course outcome

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Name of the Faculty: Prof. U.W. Khandalkar      Class: **BE**      Sem: VIII

Name of the Course: **CH412** Department Optional Course 5 (Advanced Separation Technology)

CO code	Course Outcome
CH412.1	Identify the various adsorbents and to design adsorption column.
CH412.2	Choose the separation by supercritical extraction.
CH412.3	Choose the appropriate separation techniques.
CH412.4	Understand the application of chromatography.
CH412.5	Select, maintain and design various membrane processes.
CH412.6	Assess the various techniques of modern separation processes.

Name of the Faculty: Prof. Y.A. Karpe      Class: **BE**      Sem: VIII

Name of the Course: **CH413** Department Optional Course 6 (Chemical Waste Management)

CO code	Course Outcome
CH413.1	Evaluate the subject from the technical, legal and economical points by learning of chemical waste management.
CH413.2	Examine the technical points that are required to set up a waste management system.
CH413.3	Evaluate recovery, treatment and disposal alternatives according to properties of industrial wastes.
CH413.4	Talent to gain knowledge with handling and reduction of waste in a wide perspective
CH413.5	Evaluate recovery, treatment and disposal alternatives according to properties of industrial waste
CH413.6	Ability to identify hazardous waste and environmental problems, understand, and solve their effects on universal and social scales

## Course outcome

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Name of the Faculty: Dr. C.K. Mistry

Class: **BE**

Sem: **VIII**

Name of the Course: **CH414** (Modelling Simulation and Optimization Laboratory)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH414.1</b>	Students will learn different types of simulation techniques.
<b>CH414.2</b>	Students will apply simulation techniques to solve complex system issues and to select feasible, solutions
<b>CH414.3</b>	Student will able to calculate the different physicochemical and thermodynamic properties chemicals;
<b>CH414.4</b>	Students will able to understand and analyse simulation of various separation process
<b>CH414.5</b>	Students will able to apply optimization parameter in distillation process
<b>CH414.6</b>	Students will learn to simulate the models for the purpose of optimum control by using software.

Name of the Faculty: Ms. Prajakta Angre

Class: **BE**

Sem: **VIII**

Name of the Course: **CH415** Software Applications in Chemical Engineering Laboratory

<b>CO code</b>	<b>Course Outcome</b>
<b>CH415.1</b>	Students will become aware of application of software in chemical engineering.
<b>CH415.2</b>	Students will be able to identify and use the software for optimization of the processes in chemical industries.
<b>CH415.3</b>	The students will be able to design unit operation and unit process by using chemical engineering software.
<b>CH415.4</b>	The student will be able to do the material and energy balance of chemical plant
<b>CH415.5</b>	The student will be able to optimize typical chemical processes.
<b>CH415.6</b>	The students will be able to solve the trouble shooting problem in chemical plants by using various chemical engineering softwares.



## Course outcome

Name of the Faculty: Prof. Lathika Chandramohan

Class: **SE**

Sem: **III**

Name of the Course: **CH201** (Engineering Mathematics-III)

CO code	Course Outcome
CH201.1	Apply the concept of Laplace Transform and inverse Laplace transform to solve initial value problems.
CH201.2	Demonstrate ability to manipulate matrices and compute eigenvalues and eigenvectors.
CH201.3	Apply concepts of probability and probability distribution.
CH201.4	Apply concepts of sampling theory and correlation, regression to engineering problems.
CH201.5	Use complex variable theory, applications of harmonic conjugate to get orthogonal trajectories and analytic functions.
CH201.6	Create the curve by complex transformation from z plane to w plane.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH201.1	3	3	1	1	-	-	-	-	-	-	-	-	2	2	2
CH201.2	3	3	2	2	-	-	-	-	-	-	-	-	2	1	1
CH201.3	3	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CH201.4	3	3	2	2	-	-	-	-	-	-	-	-	2	1	2
CH201.5	3	3	2	2	-	-	-	-	-	-	-	-	2	2	3
CH201.6	2	2	1	1	-	-	-	-	-	-	-	-	1	1	2
CH201	2.8 3	2.83	1.66	1.6	-	-	-	-	-	-	-	-	1.6	1.5	2

Name of the Faculty: Prof. A.V. Pawar

Class: **SE**

Sem: **III**

Name of the Course: **CH202** (Industrial and Engineering Chemistry I)

CO code	Course Outcome
CH202.1	Explain different theories of chemical bonding, organometallic chemistry, mechanism and application of Photochemical processes.
CH202.2	Explain the Stability of Coordination compounds, Kinetics and energy profile diagrams of reactions
CH202.3	Apply the knowledge of metal carbonyls and their properties
CH202.4	Explain the role of metalloproteins in biological processes
CH202.5	Apply the knowledge to carry out organic estimations, gravimetric analysis and handle different instruments in the laboratory.

CH202.6	Predict reaction intermediate formation and photochemical reaction.
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**CO-PO and CO-PSO Mapping**

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH202.1	3	2	-	-	-	-	-	-	-	-	-	-	1	2	2
CH202.2	3	1	-	-	-	-	-	-	-	-	-	-	1	2	3
CH202.3	3	2	1	-	-	-	-	-	-	-	-	-	1	2	3
CH202.4	3	2	2	-	-	-	-	-	-	-	-	-	1	1	2
CH202.5	2	3	-	1	-	-	-	-	-	-	-	-	2	2	2
CH202.6	3	2	-	-	-	-	-	-	-	-	-	-	2	2	2
CH202	2.8	2	1.5	1	-	-	-	-	-	-	-	-	1.33	1.83	2.33

## Course outcome

Name of the Faculty: Prof. U.W. Khandalkar

Class: **SE**

Sem: **III**

Name of the Course: **CH203** (Fluid Flow Operations)

CO code	Course Outcome
CH203.1	Discuss the importance of the subject in Chemical Process Industries.
CH203.2	Compute pressure or pressure drop, flow rates etc.
CH203.3	Evaluate pressure drop and flow rates in conduits for Incompressible as well as compressible fluids.
CH203.4	Compute viscosity using different methods such as Stokes Law, Capillary viscometer.
CH203.5	Evaluate power requirements in agitation, power requirement for pumps and proper selection of pumps.
CH203.6	Discuss selections of valve used for chemical process industry

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH203.1	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH203.2	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH203.3	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH203.4	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH203.5	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH203.6	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH203	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2

Name of the Faculty: Dr. C.K. Mistry

Class: **SE**

Sem: **III**

Name of the Course: **CH204** (Chemical Engineering Thermodynamics-I)

CO code	Course Outcome
CH204.1	Apply the first Law of Thermodynamics on non-flow and flow Chemical Engineering processes
CH204.2	Compute the thermal efficiencies of various conversion devices using Second Law of Thermodynamics and entropy concepts

<b>CH204.3</b>	Evaluate Exergy analysis of energy systems.
<b>CH204.4</b>	Compute properties of real fluids using different models of equations of state and other mathematical models
<b>CH204.5</b>	Compute property changes of non-ideal gas systems using departure functions
<b>CH204.6</b>	Use thermodynamic charts and diagrams for estimation of various thermodynamic properties

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH204.1	3	3	2	-	1	-	-	-	1	1	-	1	3	1	2
CH204.2	3	3	2	-	1	-	-	-	1	1	-	1	3	2	2
CH204.3	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH204.4	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH204.5	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH204.6	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH204	3	3	2.6 7	-	1	-	-	-	1	1	-	1	3	1.83	2

## Course outcome

Name of the Faculty: Prof. N.S. Sawale

Class: SE

Sem: III

Name of the Course: **CH205 (Process Calculations)**

CO Code	Course Outcome
CH205.1	Apply various systems of units and conversion from one system to another and chemical composition, chemical arithmetic and various gas laws.
CH205.2	Identify the material balance of various unit operations for steady state operations and unsteady operations with recycle, bypass and purge.
CH205.3	Analyse degrees of freedom for various units.
CH205.4	Compute material balance of chemical reactions including recycle, bypass and purge.
CH205.5	Evaluate energy balances on various process equipments with and without reactions and also NCV and GCV.
CH205.6	Apply mass and energy balances for various unit operations and also for flow sheeting calculations.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH205.1	3	3	1	-	-	2	2	1	-	2	1	-	3	2	3
CH205.2	3	3	1	-	1	1	3	2	-	1	1	-	3	2	3
CH205.3	1	1	1	-	1	-	-	-	-	1	-	-	3	2	3
CH205.4	3	3	1	-	1	1	3	2	-	1	1	-	3	2	3
CH205.5	3	3	1	-	1	2	3	2	-	1	1	-	3	2	3
CH205.6	3	3	1	-	1	2	3	2	-	2	1	-	3	2	3
CH 205	2.7	2.7	1	-	1	1.6	2.8	1.8	-	1.3	1	-	3	2	3

Name of the Faculty: Prof. P.R. Angre

Class: SE

Sem: III (R-19)

Name of the Course: **CH206 (Basic Chemical Engineering lab)**

CO code	Course Outcome
CH206.1	Apply basic principles of chemistry and chemical engineering to solve and analyze complex industrial problems

<b>CH206.2</b>	Apply mathematical skills to perform calculations on data obtained and use required formulas to do the same
<b>CH206.3</b>	Evaluate sampling methods, required sampling size and reduce measurement errors for accurate experimental design
<b>CHL206.4</b>	Estimate experimental data by different data analysis methods on PC using MS Excel for investigating complex problems
<b>CHL206.5</b>	Examine and interpret the results obtained from experiments
<b>CHL206.6</b>	Design new laboratory experiments to study industrial problems which will benefit society and environment by following strict ethical standards

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH206.1</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH206.2</b>	2	2	1	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH206.3</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	1
<b>CH206.4</b>	2	2	2	-	-	-	1	-	1	1	-	1	2	2	2
<b>CH206.5</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	1	2
<b>CH206.6</b>	2	2	1	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH206</b>	2	2	1.66	-	-	-	1.8 3	-	1	1	-	1	2	1.83	1.83

## Course outcome

Name of the Faculty: Dr. Sunita Shinde      Class: **SE**

Sem: **III**

Name of the Course: **CH207 (Industrial and Engineering Chemistry-I Lab)**

CO code	Course Outcome
<b>CH207.1</b>	Explain different theories of chemical bonding, organo metallic chemistry, mechanism and application of Photochemical processes.
<b>CH207.2</b>	Explain the Stability of Coordination compounds, Kinetics and energy profile diagrams of reactions
<b>CH207.3</b>	Apply the knowledge of metal carbonyls and their properties
<b>CH207.4</b>	Explain the role of metallo proteins in biological processes
<b>CH207.5</b>	Apply the knowledge to carry out organic estimations, gravimetric analysis and handle different instruments in the laboratory.
<b>CH207.6</b>	Evaluate and apply reaction intermediate formation and photochemical reaction.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH207.1</b>	3	2	-	-	-	-	-	-	-	-	-	-	1	2	2
<b>CH207.2</b>	3	1	-	-	-	-	-	-	-	-	-	-	1	2	3
<b>CH207.3</b>	3	2	1	-	-	-	-	-	-	-	-	-	1	2	3
<b>CH207.4</b>	3	2	2	-	-	-	-	-	-	-	-	-	1	1	2
<b>CH207.5</b>	2	3	-	1	-	-	-	-	-	-	-	-	2	2	2
<b>CH207.6</b>	3	2	-	-	-	-	-	-	-	-	-	-	2	2	2
<b>CH207</b>	2.8	2	1.5	1									1.33	1.83	2.33

Name of the Faculty: Prof. U.W. Khandalkar

Class: **SE**

Sem: **III**

Name of the Course: **CH208 Chemical Engg. Lab I (FFO Lab.)**

CO code	Course Outcome
<b>CH208.1</b>	Discuss the importance of the subject in Chemical Process Industries.
<b>CH208.2</b>	Compute pressure or pressure drop, flow rates etc.
<b>CH208.3</b>	Evaluate pressure drop and flow rates in conduits for Incompressible as well as compressible fluids.

<b>CH208.4</b>	Compute viscosity using different methods such as Stokes Law, Capillary viscometer.
<b>CH208.5</b>	Evaluate power requirements in agitation, power requirement for pumps and proper selection of pumps.
<b>CH208.6</b>	Discuss selections of valve used for chemical process industry

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH208.1</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH208.2</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH208.3</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH208.4</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH208.5</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH208.6</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH208</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2

Name of the Faculty: Dr. N.S. Kolhe / Dr. C.K. Mistry

Class: **SE**

Sem: **III**

Name of the Course: **CH209** (Chemical Technology Laboratory : Skill Based Laboratory)

CO code	Course Outcome
<b>CH209.1</b>	Identify the major Chemical Process Industries and Industrially Important Products and explain the Natural Product Industries.
<b>CH209.2</b>	Explain the Laboratory Preparation of Industrially Important Chemical Compounds and Products.
<b>CH209.3</b>	Outline the processes used for the Manufacture of Acids and Fertilizers.
<b>CH209.4</b>	Explain the Manufacturing Processes used in the Chloro-Alkali Industries.
<b>CH209.5</b>	Explain the Basic Building Blocks of the Petrochemical Industry.
<b>CH209.6</b>	Discuss the Synthesis of Important Heavy Organic Chemicals and Intermediates and outline the processes used for the Synthesis of Polymers.



## Course outcome

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH209.1	2	2	1	-	-	-	2	-	1	1	-	1	2	1	2
CH209.2	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH209.3	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH209.4	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH209.5	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH209.6	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH209	2	2	1.83	-	-	-	2	-	1	1	-	1	2	1.83	2

Name of the Faculty: Prof. Lathika Chandramohan      Class: **SE**      Sem: **III**

Name of the Course: CH210 - Engineering Mathematics-III (T)

CO code	Course Outcome
CH210.1	Apply concept of Laplace Transform and inverse Laplace transform to solve initial value problems.
CH210.2	Demonstrate ability to manipulate matrices and compute eigen values and eigen vectors.
CH210.3	Apply concept of probability and probability distribution.
CH210.4	Apply concept of sampling theory and correlation, regression to engineering problems.
CH210.5	Explain the complex variable theory, applications of harmonic conjugate to get orthogonal trajectories and analytic functions.
CH210.6	Create the image of the curve by complex transformation from z plane to w plane.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH210.1	3	3	1	1	-	-	-	-	-	-	-	-	2	2	2
CH210.2	3	3	2	2	-	-	-	-	-	-	-	-	2	1	1
CH210.3	3	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CH210.4	3	3	2	2	-	-	-	-	-	-	-	-	2	1	2



## Course outcome

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## Course outcome

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## Course outcome

Name of the Faculty: Prof. V.A. Bokade      Class: **SE**

Sem: **IV**

Name of the Course: CH211 Engineering Mathematics-IV

CO code	Course Outcome
CH211.1	Demonstrate ability of using Fourier series in solving PDE.
CH211.2	Demonstrate ability of using Fourier Transform in solving PDE.
CH211.3	Use finite Differences Approximations to solve boundary value problem using Finite Differences Approximations.
CH211.4	Identify the applicability of theorems and evaluate the contour integrals.
CH211.5	Evaluate the contour integrals using residues.
CH211.6	Apply the knowledge for any further course on optimization.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH211.1	3	3	1	1	-	-	-	-	-	-	-	-	1	2	2
CH211.2	3	3	2	2	-	-	-	-	-	-	-	-	1	2	3
CH211.3	3	3	2	-	-	-	-	-	-	-	-	-	1	2	3
CH211.4	3	3	2	2	-	-	-	-	-	-	-	-	1	1	2
CH211.5	3	3	2	2	-	-	-	-	-	-	-	-	2	2	2
CH211.6	2	2	1	1	-	-	-	-	-	-	-	-	2	2	2
CH211	2.83	2.83	1.66	1.6	-	-	-	-	-	-	-	-	1.33	1.83	2.33

Name of the Faculty: Prof. A.V. Pawar      Class: **SE**

Sem: **IV**

Name of the Course: CH212 Industrial and Engineering Chemistry II

CO code	Course Outcome
CH212.1	Explain the role of different conductivity cells and different titrimetric methods and solvent extractions.
CH212.2	Identify the organic and inorganic biological compound by the use of spectrophotometer
CH212.3	Apply the knowledge of the colloidal phenomenon in food industry and pesticides.
CH212.4	Identify the significance of rearrangement reactions, active methylene group

CH212.5	Predict and synthesize different products by learning reaction mechanism.
CH212.6	Apply the knowledge of Qualitative (Analysis) and Quantitative (estimations) methods in the laboratory.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH212.1	3	2	-	-	-	-	-	-	-	-	-	-	2	2	2
CH212.2	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1
CH212.3	2	1	2	-	-	-	-	-	-	-	-	-	1	2	2
CH212.4	3	2	1	-	-	-	-	-	-	-	-	-	2	1	2
CH212.5	3	1	1	1	-	-	-	-	-	-	-	-	2	2	3
CH212.6	2	2	1	1	-	-	-	-	-	-	-	-	1	1	2
CH212	2.6 6	1.6 6	1.2 5	1	-	-	-	-	-	-	-	-	1.66	1.5	2



## Course outcome

Name of the Faculty: Dr. C.K. Mistry

Class: **SE**

Sem: **IV**

Name of the Course: **CH213**Chemical Engineering Thermodynamics-II

CO code	Course Outcome
<b>CH213.1</b>	Apply the First law and Second law of Thermodynamics.
<b>CH213.2</b>	Analyze the problems of phase equilibrium and reaction equilibrium.
<b>CH213.3</b>	Evaluate the refrigerant flow rate for a given duty of refrigeration.
<b>CH213.4</b>	Evaluate the compressor sizes and loads for refrigeration.
<b>CH213.5</b>	Utilize the calculations of phase equilibria and apply it as a fundamental concept for design of mass transfer equipment.
<b>CH213.6</b>	Apply the methods for estimation of Thermodynamic properties.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH213.1	3	3	2	-	1	-	-	-	1	1	-	1	3	1	2
CH213.2	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH213.3	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH213.4	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH213.5	3	3	3	-	3	-	-	-	1	1	-	1	3	2	2
CH213.6	3	3	2	-	3	-	-	-	1	1	-	1	3	2	2
CH213	3	3	2.6 7	-	1.6 6	-	-	-	1	1	-	1	3	1.83	2

Name of the Faculty: Prof. N.S. Sawale

Class: **SE**

Sem: **IV**

Name of the Course: **CH214** Solid Fluid Mechanical Operations

CO code	Course Outcome
<b>CH214.1</b>	Apply and analyze the concept of particle size analysis and size reduction.
<b>CH214.2</b>	Apply and analyze the concept of flow through packed bed, fluidization and filtration

<b>CH214.3</b>	Identify the scope of subjects in Chemical Industry
<b>CH2014.4</b>	Discuss and analyze the concept of sedimentation and gas- solid separation.
<b>CH214.5</b>	Apply the concept of solid mixing, solid storage & conveying, size enlargement.
<b>CH214.6</b>	Plan to use the basic knowledge in particle technology (particle size, shape, specific surface) and concept of particle size measurement and distribution

**CO-PO and CO-PSO Mapping**

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH214.1	1	2	3	-	-	2	-	2	-	-	-	-	2	1	2
CH214.2	2	2	3	-	-	2	-	2	-	-	-	-	2	2	2
CH214.3	2	2	3	-	-	2	-	2	-	-	-	-	2	2	2
CH214.4	2	2	3	-	-	2	-	2	-	-	-	-	2	2	2
CH214.5	2	2	3	-	-	2	-	2	-	-	-	-	2	2	2
CH214.6	2	2	2	-	-	2	-	2	-	-	-	-	2	2	2
CH214	1.8 3	2	2.8 3	-	-	2	-	2	-	-	-	-	2	1.83	2

## Course outcome

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Name of the Faculty: Mr. Anand Ingle

Course Code: CH215

Course Name: Numerical Methods in Chemical Engineering

Course	Numerical Methods in Chemical Engineering	Course Code	CH215	Course Teacher	Prof. Anand A. Ingle
<b>Course Outcomes (CO)</b>					
CH215.1	Solve linear algebraic equations.				
CH215.2	Solve nonlinear algebraic equations.				
CH215.3	Solve using Curve fitting				
CH215.4	Solve Ordinary Differential equations				
CH215.5	Solve Partial Differential equations				
CH215.6	Solve Chemical engineering problems with numerical analysis techniques.				



## Course outcome

### NMCE (CH215) CO PO Matrix

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH215.1	3	3	1	3	1										1
CH215.2	3	3	2	3	2										2
CH215.3	3	3	3	3	3										1
CH215.4	3	3	2	3	2										2
CH215.5	3	3	2	3	2										2
CH215.6	3	3	3	3	3	2									3
CH215	3	3	2.16	3	2.16	1									1.83

Name of the Faculty: Dr. N.S. Kolhe

Class: **SE**

Sem: **IV**

Name of the Course: **CH216** (Skill Based Laboratory: Design Calculation of Auxiliary Plant Equipment)

CO code	Course Outcome
<b>CH216.1</b>	Discuss unit conversion and apply to chemical engineering problems.
<b>CH216.2</b>	Identify the basic function and design of steam trap.
<b>CH216.3</b>	Understand the pressure vessels and its design.
<b>CH216.4</b>	Explain various characteristics and power requirement of pumps.
<b>CH216.5</b>	Explain use of Psychrometric chart for properties of water and steam.
<b>CH216.6</b>	Discuss the theoretical concepts from process calculation

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	P O	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH216.1	2	2	2	-	-	-	2	-	1	1	-	1	2	1	2

CH216.2	2	2	2	-	-	-	1	-	1	1	-	1	2	2	2
CH216.3	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH216.4	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH216.5	2	2	1	-	-	-	2	-	1	1	-	1	2	2	2
CH216.6	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH216	2	2	1.83	-	-	-	1.83	-	1	1	-	1	2	1.83	2

Name of the Faculty: Dr. Sunita Shinde Class: **SE**

Sem: IV

Name of the Course: **CH217 Industrial and Engineering Chemistry-II Lab**

CO code	Course Outcome
<b>CH217.1</b>	Explain the role of different conductivity cells and different titrimetric methods and solvent extractions.

## Course outcome

<b>CH217.2</b>	Identify the organic and inorganic biological compound by the use of spectrophotometer
<b>CH217.3</b>	Apply the knowledge of colloidal phenomenon in food industry and pesticides.
<b>CH217.4</b>	Identify the significance of rearrangement reactions, active methylene group
<b>CH217.5</b>	Predict and synthesize different products by learning reaction mechanism.
<b>CH217.6</b>	Apply the knowledge of Qualitative (Analysis) and uantitative(estimations) methods in the laboratory.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH217.1</b>	3	2	-	-	-	-	-	-	-	-	-	-	2	2	2
<b>CH217.2</b>	3	2	-	-	-	-	-	-	-	-	-	-	2	1	1
<b>CH217.3</b>	2	1	2	-	-	-	-	-	-	-	-	-	1	2	2
<b>CH217.4</b>	3	2	1	-	-	-	-	-	-	-	-	-	2	1	2
<b>CH217.5</b>	3	1	1	1	-	-	-	-	-	-	-	-	2	2	3
<b>CH217.6</b>	2	2	1	1	-	-	-	-	-	-	-	-	1	1	2
<b>CH217</b>	2.66	1.66	1.25	1									1.66	1.5	2

Name of the Faculty: Dr. N.S. Kolhe / Prof. Y.A. Karpe  
 Class: **SE** Sem: **IV**

Name of the Course: **CH218** (Solid Fluid Mechanical Operation - Laboratory)

CO code	Course Outcome
<b>CH218.1</b>	Apply the concept of size analysis & screen effectiveness
<b>CH218.2</b>	Analyze the light & heavy material through cyclone separator

<b>CH218.3</b>	Explain the concept of reduction of large particles into a small size.
<b>CH218.4</b>	Explain the sedimentation in effluent treatment plant.
<b>CH218.5</b>	Identify the importance of liquid & solid material by way of filtration.
<b>CH218.6</b>	Utilize and access the equipments for preparation of paint.

**CO-PO and CO-PSO Mapping**

Course	Numerical Methods in Chemical Engineering Lab	Course Code	CHL402	Course Teacher	Prof. Anand A. Ingle
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CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH218.1</b>	2	2	1	--	1	--	--	--	--	--	--	--	2	2	1
<b>CH218.2</b>	1	1	2	--	2	--	--	--	--	--	--	--	1	1	2
<b>CH218.3</b>	1	2	3	--	1	--	--	--	--	--	--	--	2	2	1
<b>CH218.4</b>	2	2	1	--	2	--	--	--	--	--	--	--	1	1	2
<b>CH218.5</b>	2	2	3	1	--	--	--	--	--	--	--	--	2	1	1
<b>CH218.6</b>	1	3	1	1	--	--	--	--	--	--	--	--	1	2	2
<b>CH218</b>	1.5	2	1.83 3		1.5	--	--	--	--	--	--	--	1.5	1.5	1.5

Name of the Faculty: Prof. Anand A. Ingle

Class: **SE**

Sem: **IV**

Course Code: CH219

Course Name: Numerical Methods in Chemical Engineering Lab







## Course outcome

Name of the Faculty: Prof. V.A. Bokade

Class: **SE**

Sem: **IV**

Name of the Course: CH220 Engineering Mathematics-IV (T)

CO code	Course Outcome
CH220.1	Demonstrate ability of using Fourier series in solving PDE.
CH220.2	Demonstrate ability of using Fourier Transform in solving PDE.
CH220.3	Explain boundary value problem using Finite Differences Approximations.
CH220.4	Identify the applicability of theorems and evaluate the contour integrals.
CH220.5	Evaluate the contour integrals using residues.
CH220.6	Apply the knowledge of optimization for any further course on optimization.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH220.1	3	3	1	1	-	-	-	-	-	-	-	-	1	2	2
CH220.2	3	3	2	2	-	-	-	-	-	-	-	-	1	2	3
CH220.3	3	3	2	-	-	-	-	-	-	-	-	-	1	2	3
CH220.4	3	3	2	2	-	-	-	-	-	-	-	-	1	1	2
CH220.5	3	3	2	2	-	-	-	-	-	-	-	-	2	2	2
CH220.6	2	2	1	1	-	-	-	-	-	-	-	-	2	2	2
CH220	2.8 3	2.8 3	1.6 6	1.6	-	-	-	-	-	-	-	-	1.33	1.83	2.33



## Course outcome

Name of the Faculty: Dr. C.K. Mistry

Class: **TE**

Sem: **V**

Name of the Course: **CH301** (Advanced Material Science –Department Optional Course 1)

CO code	Course Outcome
<b>CH301.1</b>	Identify various types of advanced materials such as polymers, ceramics and composites.
<b>CH301.2</b>	Evaluate and utilize the properties of various polymeric, ceramic and metallic materials and discuss their applications in various fields.
<b>CH301.3</b>	Select and analyze different types of composite materials, their properties and applications.
<b>CH301.4</b>	Explain the fabrication of various composite materials.
<b>CH301.5</b>	Outline the types of nanotubes and nanosensors and their applications.
<b>CH301.6</b>	Evaluate the thin film coating methods and discuss their applications in various fields.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH301.1	2	2	1	-	-	-	1	-	1	1	-	1	2	1	2
CH301.2	2	2	1	-	-	-	1	-	1	1	-	1	2	1	2
CH301.3	2	2	1	-	-	-	1	-	1	1	-	1	2	2	2
CH301.4	2	2	1	-	-	-	1	-	1	1	-	1	2	2	2
CH301.5	2	2	1	-	-	-	1	-	1	1	-	1	2	2	2
CH301.6	2	2	1	-	-	-	1	-	1	1	-	1	2	2	2
CH301	2	2	1	-	-	-	1	-	1	1	-	1	2	1.67	2



## Course outcome

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## Course outcome

Name of the Faculty: Prof. Y. A. Karpe

Class: **TE**

Sem: **V**

Name of the Course: **CH302** (Mass Transfer Operation -I)

CO code	Course Outcome
<b>CH302.1</b>	Analyze the fundamentals of the relationship between fluid flow, convection heat transfer and mass transfer.
<b>CH302.2</b>	Apply the concept and operation of various types of gas-liquid contacts equipment.
<b>CH302.3</b>	Discuss the desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability and sustainability.
<b>CH302.4</b>	Evaluate NTU, HTU, HETP and height of packed bed used for Absorption and Humidification operations.
<b>CH302.5</b>	Demonstrate knowledge of mass transfer by applying principles of diffusion, mass transfer coefficients, and interphase mass transfer.
<b>CH302.6</b>	Evaluate the time required for drying and design of drying equipments.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH302.1	2	2	2	-	-	-	2	-	1	-	-	-	1	2	1
CH302.2	2	2	3	-	-	-	2	-	1	-	-	-	2	2	2
CH302.3	2	2	3	-	-	-	2	-	1	-	-	-	2	2	2
CH302.4	2	2	3	-	-	-	2	-	1	-	-	-	3	2	2
CH302.5	2	2	3	-	-	-	2	-	1	-	-	-	2	2	2
CH302.6	2	2	2	-	-	-	2	-	1	-	-	-	2	2	2
CH302	2	2	2.6 7	-	-	-	2	-	1	-	-	-	2	2	1.83

Name of the Faculty: Dr. N.S. Kolhe

Class: **TE**Sem: **V**Name of the Course: **CH303** HEAT TRANSFER OPERATIONS

CH303.1	Demonstrate rate of heat transfer by all three modes of heat transfer.
CH303.2	Apply basic principles involved in mechanism and calculation of heat transfer rates.
CH303.3	Explain the most common types of unsteady state operations of heat transfer.
CH303.4	Explain heat transfer through extended surfaces
CH303.5	Design Heat Exchangers
CH303.6	Explain radiation in heat transfer

**CO-PO and CO-PSO Mapping**

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH303.1	2	2	1	--	--	--	--	--	--	--	--	--	2	2	1
CH303.2	2	1	2	--	--	--	--	--	--	--	--	--	1	1	2
CH303.3	1	2	3	--	2	--	--	--	--	--	--	--	2	2	1
CH303.4	2	2	1	--	--	--	--	--	--	--	--	--	1	2	2
CH303.5	2	2	3	1	--	--	--	--	--	--	--	--	2	2	1
CH303.6	2	3	1	1	--	--	--	--	--	--	--	--	1	2	2
CH303	1.83 3	2	1.83 3	1	--	--	--	--	--	--	--	--	1.5	1.83 3	1.5

Name of the Faculty: Prof. Nishant Sawale

Class: **TE**Sem: **V**Name of the Course: **CH304** (Chemical Reaction Engineering I)

CO code	Course Outcome
CH304.1	Analyze the kinetics of homogeneous systems

## Course outcome

CH304.2	Explain different methods of analysis of experimental data
CH304.3	Apply the knowledge to develop kinetics models for different types of homogeneous reactions.
CH304.4	Apply the knowledge to develop the design equations of various reactors (Batch, PFR & CSTR).
CH304.5	Discuss the different arrangement of reactors in series and parallel.
CH304.6	Identify the effect of temperature on reactor performance for adiabatic and non-adiabatic operation and predict the kinetic model to design the reactors for adiabatic and non-isothermal operations.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH304.1	2	2	1	--	--	--	--	--	--	--	--	--	2	2	1
CH304.2	2	1	2	--	--	--	--	--	--	--	--	--	1	1	2
CH304.3	1	2	3	--	2	--	--	--	--	--	--	--	2	2	1
CH304.4	2	2	1	--	--	--	--	--	--	--	--	--	1	2	2
CH304.5	2	2	3	1	--	--	--	--	--	--	--	--	2	2	1
CH304.6	2	3	1	1	--	--	--	--	--	--	--	--	1	2	2
CH304	1.83 3	2	1.83 3	1	--	--	--	--	--	--	--	--	1.5	1.833	1.5

Name of the Faculty: Dr. Arati Barik

Class: **TE**

Sem: **V**

Name of the Course: **CH305** (Transport Phenomena)

CO code	Course Outcome
<b>CH305.1</b>	The student understands transport properties and analyze the mechanisms of molecular momentum, energy and mass transport.
<b>CH305.2</b>	The students can establish and simplify appropriate conservation statements for momentum, energy and mass transfer processes.
<b>CH305.3</b>	The students can formulate the differential forms of the equations of change for momentum, heat and mass transfer problems
<b>CH305.4</b>	The students can solve various industrial problems based on momentum, energy and mass transfer analysis.

<b>CH305.5</b>	The students understand conservation principles and appropriate boundary conditions in transport processes.
<b>CH305.6</b>	The student can apply conservation principles, along with appropriate boundary conditions for designing and optimizing parameters of industrial equipment based on different transport processes.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH305.1	3	2	2	-	1	-	-	-	1	1	-	1	3	1	2
CH305.2	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH305.3	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH305.4	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH305.5	3	2	3	-	1	-	-	-	1	1	-	1	3	2	2
CH305.6	3	3	2	-	1	-	-	-	1	1	-	1	3	2	2
CH305	3	2.67	2.67	-	1	-	-	-	1	1	-	1	3	1.83	2

Name of the Faculty: Prof. Sreedevi Nair

Class: **TE**

Sem: **V**

Name of the Course: **CH306** (Skill Based Lab. : Professional Communication and Ethics II)

CO code	Course Outcome
<b>CH306.1</b>	Plan and Prepare effective business/technical documents which will in turn provide solid foundation for their future managerial roles.
<b>CH306.2</b>	Strategize their personal and professional skills to build a professional image and meet the demands of the industry.
<b>CH306.3</b>	Emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations.
<b>CH306.4</b>	Deliver persuasive and professional presentations.
<b>CH306.5</b>	Develop creative thinking and interpersonal skills required for effective professional communication.
<b>CH306.6</b>	Apply codes of ethical conduct, personal integrity and norms of organizational behaviour.

## Course outcome

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH306.1	1	-	-	-	-	1	1	3	2	3	-	1	1	1	1
CH306.2	1	-	-	-	-	1	1	3	2	3	-	1	1	1	1
CH306.3	1	-	-	-	-	1	1	3	2	3	-	1	1	1	1
CH306.4	1	-	-	-	-	1	1	3	2	3	-	1	1	1	1
CH306.5	1	-	-	-	-	1	1	3	2	3	-	1	1	1	1
CH306.6	1	-	-	-	-	1	1	3	2	3	-	1	1	1	1
CH306	1	-	-	-	-	1	1	3	2	3	-	1	1	1	1

Name of the Faculty: Prof. Y. A. Karpe

Class: **TE**

Sem: **V**

Name of the Course: **CH307** (MTO-I Laboratory)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH307.1</b>	Demonstrate the fundamentals of the relationship between fluid flow, convection heat transfer and mass transfer operation.
<b>CH307.2</b>	Compile and compare the concept and operation of various types of gas-liquid contacts equipment.
<b>CH307.3</b>	Evaluate the efficiency of cooling tower.
<b>CH307.4</b>	Evaluate NTU, HTU of cooling tower and height of packed bed used for Absorption and Humidification operations.
<b>CH307.5</b>	Identify the rate of diffusion and mass transfer coefficients.
<b>CH307.6</b>	Evaluate the time required for drying and design of drying equipment.

## Course outcome

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH307.1	2	2	2	-	-	-	2	-	1	-	-	-	1	2	1
CH307.2	2	2	3	-	-	-	2	-	1	-	-	-	2	2	2
CH307.3	2	2	3	-	-	-	2	-	1	-	-	-	2	2	2
CH307.4	2	2	3	-	-	-	2	-	1	-	-	-	3	2	2
CH307.5	2	2	3	-	-	-	2	-	1	-	-	-	2	2	2
CH307.6	2	2	2	-	-	-	2	-	1	-	-	-	2	2	2
CH307	2	2	2.6 7	-	-	-	2	-	1	-	-	-	2	2	1.83

Name of the Faculty: Dr. N.S. Kolhe

Class: **TE**                      Sem: **V**

Name of the Course: **CH308** (HTO Laboratory)

CO code	Course Outcome
<b>CH308.1</b>	Explain to determine the heat transfer coefficient in under unsteady state.
<b>CH308.2</b>	Explain to determine the overall & individual and shell side heat transfer coefficient of vertical heat exchanger
<b>CH308.3</b>	Explain to determine the thermal conductivity of the given metal test piece.
<b>CH308.4</b>	Explain to determine the emissivity of given test plate
<b>CH308.5</b>	Explain to determine the overall & individual heat transfer coefficient in an agitated vessel under steady state conditions.
<b>CH308.6</b>	Explain to determine overall & individual heat transfer coefficient of double pipe heat exchanger.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	P O	PO	P O	P O	P O	P O	P O	P O	P O	P O	PO	PS O	PS O	PS O
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH308.1	1	2	2	--	1	--	--	--	1	--	--	--	1	1	1
CH308.2	2	2	1	--	1	--	--	--	--	1	--	--	2	2	2
CH308.3	2	2	3	--	1	--	--	--	1	1	--	--	3	2	2
CH308.4	2	2	2	--	1	--	--	--	1	1	--	--	2	2	3
CH308.5	2	2	2	--	1	--	--	--	--	1	--	--	2	1	2
CH308.6	2	2	1	--	1	--	--	--	1	-	--	--	2	2	2
CH308	1.83 3	2	1.83 3	--	1	--	--	--	1	1	--	--	2	1.66	2

Name of the Faculty: Prof. Nishant Sawale      Class: **TE**      Sem: V

Name of the Course: **CH309** (CRE I Laboratory)

CO code	Course Outcome
CH309.1	Evaluate rate constant and order of reaction at room temperature using differential & integral method of analysis.
CH309.2	Evaluate activation energy using Arrhenius, Collision and Transition state theory.
CH309.3	Identify conversion in batch reactor at time t
CH309.4	Identify theoretical and experimental conversion in Plug flow and mixed flow reactor.
CH309.5	Identify conversion in PFR – CSTR combination and evaluate order of reaction when reaction is pseudo first order.
CH309.6	Predict order of reaction using half life method and will be able to study acidic hydrolysis.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3



## Course outcome

<b>CH309.1</b>	2	2	1	--	2	--	--	--	1	--	--	--	2	2	1
<b>CH309.2</b>	2	1	2	--	2	--	--	--	1	--	--	--	1	1	2
<b>CH309.3</b>	1	2	3	--	2	--	--	--	1	--	--	--	2	2	1
<b>CH309.4</b>	2	2	1	--	2	--	--	--	1	--	--	--	1	2	2
<b>CH309.5</b>	2	2	3	1	2	--	--	--	1	--	--	--	2	2	1
<b>CH309.6</b>	2	3	1	1	2	--	--	--	1	--	--	--	1	2	2
<b>CH309</b>	1.83 3	2	1.83 3	1	2	--	--	--	1--	--	--	--	1.5	1.83 3	1.5

Name of the Faculty: Prof. Y. A. Karpe

Class: **TE**

Sem: **VI**

Name of the Course: **CH310** Pollution Control Technology

<b>CO code</b>	<b>Course Outcome</b>
<b>CH310.1</b>	Identify sources, types of pollutants and determine their impact on the environment, related laws and standards.
<b>CH310.2</b>	To understand sampling, measurement of various water pollutants, natural purification process, design various waste water treatments methods.
<b>CH310.3</b>	Analyze sampling, measurements, meteorological aspects air pollutant dispersion, its control and equipment's used for air pollution control
<b>CH310.4</b>	To manage solid waste and noise pollution control.
<b>CH310.5</b>	Analyze and select appropriate treatment process for specific effluents emerging from chemical industries.
<b>CH310.6</b>	To minimize use of resources in chemical industries.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	P O	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH310.1</b>	2	2	1	-	-	-	2	-	1	1	-	1	2	1	2
<b>CH310.2</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH310.3</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH310.4</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH310.5</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH310.6</b>	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
<b>CH310</b>	2	2	1.8 3	-	-	-	2	-	1	1	-	1	2	1.83	2

Name of the Faculty: Dr. Arati Barik

Class: **TE**

Sem: **VI**

Name of the Course: **CH311** Mass transfer Operations –II (MTO-II)

CO code	Course Outcome
<b>CH311.1</b>	Analyze equilibrium in all separation process
<b>CH311.2</b>	Identify and understand various mass transfer equipments and their operation
<b>CH311.3</b>	Design various mass transfer equipments such as distillation column, extraction column and adsorption equipments etc.
<b>CH311.4</b>	Select and analyze the separation operation which will be economical for the process
<b>CH311.5</b>	Evaluate and optimize the process parameters
<b>CH311.6</b>	Demonstrate membrane separation processes, their principles and working

## Course outcome

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH311.1	3	3	2		1	-	-	-	1	1	-	1	3	2	2
CH311.2	3	3	1	-	1	-	-	-	1	1	-	1	3	3	2
CH311.3	3	3	3	-	1	-	-	-	1	1	-	1	3	3	2
CH311.4	3	3	3	-	1	-	-	-	1	1	-	1	3	3	2
CH311.5	3	3	3	-	1	-	-	-	1	1	-	1	3	3	2
CH311.6	2	2	2	-	1	-	-	-	1	1	-	1	3	3	2
CH311	2.8 3	2.8 3	2.3 3	-	1	-	-	-	1	1	-	1	3	2.83	2

Name of the Faculty: Prof. Prajakta Angre

Class: **TE**

Sem: **VI**

Name of the Course: **CH312** (Process Engineering and Economics)

CO code	Course Outcome
<b>CH312.1</b>	Understand the functions of process engineering and various approaches of chemical process design.
<b>CH312.2</b>	To calculate different types of interests and annual depreciation costs using different methods.
<b>CH312.3</b>	To draw various flow diagrams and carry out process design of piping and various flow moving devices.
<b>CH312.4</b>	To carry out process design of multicomponent distillation and absorption columns using various approaches.
<b>CH312.5</b>	Evaluate basic design aspects of major process equipment, carry out their quick cost estimation and demonstrate their knowledge of different types of costs and capital cost estimates.
<b>CH312.6</b>	Demonstrate their knowledge of cash flow in an industrial operation and perform break-even and profitability analysis using different methods.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH312.1	1	2	2	-	2	-	2	-	1	-	1	-	1	2	2
CH312.2	2	2	2	-	2	-	2	-	1	-	3	-	2	2	2
CH312.3	2	1	2	-	2	-	2	-	1	-	1	-	2	2	2
CH312.4	2	2	2	-	2	-	2	-	1	-	1	-	2	2	2
CH312.5	1	2	2	-	2	-	2	-	1	-	3	-	2	2	3
CH312.6	2	2	2	-	2	-	2	-	1	-	3	-	2	2	2
CH312	1.6 6	1.8 3	2	-	2	-	2	-	1	-	2	-	1.83	2	2

Name of the Faculty: Prof. Nishant Sawale      Class: **TE**      Sem: VI

Name of the Course: **CH313** Chemical Reaction Engineering–II (CRE- II)

CO code	Course Outcome
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## Course outcome

CH313.1	Explain the kinetics & mechanism of various heterogeneous reactions & design consideration of reactors used during different operating conditions.
CH313.2	Apply the knowledge of design of solid catalyzed fluid phase reactors.
CH313.3	Demonstrate the concept of Non catalytic heterogeneous reactions.
CH313.4	Apply the knowledge of design of reactors for non catalytic reactions.
CH313.5	Demonstrate the concept of kinetics of fluid - fluid reactions.
CH313.6	Explain the concept of residence time distribution (RTD) in non-ideal reactors.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH313.1	2	2	2	--	1	--	--	--	--	--	--	--	1	2	1
CH313.2	1	2	3	1	1	--	--	--	--	--	--	--	1	2	2
CH313.3	2	2	1	--	--	--	--	--	--	--	--	--	2	2	1
CH313.4	1	2	2	--	1	--	--	--	--	--	--	--	1	2	2
CH313.5	2	2	2	1	1	--	--	--	--	--	--	--	2	1	2
CH313.6	2	1	2	1	3	--	--	--	--	--	--	--	1	2	2
CH313	1.66	1.83 3	2	1	1.4	--	--	--	--	--	--	--	1.33	1.833	1.66

Name of the Faculty: Prof. Umakant W. Khandalkar

Class: **TE**Sem: **VI**Name of the Course: **CH314** Piping Engineering (Department Optional Course 2)

CO code	Course Outcome
<b>CH314.1</b>	Recognize role of piping engineer.
<b>CH314.2</b>	Understand Pipe Material selection.
<b>CH314.3</b>	Choose the piping fundamentals, codes and standards
<b>CH314.4</b>	Select piping system components.
<b>CH314.5</b>	Examine piping system.
<b>CH314.6</b>	Choose and Design different piping drawing.

**CO-PO and CO-PSO Mapping**

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH314.1	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH314.2	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH314.3	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH314.4	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH314.5	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH314.6	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH314	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2

Name of the Faculty: Prof. Y. A. Karpe

Class: **TE**Sem: **VI**Name of the Course: **CH315** (PCT Laboratory)

CO code	Course Outcome
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## Course outcome

<b>CH315.1</b>	Evaluate the Physical characteristics of different samples.
<b>CH315.2</b>	Identify various pollutants sources and evaluate adverse effects, Environmental Legislation
<b>CH315.3</b>	Identify meteorological aspects air pollutant dispersion, Sampling and measurement, Control Methods and Equipment.
<b>CH315.4</b>	Analyze Sampling, measurement of various water pollutant techniques.
<b>CH315.5</b>	Identify and design various Waste Water Testing techniques like BOD, COD, etc.
<b>CH315.6</b>	Apply the Environmental Engineering concepts to control management of various types of pollutants.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH315.1	2	2	1	-	-	-	2	-	1	1	-	1	2	1	2
CH315.2	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH315.3	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH315.4	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH315.5	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH315.6	2	2	2	-	-	-	2	-	1	1	-	1	2	2	2
CH315	2	2	1.8 3	-	-	-	2	-	1	1	-	1	2	1.83	2

Name of the Faculty: Dr. Arati Barik

Class: TE

Sem: VI

Name of the Course: CH316 (MTO-II Laboratory)

CO code	Course Outcome
CH316.1	Analyze equilibrium in all separation process
CH316.2	Identify and understand various mass transfer equipment and their operation
CH316.3	Design distillation column
CH316.4	Select and analyse the separation operation which will be economical for the process
CH316.5	Evaluate and optimize the process parameters
CH316.6	Demonstrate crystallization and adsorption processes principle and working

## CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH316.1	3	3	2		1	-	-	-	1	1	-	1	3	2	2
CH316.2	3	3	1	-	1	-	-	-	1	1	-	1	3	3	2
CH316.3	3	3	3	-	1	-	-	-	1	1	-	1	3	3	2
CH316.4	3	3	3	-	1	-	-	-	1	1	-	1	3	3	2
CH316.5	3	3	3	-	1	-	-	-	1	1	-	1	3	3	2
CH316.6	3	3	3	-	1	-	-	-	1	1	-	1	3	3	2
CH316	3	3	2.5	-	1	-	-	-	1	1	-	1	3	2.83	2

Name of the Faculty: Prof. Nishant Sawale

Class: TE

Sem: VI

Name of the Course: CH317 (CRE-II Laboratory)

CO code	Course Outcome
CH317.1	Explain the concept of Residence time distribution



## Course outcome

<b>CH317.2</b>	Demonstrate the Pulse input and Step input methods for RTD measurement.
<b>CH317.3</b>	Discuss the difference between batch and semi batch reactor.
<b>CH317.4</b>	Demonstrate the concept of the major resistance offered to overall reaction rate.
<b>CH317.5</b>	Explain the concept of non-catalytic and heterogeneous catalytic reactions & Esterification reaction
<b>CH317.6</b>	Explain the concept of adsorption isotherm

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH317.1	2	2	3	--	2	--	--	--	1	--	--	--	1	2	1
CH317.2	1	1	2	--	2	--	--	--	1	--	--	--	2	2	1
CH317.3	2	1	2	--	2	--	--	--	1	--	--	--	2	2	1
CH317.4	2	2	2	--	2	--	--	--	1	--	--	--	1	2	1
CH317.5	1	2	1	--	2	--	--	--	1	--	--	--	2	2	2
CH317.6	2	1	2	--	2	--	--	--	1	--	--	--	2	1	2
CH317	1.6 6	1.5	2	--	2	--	--	--	1	--	--	--	1.66	1.83 3	1.33

Name of the Faculty: Prof. Prajakta Angre

Class: **TE**

Sem: **VI**

Name of the Course: **CH318** (Process Engineering and Economics Tutorial)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH318.1</b>	Understand the functions of process engineering and various approaches of chemical process design.
<b>CH318.2</b>	To calculate different types of interests and annual depreciation costs using different methods.
<b>CH318.3</b>	To draw various flow diagrams and carry out process design of piping and various flow moving devices.
<b>CH318.4</b>	To carry out process design of multicomponent distillation and absorption columns using various approaches.
<b>CH318.5</b>	Evaluate basic design aspects of major process equipment, carry out their quick cost estimation and demonstrate their knowledge of different types of costs and capital cost estimates.
<b>CH318.6</b>	Demonstrate their knowledge of cash flow in an industrial operation and perform break-even and profitability analysis using different methods.

## Course outcome

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH318.1	1	2	2	-	2	-	2	-	1	-	1	-	1	2	2
CH318.2	2	2	2	-	2	-	2	-	1	-	3	-	2	2	2
CH318.3	2	1	2	-	2	-	2	-	1	-	1	-	2	2	2
CH318.4	2	2	2	-	2	-	2	-	1	-	1	-	2	2	2
CH318.5	1	2	2	-	2	-	2	-	1	-	3	-	2	2	3
CH318.6	2	2	2	-	2	-	2	-	1	-	3	-	2	2	2
CH318	1.6 6	1.8 3	2	-	2	-	2	-	1	-	2	-	1.83	2	2

Name of the Course: **CH319** Skill Based Lab. : Piping Design Engineering Laboratory

CO code	Course Outcome
<b>CH319.1</b>	To apply piping standards in design of complex piping networks.
<b>CH319.2</b>	To solve complex engineering problem of selection of appropriate material for pipes and fittings for chemical plants.
<b>CH319.3</b>	To identify, analyze and solve pipe sizing, pump sizing, valve sizing and pipe-valve-pump selection problems.
<b>CH319.4</b>	To design and draw piping networks, piping layout ,P & ID ,isometric drawings and plot plan by considering legal, environmental, societal and ethical aspects.
<b>CH319.5</b>	To use modern IT tools such as MS Excel/Libre office Calc/WPS spreadsheets, DWSIM, AutoCAD 2D and 3D,CAE demo and Edraw Fluid flow for design and analysis of piping networks.
<b>CH319.6</b>	To carry out stress analysis, network analysis, flexibility analysis and surge analysis for chemical plants which will benefit society and environment by following strict ethical standards.

**CO-PO and CO-PSO Mapping**

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH319.1	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH319.2	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH319.3	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH319.4	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH319.5	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH319.6	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2
CH319	3	2	2	-	-	-	2	-	1	1	-	1	3	3	2

## Course outcome

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Name of the Faculty: Ms. Prajakta Angre

Class: BE

Sem: VII

Name of the Course: **CH401** (Chemical Engineering Equipment Design)

<b>CO code</b>	<b>Course Outcome</b>
<b>CH401.1</b>	Apply the concept of Chemical Engineering equipment design terminologies and equipment testing methods.
<b>CH401.2</b>	Design pressure and high pressure vessel.
<b>CH401.3</b>	Design reaction vessel and agitator.
<b>CH401.4</b>	Design heat exchanger and evaporator.
<b>CH401.5</b>	Design distillation column.
<b>CH401.6</b>	Illustrate and explain the concept of storage tank and types of supports

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH401.1	1	2	2	-	2	-	2	-	1	-	-	-	1	2	2
CH401.2	2	2	2	-	2	-	2	-	1	-	-	-	2	2	2
CH401.3	2	1	2	-	2	-	2	-	1	-	-	-	2	2	2
CH401.4	2	2	2	-	2	-	2	-	1	-	-	-	2	2	2
CH401.5	1	2	2	-	2	-	2	-	1	-	-	-	2	2	3
CH401.6	2	2	2	-	2	-	2	-	1	-	-	-	2	2	2
CH401	1.6 6	1.8 3	2	-	2	-	2	-	1	-	-	-	1.83	2	2

Name of the Faculty: Prof. Prajakta Angre

Class: **BE**

Sem: **VII**

Name of the Course: **CH402** Department Optional Course 3 (Corrosion Engineering)

CO code	Course Outcome
<b>CH402.1</b>	Understand corrosion and its related mechanisms and Basic terminologies.
<b>CH402.2</b>	Classify different forms of corrosion and its conditions.
<b>CH402.3</b>	To describe the Corrosion Protection techniques, Coatings, Anodic protection, Cathodic Protection.
<b>CH402.4</b>	Apply the Methodology, Methods and Materials to prevent the Corrosion
<b>CH402.5</b>	

## Course outcome

	The understanding the modern theory principles behind corrosion.
<b>CH402.6</b>	To describe and demonstrate the Corrosion monitoring and control methods.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH402.1</b>	3	2	3	-	-	-	2	-		1	-		2	1	2
<b>CH402.2</b>	3	2	3	-	-	-	2	-		1	-		2	2	2
<b>CH402.3</b>	3	2	3	-	-	-	2	-		1	-		2	2	2
<b>CH402.4</b>	3	2	3	-	-	-	2	-		1	-		2	2	2
<b>CH402.5</b>	3	2	3	-	-	-	2	-		1	-		2	2	2
<b>CH402.6</b>	3	2	3	-	-	-	2	-		1	-		2	2	2
<b>CH402</b>	3	2	3	-	-	-	2	-		1	-		2	2	2





## Course outcome

Name of the Faculty: Dr. Arati Barik Class: **BE Sem: VII**

Name of the Course: **CH403** Instrumentation Process Dynamics and Control (PDC)

CO code	Course Outcome
<b>CH403.1</b>	Develop model of different dynamic systems.
<b>CH403.2</b>	Compute system response for various changes in input to the system based on application of Laplace Transform
<b>CH403.3</b>	Analyze and select measuring instruments for measuring various process parameters
<b>CH403.4</b>	Design controller for controlling output of a specified system
<b>CH403.5</b>	Compute stability analysis of a feedback control system based on Frequency response (Bode diagram)
<b>CH403.6</b>	Design controller parameters based on Zeigler-Nichols controller tuning method.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH403.1	3	3	2	-	1	-	-	-	1	1	-	1	3	1	1
CH403.2	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH403.3	3	3	3	-	3	-	-	-	1	1	-	1	3	3	3
CH403.4	3	3	3	-	3	-	-	-	1	1	-	1	3	3	3

CH403.5	3	3	3	-	3	-	-	-	1	1	-	1	3	3	3
CH403.6	3	3	2	-	1	-	-	-	1	1	-	1	3	2	2
CH403	3	3	2.6 7	-	2	-	-	-	1	1	-	1	3	2.33	2.33

Name of the Faculty: Prof. U.W. Khandalkar

Class: **BE**

Sem: **VII**

Name of the Course: **CH404** Department Optional Course 4 (Petroleum Refining Technology)

CO code	Course Outcome
<b>CH404.1</b>	Recognize the significance crude petroleum and petroleum refinery.
<b>CH404.2</b>	Understand and express the overall objectives of fractionate crude petroleum into useful fractions.
<b>CH404.3</b>	Apply important physical properties of petroleum products
<b>CH404.4</b>	Analyze refinery processes to maximize desired petro products
<b>CH404.5</b>	Students will be able to understand upgradation process.
<b>CH404.6</b>	Identify the economic and environmental drivers of petroleum refining.

#### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH404.1	2	2	1	-	-	2	-	-	1	-	-	-	2	1	2
CH404.2	2	2	2	-	-	2	-	-	1	-	-	-	2	2	2
CH404.3	2	2	2	-	-	2	-	-	1	-	-	-	2	2	2
CH404.4	2	2	2	-	-	2	-	-	1	-	-	-	2	2	2
CH404.5	2	2	2	-	-	2	-	-	1	-	-	-	2	2	2

## Course outcome

CH404.6	2	2	2	-	-	2	-	-	1	-	-	-	2	2	2
CH404	2	2	1.8 3	-	-	2	-	-	1	-	-	-	2	1.83	2

Name of the Faculty: Prof. Y.A. Karpe

Class: **BE**

Sem: **VII**

Name of the Course: **CH405** Institute Optional Course 1 (Energy Audit and Management)

CO code	Course Outcome
<b>CH405.1</b>	To identify and describe present state of energy security and its importance.
<b>CH405.2</b>	To identify and describe the basic principles and methodologies adopted in energy audit of an utility.
<b>CH405.3</b>	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.
<b>CH405.4</b>	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities
<b>CH405.5</b>	To analyze the data collected during performance evaluation
<b>CH405.6</b>	To recommend energy saving measures

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)	PSO
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	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH405.1</b>	3	2	3	-	-	1	2	-	1	1	-		2	1	2
<b>CH405.2</b>	3	2	3	-	-	1	2	-	1	1	-		2	2	2
<b>CH405.3</b>	3	2	3	-	-	1	2	-	1	1	-		2	2	2
<b>CH405.4</b>	3	2	3	-	-	1	2	-	1	1	-		2	2	2
<b>CH405.5</b>	3	2	3	-	-	1	2	-	1	1	-		2	2	2
<b>CH405.6</b>	3	2	3	-	-	1	2	-	1	1	-		2	2	2

Name of the Faculty: Ms. Prajakta Angre

Class: BE

Sem: VII

Name of the Course: **CH406** (Chemical Engineering Equipment Design Lab)

CO code	Course Outcome
<b>CH406.1</b>	Design and pictorially represent Pressure vessel.
<b>CH406.2</b>	Design and pictorially represent High pressure vessel.
<b>CH406.3</b>	Design and pictorially represent Reaction vessel and Agitator
<b>CH406.4</b>	Design and draw internals of Heat exchanger and Evaporator
<b>CH406.5</b>	Design and represent pictorially distillation column.
<b>CH406.6</b>	Sketch the internals of storage tank and types of supports

#### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)	PSO
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## Course outcome

	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH406.1</b>	3	2	3	-	2	-	2	-	1	1	-		2	1	2
<b>CH406.2</b>	3	2	3	-	2	-	2	-	1	1	-		2	2	2
<b>CH406.3</b>	3	2	3	-	2	-	2	-	1	1	-		2	2	2
<b>CH406.4</b>	3	2	3	-	2	-	2	-	1	1	-		2	2	2
<b>CH406.5</b>	3	2	3	-	2	-	2	-	1	1	-		2	2	2
<b>CH406.6</b>	3	2	3	-	2	-	2	-	1	1	-		2	2	2

Name of the Faculty: Dr. Arati Barik Class: **BE Sem: VII**

Name of the Course: **CH407** (Instrumentation Process Dynamics and Control Lab.)

CO code	Course Outcome
<b>CH407.1</b>	Analyze the dynamic behavior of a system for various inputs
<b>CH407.2</b>	Determine the characteristic parameters of a system
<b>CH407.3</b>	Analyze the characteristics of control valves
<b>CH407.4</b>	Develop Empirical Model from Process Data
<b>CH407.5</b>	Analyze various measuring devices
<b>CH407.6</b>	Tune the controller parameter

**CO-PO and CO-PSO Mapping**

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH407.1	3	3	2	-	1	-	-	-	1	1	-	1	3	1	2
CH407.2	3	3	2	-	1	-	-	-	1	1	-	1	3	2	2
CH407.3	3	3	3	-	1	-	-	-	1	1	-	1	3	2	2
CH407.4	3	3	3	-	3	-	-	-	1	1	-	1	3	3	3
CH407.5	3	3	3	-	3	-	-	-	1	1	-	1	3	3	3
CH407.6	3	3	3	-	3	-	-	-	1	1	-	1	3	3	3
CH407	3	3	2.6 7	-	2	-	-	-	1	1	-	1	3	2.33	2.5

## Course outcome

Name of the Faculty: Dr. N.S. Kolhe / Prof. N.S. Sawale

Class: **BE**

Sem: **VII**

Name of the Course: **CH408** (Hazard and Risk Analysis Lab.)

CO code	Course Outcome
<b>CH408.1</b>	Students will be able to apply the knowledge of mathematics, science, engineering fundamentals for identifying causative and initiating factors of accidents.
<b>CH408.2</b>	Students will be able to carry out Hazard and Risk analysis by using principles of sciences and engineering.
<b>CH408.3</b>	Students will be able to develop fire and explosion index and chemical exposure index by analyzing and interpreting of available data.
<b>CH408.4</b>	Students will be able to use IT tools such as RAST-CHEF to understand and evaluate situations causing industrial fire, explosions and evaluate risk.
<b>CH408.5</b>	Students will be able to prepare scenario list- guidance and maximum allowable response time for particular chemical plant/equipment
<b>CH408.6</b>	Students should be able to prepare Risk Assessment Matrix and Risk summary for particular plant to avoid accidents, for betterment of environment, society and communicate it with higher authorities

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH408.1	1	2	2	-	2	2	2	-	1	-	-	-	1	2	2
CH408.2	2	2	2	-	2	2	2	-	1	-	-	-	2	2	2
CH408.3	2	1	2	-	2	2	2	-	1	-	-	-	2	2	2

CH408.4	2	2	2	-	2	2	2	-	1	-	-	-	2	2	2
CH408.5	1	2	2	-	2	2	2	-	1	-	-	-	2	2	3
CH408.6	2	2	2	-	2	2	2	-	1	-	-	-	2	2	2
CH408	1.6 6	1.8 3	2	-	2	2	2	-	1	-	-	-	1.83	2	2

Name of the Faculty: Dr. C.K. Mistry

Class: **BE**

Sem: **VIII**

Name of the Course: **CH409** Modeling, Simulation & Optimization (MSO)

CO code	Course Outcome
<b>CH409.1</b>	The students will be able to write and solve models of chemical engineering system.
<b>CH409.2</b>	The students will be able to carry out sequential and equation oriented simulation of complete flow sheets.
<b>CH409.3</b>	The student will be able to optimize typical chemical processes.
<b>CH409.4</b>	The students will able to solve a process simulation.
<b>CH409.5</b>	The students will able to use basics of numerical methods.
<b>CH409.6</b>	The students will able to understand artificial neural network principles.



## Course outcome

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH409.1	3	3	2	-	1	-	-	-	1	1	1	1	3	2	2
CH409.2	3	3	3	-	1	-	-	-	1	1	1	1	3	2	2
CH409.3	3	3	2	-	1	-	-	-	1	1	1	1	3	2	2
CH409.4	3	3	3	-	3	-	-	-	1	1	1	1	3	2	2
CH409.5	3	3	2	-	3	-	-	-	1	1	1	1	3	2	2
CH409.6	3	3	3	-	3	-	-	-	1	1	1	1	3	2	2
CH409	3	3	2.5	-	2	-	-	-	1	1	1	1	3	2	2

Name of the Faculty: Dr. N.S. Kolhe

Class: **BE**                      Sem: VIII

Name of the Course: **CH410** Institute Optional Course 2 (Project Management)

CO code	Course Outcome
<b>CH410.1</b>	Apply selection criteria and select an appropriate project from different options.
<b>CH410.2</b>	Write work break down structure for a project and develop a schedule based on it.
<b>CH410.3</b>	Identify opportunities and threats to the project and decide an approach to deal with them strategically.
<b>CH410.4</b>	Use Earned value technique.
<b>CH410.5</b>	Determine & predict status of the project.

<b>CH410.6</b>	Capture lessons learned during project phases and document them for future reference.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH410.1</b>	1	2	2	--	1	--	--	--	1	1	3	1	1	2	2
<b>CH410.2</b>	1	2	2	--	1	--	--	--	1	2	3	1	1	2	2
<b>CH410.3</b>	1	2	2	--	1	--	--	--	3	3	3	1	1	2	2
<b>CH410.4</b>	2	2	2	--	1	--	--	--	1	1	3	1	1	2	2
<b>CH410.5</b>	1	2	2	--	1	--	--	--	1	1	3	1	1	2	2
<b>CH410.6</b>	1	2	2	--	1	--	--	--	3	1	3	1	1	2	2
<b>CH410</b>	1.17	2	2	--	1	--	--	--	1.67	1.5	3	1	1	2	2

Name of the Faculty: Ms. Prajakta Angre

Class: BE

Sem: VIII

Name of the Course: **CH411** Department Optional Course 5 Energy System Design

CO code	Course Outcome
<b>CH411.1</b>	Understand the present energy status and major steps to be taken to conserve the energy.
<b>CH411.2</b>	Know the importance of energy management program, how to carry it and follow the same when they will actual start working in industries.
<b>CH411.3</b>	Be aware about best energy efficient practices and will follow the same in future wherever they work.
<b>CH411.4</b>	To carry out Heat exchanger networking and learn other heat integration techniques to conserve the energy.

## Course outcome

<b>CH411.5</b>	Identify sources of waste heat in industry, know the techniques to recover and reuse the waste heat and have knowledge about cogeneration technique.
<b>CH411.6</b>	Understand various renewable energy sources, their applications and preference over non-renewable energy sources.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH411.1</b>	3	3	3	1	1	1	2	-		1	-		3	1	2
<b>CH411.2</b>	3	3	3	1	1	1	2	-		1	-		3	2	2
<b>CH411.3</b>	3	3	3	1	1	1	2	-		1	-		3	2	2
<b>CH411.4</b>	3	3	3	1	1	1	2	-		1	-		3	2	2
<b>CH411.5</b>	3	3	3	1	3	1	2	-		1	-		3	2	2
<b>CH411.6</b>	3	3	2	1	3	1	2	-		1	-		3	2	2
<b>CH411</b>	3	3	2.8 3	1	1.6 7	1	2	-		1	-		3	1.83	2

Name of the Faculty: Prof. U.W. Khandalkar      Class: **BE**      Sem: VIII

Name of the Course: **CH412** Department Optional Course 5 (Advanced Separation Technology)

<b>CO code</b>	<b>Course Outcome</b>
CH412.1	Identify the various adsorbents and to design adsorption column.
CH412.2	Choose the separation by supercritical extraction.
CH412.3	Choose the appropriate separation techniques.
CH412.4	Understand the application of chromatography.
CH412.5	Select, maintain and design various membrane processes.
CH412.6	Assess the various techniques of modern separation processes.

## Course outcome

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH412.1	2	1	1	1	1	--	--	--	--	--	--	--	1	1	2
CH412.2	2	2	2	1	1	--	1	--	--	--	--	--	2	2	1
CH412.3	1	2	2	--	2	--	1	--	--	--	--	--	2	2	1
CH412.4	1	1	3	1	1	--	1	--	--	--	--	--	1	1	2
CH412.5	2	1	2	1	2	--	--	--	--	--	--	--	2	2	1
CH412.6	2	1	2	--	1	--	--	--	--	--	--	--	1	2	2
CH412	1.6 6	1.3 3	2	1	1.3 3	--	1	--	--	--	--	--	1.5	1.66	1.5

Name of the Faculty: Prof. Y.A. Karpe      Class: **BE**      Sem: VIII

Name of the Course: **CH413** Department Optional Course 6 (Chemical Waste Management)

CO code	Course Outcome
CH413.1	Evaluate the subject from the technical, legal and economical points by learning of chemical waste management.
CH413.2	Examine the technical points that are required to set up a waste management system.
CH413.3	Evaluate recovery, treatment and disposal alternatives according to properties of industrial wastes.
CH413.4	Talent to gain knowledge with handling and reduction of waste in a wide perspective
CH413.5	Evaluate recovery, treatment and disposal alternatives according to properties of industrial waste
CH413.6	Ability to identify hazardous waste and environmental problems, understand, and solve their effects on universal and social scales

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**CO-PO and CO-PSO Mapping**

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH413.1	2	1	1	-	-	2	2	--	--	--	--	--	1	2	2
CH413.2	2	2	2	-	-	2	2	--	--	--	--	--	2	2	1
CH413.3	1	2	2	-	-	2	2	--	--	--	--	--	2	2	1
CH413.4	1	1	3	-	-	2	2	--	--	--	--	--	1	2	2
CH413.5	2	1	2	-	-	2	2	--	--	--	--	--	2	2	1
CH413.6	2	1	2	-	-	2	2	--	--	--	--	--	1	2	2
CH413	1.6 6	1.3 3	2	-	-	2	2	--	--	--	--	--	1.5	2	1.5

## Course outcome

Name of the Faculty: Dr. C.K. Mistry

Class: **BE**

Sem: **VIII**

Name of the Course: **CH414** (Modelling Simulation and Optimization Laboratory)

CO code	Course Outcome
<b>CH414.1</b>	Students will learn different types of simulation techniques.
<b>CH414.2</b>	Students will apply simulation techniques to solve complex system issues and to select feasible, solutions
<b>CH414.3</b>	Student will able to calculate the different physicochemical and thermodynamic properties chemicals;
<b>CH414.4</b>	Students will able to understand and analyse simulation of various separation process
<b>CH414.5</b>	Students will able to apply optimization parameter in distillation process
<b>CH414.6</b>	Students will learn to simulate the models for the purpose of optimum control by using software.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH414.1	3	3	2	-	1	-	-	-	1	1	1	1	3	2	2
CH414.2	3	3	3	-	1	-	-	-	1	1	1	1	3	2	2
CH414.3	3	3	2	-	1	-	-	-	1	1	1	1	3	2	2
CH414.4	3	3	2	-	3	-	-	-	1	1	1	1	3	2	2
CH414.5	3	3	3	-	1	-	-	-	1	1	1	1	3	2	2
CH414.6	2	2	3	-	3	-	-	-	1	1	1	1	2	2	2
CH414	2.8 3	2.8 3	2.5	-	1.6 7	-	-	-	1	1	1	1	2.83	2	2

Name of the Course: **CH415** Software Applications in Chemical Engineering Laboratory

CO code	Course Outcome
<b>CH415.1</b>	Students will become aware of application of software in chemical engineering.
<b>CH415.2</b>	Students will be able to identify and use the software for optimization of the processes in chemical industries.
<b>CH415.3</b>	The students will be able to design unit operation and unit process by using chemical engineering software.
<b>CH415.4</b>	The student will be able to do the material and energy balance of chemical plant
<b>CH415.5</b>	The student will be able to optimize typical chemical processes.
<b>CH415.6</b>	The students will be able to solve the trouble shooting problem in chemical plants by using various chemical engineering softwares.

**CO-PO and CO-PSO Mapping**

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CH415.1	3	3	2	-	1	-	-	-	1	1	1	1	3	2	2
CH415.2	3	3	3	-	1	-	-	-	1	1	1	1	3	2	2
CH415.3	3	3	2	-	1	-	-	-	1	1	1	1	3	2	2
CH415.4	3	3	2	-	3	-	-	-	1	1	1	1	3	2	2
CH415.5	3	3	3	-	1	-	-	-	1	1	1	1	3	2	2
CH415.6	2	2	3	-	3	-	-	-	1	1	1	1	2	2	2



## Course outcome

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CH415	2.8 3	2.8 3	2.5	-	1.6 7	-	-	-	1	1	1	1	2.83	2	2
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## Course outcome

Name of the Faculty: Ms. Prajakta Angre

Class: BE

Sem:VIII

Name of the Course: **CH414** Energy System Design Tutorial

CO code	Course Outcome
<b>CH414.1</b>	Discuss global energy scenario.
<b>CH414.2</b>	Demonstrate energy audit.
<b>CH414.3</b>	Develop energy efficient technologies.
<b>CH414.4</b>	Design energy integration in process industries.
<b>CH414.5</b>	Design heat integration in process units.
<b>CH414.6</b>	Demonstrate and implement the concept of cogeneration and waste heat recovery.

### CO-PO and CO-PSO Mapping

CO code	Program Outcomes (PO)												PSO		
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>CH414.1</b>	3	3	3	1	1	1	2	-	1	-	-	-	3	1	2
<b>CH414.2</b>	3	3	3	1	1	1	2	-	1	-	-	-	3	2	2
<b>CH414.3</b>	3	3	3	1	1	1	2	-	1	-	-	-	3	2	2
<b>CH414.4</b>	3	3	3	1	1	1	2	-	1	-	-	-	3	2	2
<b>CH414.5</b>	3	3	3	1	3	1	2	-	1	-	-	-	3	2	2
<b>CH414.6</b>	3	3	2	1	3	1	2	-	1	-	-	-	3	2	2
<b>CH414</b>	3	3	2.83	1	1.67	1	2	-	1	-	-	-	3	1.83	2