

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati
Course Structure and Syllabus

(From Academic Session 2024-25 onwards)

B. TECH
CHEMICAL ENGINEERING

3rd SEMESTER

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Course Structure
(From Academic Session 2024-25 onwards)

B. Tech 3rd Semester: Chemical Engineering

Semester III

Sl. No.	Sub-Code	Subject	Hours per Week			Credit	Marks	
			L	T	P	C	CE	ESE
Theory								
1	CHE241301	Fluid Flow Operations	3	0	0	3	30	70
2	CHE241302	Chemical Process Industries	3	0	0	3	30	70
3	CHE241303	Mechanical Operations	3	0	0	3	30	70
4	CHE241304	Introduction to Chemical Engineering	3	1	0	4	30	70
5	MA241305A	Mathematics III-A	3	0	0	3	30	70
6	HS241306	Indian Knowledge Systems	2	0	0	2	-	50
7	AC241307	Languages other than MIL	1	1	0	0 PP/NP	-	50
Practical								
1	CHE241311	Fluid Flow Operations Lab	0	0	2	1	15	35
2	CHE241312	Chemical Process Industries Lab	0	0	2	1	15	35
3	CHE241313	Mechanical Operations Lab	0	0	2	1	15	35
4	SI241321	Social Internship	0	0	4	2	-	50
TOTAL			18	2	10	**23**	**195**	**605**
Total Contact Hours per week: 30								
Total Credits: 23								

N.B. AC241307 is a Mandatory Audit Course (No Credit). It will be evaluated as PP (Pass) or NP (Not Pass)

DETAILED SYLLABUS

Course Code	Course Title	Hours per week L-T-P	Credit C
CHE241301	Fluid Flow Operations	3-0-0	3

Course Objectives: This course mainly deals with the understanding and prediction of the motion of fluids including their velocity, pressure and flow patterns, which is crucial for various industrial applications and natural phenomena,

Course Outcomes: At the end of this course, the students will be able to

- **CO1:** Understand and identify different fluid properties and flow regimes.
- **CO2:** Apply fundamental fluid flow equations to analyse and solve problems related to Fluid flow.
- **CO3:** Analyse the flow behaviour of incompressible fluid in conduits
- **CO4:** Select and evaluate the performance of various fluid transport and metering devices.
- **CO5:** Apply Dimensional Analysis in Fluid flow.

MODULE 1: Introduction:
Properties of fluids, compressible and incompressible fluids, Normal forces on fluids.

MODULE 2: Fluid Statics:
Principle of hydrostatic equilibrium, barometric equation, pressure management manometer, buoyancy.

MODULE 3: Fluid Flow Phenomena:
Velocity field, laminar flow, velocity gradient and rate of shear, Eddie viscosity, viscosity and momentum flux, shear stress field, Newtonian and non-Newtonian fluids, Bingham model, Ostwald-de Waele model of non-Newtonian fluid, turbulent flow, Reynold's experiments, flow in boundary layer, laminar and turbulent flow in boundary layer, transition from laminar to turbulent flow – Reynold's number, boundary layer separation and wake formation.

MODULE 4: Basic Equation of Fluid Flow:
Stream lines and stream tubes, average velocity, mass velocity, integral equation of flow – Euler's equation of motion, momentum equation for one dimensional flow under steady state condition, the Bernoulli's equation, its application to pumps, blowers, turbines etc.

MODULE 5: Flow of Incompressible Fluid in Conduits:
Flow of incompressible fluids in pipes, boundary layer formation in straight tube, laminar flow of Newtonian fluids, Hagen- Poiseuille equation, laminar flow of non-Newtonian fluids, velocity distribution for turbulent flow, average velocity, relation between maximum and average velocity, application of dimensional analysis to fluid flow problems – friction factor, pipe roughness, loss of head due to friction, bends, fittings etc.

MODULE 6: Compressible Fluids:
Continuity equation, total energy balance, mechanical energy balance, real gas equation, process compressible fluids.

MODULE 7: Flow Past Immersed Bodies:
Drag, Drag-co-efficient, turbulence, friction in flow through bed of solids–Kozeny-Carman equation, Blake-Plummer equation, motion of particles through fluids, equation for one dimensional motion of particle through fluid.

MODULE 8: Transportation and Metering of Fluids:
Orificemeter, Venturimeter, Pitot tube, Rotameter, Weir and Ultrasonic flowmeter-its principle, theory and application, Classification and performance of Pump, Compressor, Blower, Valves, selection and

specification.

MODULE 9: Dimensional Analysis and Similitude:

Rayleigh method, Buckingham π method, Geometric similarity, Kinematic similarity, Dynamic Similarity

Text/Reference Books:

1. McCabe and Smith, Unit Operation of Chemical Engineering, McGraw-Hill Inc..
2. Coulson and Richardson, Chemical Engg. Vol-II, Butterworth and Heinemann.
3. Badger and Banchero, Introduction to Chemical Engineering, McGraw-Hill Inc..
4. Dr. D.S. Kumar, Fluid Mechanics, S.K. Kataria & Sons.
5. Fox and White, McGraw-Hill, 9th edition n 2022.

Course Code	Course Title	Hours per week L-T-P	Credit C
CHE241302	Chemical Process Industries	3-0-0	3

Course Objective: This course mainly deals with the fundamental concepts of production and processing of different chemicals and their importance in chemical processing industries.

Course Outcomes: At the end of this course, the students will be able to

- **CO1:** Explain different manufacturing processes of acids, chlor-alkali industries and fertilizers and major engineering problems associated with it.
- **CO2:** Understand the processing and production of Cement & Paper with various engineering problems
- **CO3:** Identify fats and oils, soaps and detergents and their production processes.
- **CO4:** Understand the fermentation processes and their associated products.
- **CO5:** Understand the basics of Polymers and Petrochemical Industries.

MODULE 1: Inorganic chemical Industry:
Manufacture and Engineering aspects of Nitric Acid, Sulphuric Acid and Hydrochloric Acid, Production of Soda ash, Caustic soda, Chlorine and Common salt; Engineering problems

MODULE 2: Cement Industry:
Raw materials, Types and production of Portland cement. Special types of cement.

MODULE 3: Fertilizer Industry:
Types, Production of Nitrogenous, phosphatic, potassium fertilizer (Ammonia, DAP, Urea, SSP and TSP) - Uses & associated Engineering problems and solutions.

MODULE 4: Paper Industry:
Production and processing of pulp and paper.

MODULE 5: Fats and Oils:
Sources and raw materials, Properties and production of fats and oils; hydrogenation, Soap and detergents.

MODULE 6: Bio-based process Industry:
Basics, Raw materials, Process, Fermentation products.

MODULE 7: Introduction to polymers and petrochemicals:
Polymer fundamentals- raw materials, formation criteria, classification, manufacture of polyethylene (LLDPE and HDPE), PVC, phenols, epoxy, elastomers- natural and synthetic rubbers, synthetic fibers, biodegradable polymers.

Text Book/Reference

1. Outlines of Chemical Technology by Dryden
2. Chemical Technology: From Principles to Products by Jess and Wasserscheid
3. Austin G.T., Shreve's Chemical Process Industries - International Student Edition, McGraw Hill Inc., 1998, 5th Edition.
4. Fundamentals of Polymers. Niranjan Karak. PHI Learning Pvt Ltd.
5. Guwarekar, Textbook of Polymer Science

Course Code	Course Title	Hours per week L-T-P	Credit C
CHE241303	Mechanical Operations	3-0-0	3

Course Objectives: The objective of this course is to provide fundamental concepts and understanding of different mechanical operations which are vital to a number of chemical industries. Students will introduce to different topics in size reduction, particulate solids, filtration, mixing, gas cleaning equipments, and transportation of materials.

Course Outcomes: At the end of this course, the students will be able to:

- **CO1:** Understand the important physical mechanisms occurring in operations involving particles,
- particle separation, mixing of particles, and particle dynamics.
- **CO2:** Distinguish between various types of crushers and select the appropriate ones for a particular
- purpose and assess the energy required.
- **CO3:** Select appropriate separation method for different solid-solid/ solid-liquid/ gas-solid systems.
- **CO4:** Differentiate between different types of mixers and agitated vessels and solid conveyers.

MODULE 1: Particulate Solids:
Particle characterization – particle size distribution and mean particle size; Particulate solid in bulk-agglomeration, angle of repose and friction, flow of solids in hoppers, flow of solids through orifices, conveying of solids, measurement of solid flow rate; Classification of solid particles–gravity settling, centrifugal separators, sieves, magnetic separators, electrostatic separators, floatation.

MODULE 2: Size Reduction of Solids:
Mechanism of size reduction, Energy for size reduction – energy utilization, Methods of operating crushers, Nature of materials to be crushed, Types of crushing equipment's-Coarse crushers, Intermediate crushers, Fine crushers, Vibration mills, Colloid mills, Fluid energy mills.

MODULE 3: Motion of Particles in a Fluid:
The drag force on a spherical particle – total force on the particle – effect of motion of the fluid – terminal falling velocities, Non-spherical particles – effect of shape & orientation on drag – terminal falling velocities, Motions of bubble and drops, Acceleration motion of a particle in the gravitational field, Motion of particles in a centrifugal field.

MODULE 4: Sedimentation:
Gravitational sedimentation – Fine suspensions – Coarse suspensions – Solids flux in batch sedimentation – The Kynch theory of sedimentation – thickner, Centrifugal separation – behavior of liquids in centrifuge basket – fluid pressure – sedimentation in a centrifugal field – separation of two immiscible liquids – centrifugal equipment.

MODULE 5: Pneumatic and Hydraulic Conveying:
Pneumatic conveying-vertical and horizontal, Hydraulic conveying-homogenous flow-horizontal transport of settling suspensions-vertical transport-industrial applications.

MODULE 6: Solid and Gas separations:
Gravity separators, centrifugal separators, inertia or momentum separators, fabric filters, electrostatic precipitators, liquid washing, Agglomeration and coalescence.

MODULE 7: Filtration:
The theory of filtration – relation between thickness of cake and volume of filtrate-flow of liquid through the cloth-flow of filtrate through the cloth and cake combined, compressible filter cakes,

Filtration practice-The filter medium-blocking filtration, effect of particle sedimentation on filtration-delayed cake filtration-preliminary treatment of slurries before filtration-washing of filter cake, Filtration equipment, Filtration in a centrifuge, Filtration calculations.

MODULE 8: Mixing and Agitation:

Agitation of liquids – Purpose of agitation-agitation Equipment-Impellers-Flow patterns in agitation vessels circulation rate- velocity gradients in agitated vessels-power correlations for specific impellers-effect of system geometry-calculation of power consumption.

Text/Reference Books:

1. McCabe and Smith, Unit Operation of Chemical Engineering, McGraw-Hill Inc..
2. Coulson and Richardson, Chemical Engg. Vol-II, Butterworth and Heinemann.
3. Badger and Banchero, Introduction to Chemical Engineering, McGraw-Hill Inc..
4. GG Brown,Unit Operations,CBS Publishers and Distributors

Course Code	Course Title	Hours per week L-T-P	Credit C
CHE241304	**Introduction to Chemical Engineering**	**3-1-0**	**4**

Course Objective: To equip students with systematic problem-solving skills to analyze chemical processes through material and energy balance calculations.

Course Outcomes: At the end of this course, the students will be able to:

- **CO1:** Distinguish between different unit operations and unit processes and prepare appropriate flowsheets.
- **CO2:** Apply fundamental principles to perform basic calculations related to chemical processes
- **CO3:** Analyze and solve material balance problems for both non-reactive and reactive processes including recycle
- **CO4:** Apply the principles of Chemistry and Thermodynamics to solve energy balance problems for both non-reactive and reactive processes
- **CO5:** Enhance problem solving skills using different tools such as computer aided calculations, spreadsheets.

MODULE 1: Introduction:
Introduction to various unit operations and processes and their applications, preparation of flow sheets.

MODULE 2: Basic calculation:
Units and Dimensions, Ideal gases and Real gases, Applications of Raoult's law and Dalton's law, Chemical Reactions, Excess and limiting reactant, Conversion, yield and selectivity, Combustion calculations

MODULE 3: Humidity and Psychometric Chart
Saturation, Humidity, Humid heat, Adiabatic saturation temperature, Humid volume and enthalpy, applications of Psychometric Chart

MODULE 4: Material Balance for non-reactive processes
Application of material balance principles, degree of freedom, choosing a basis, material balance without Chemical Reactions, Recycle, Bypass and Purge calculations

MODULE 5: Material Balance for reactive processes
Material balance with Chemical Reaction, Recycle, Bypass and Purge calculations.

MODULE 6: Energy Balance
Concepts of Steady-state and unsteady state processes, The standard heat (enthalpy) formation, The heat (enthalpy) of reaction, The heat (enthalpy) of combustion, Balance on non-reactive processes, Balance on reactive processes.

MODULE 7: Introduction to Computer tools
Use of spreadsheets to solve basic calculations, Introduction to flow sheeting methods, computer tools to solve basic problems of chemical engineering.

Textbooks

1. David M. Himmelblau, James B. Riggs, Basic Principles and Calculations in Chemical Engineering, 8th Ed., Prentice Hall of India, 2001.
2. K. V. Narayanan and B. Lakshmikutty, Stoichiometry and Process Calculations, PHI.

References

1. R. M. Felder and R. W.Rousseau, Elementary principles of chemical processes, 3rd Ed., Wiley, 2005.
2. O.A.Hougen, K. M. Watson and R. A. Ragatz,"Chemical Process Principles", Vol-I,CBS Publishers and Distributors, New Delhi,

Course Code	Course Title	Hours per week L-T-P	Credit C
MA241305A	**Mathematics III-A**	**3-0-0**	**3**

Course Outcomes:

At the end of this course, the students will be able to

- **CO1** Solve first- and second-order PDEs using analytical methods and classify second-order equations.
- **CO2** Apply separation of variables to solve diffusion, wave, and Laplace equations with given conditions.
- **CO3** Understand and apply the concept of numerical methods in solving real life problems.
- **CO4** Apply probability theory, including discrete and continuous distributions, expectation, moments, and Bayes' rule, to model uncertainty and analyze random phenomena in engineering contexts.
- **CO5** Apply Laplace and inverse Laplace transforms and Fourier transforms, including their properties and convolution theorem, to solve ordinary differential equations arising in engineering applications.
- **CO6** Apply statistical techniques—including data analysis, curve fitting, correlation, and hypothesis testing—to interpret and make decisions from experimental and observational data.

MODULE 1: Partial Differential Equations (10 Hours)

Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method. Second-order linear equations and their classification, Initial and boundary conditions, Separation of variables method to simple problems in Cartesian coordinates. One dimensional diffusion equation, wave equation, Laplace equation and their solution by separation of variable method.

MODULE 2: Numerical Methods (10 Hours)

Gauss-Seidal iteration method to solve a system of equations - Numerical solution of algebraic and transcendental equations by Regula-Falsi method and Newton-Raphson's method - Lagrange interpolation, Forward and backward differences, Newton's forward and backward interpolation formulae - Numerical differentiation with forward and backward differences - Numerical Integration with Trapezoidal rule, Simpson's 1/3 rule and Simpson's 3/8 rule - Taylor series method, Euler's method, 4th order Runge-Kutta method for solving first order ordinary differential equations.

MODULE 3: Probability (10 Hours)

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, Expectation, Moments, Variance, Chebyshev's Inequality. Continuous random variables, distribution functions: normal, exponential and gamma densities. Bivariate distributions, Bayes' rule.

MODULE 4(a): Laplace Transform and Fourier Transform (10 Hours)

Laplace transform of elementary function, Properties of Laplace transform, Inverse Laplace transform (without proof of formulae), Convolution theorem (without proof of the theorem), Solution of ordinary differential equations with the help of Laplace transform.

Fourier Transform: Solution of partial differential equation by Fourier Transform

MODULE 4(b): Statistics **(10 Hours)**

Basic Statistics, Measures of Central tendency: Moments, skewness and Kurtosis Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, Tests for single mean, difference of means, and difference of standard deviations. Test for ratio of variances - Chi- square test for goodness of fit and independence of attributes

Remarks:

1. **Module 1, 2, 3, 4(a): for Chemical Engineering**
2. **Module 1, 2, 3, 4(b): for Civil Engineering , Mechanical Engineering, Industrial and Production Engineering**

Text Books:

1. Reena Garg, Engineering Mathematics, Khanna Book Publishing Company, 2022.
2. Reena Garg, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2021.
3. Erwin Kreyszig, Advanced Engineering Mathematics, , John Wiley & Sons, 9th Edition, 2006.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint 2010.
5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003.
6. S. Ross, A First Course in Probability, Pearson Education India , 6th Ed., 2002

Course Code	Course Title	Hours per week L-T-P	Credit C
HS241306	**Indian Knowledge Systems**	**2-0-0**	**2**

Course Objectives:

1. To introduce students to the foundational concepts of Indian Knowledge Systems (IKS).
2. To explore the contributions of ancient and medieval India in science, technology, mathematics, and philosophy.
3. To develop an appreciation for traditional Indian knowledge and its relevance in modern contexts.
4. To encourage critical thinking about indigenous knowledge systems and their applications.

Course Outcome (CO):

After completion of the course, the students will be able to

- **CO1:** Understand the key principles of Indian Knowledge Systems.
- **CO2:** Recognize India's contributions to science, mathematics, medicine, and engineering**.**
- **CO3:** Analyze the interdisciplinary nature of IKS and its connections with modern technology.
- **CO4:** Appreciate the philosophical and ethical dimensions of traditional Indian knowledge.

MODULE 1: Introduction to Indian Knowledge System (IKS) (4 Lectures)

a. Definition, scope, and significance of IKS
b. Sources of Indian knowledge: Vedas, Upanishads, Puranas, Smritis, and other texts
c. Classification of knowledge in Indian tradition (Vidyas and Kalas)

MODULE 2: Science & Technology in Ancient India (12 Lectures)

- Contributions to mathematics (Zero, Decimal System, Vedic Mathematics, Aryabhata, Brahmagupta)
- Astronomy & Space Science (Surya Siddhanta, Planetary Motion, Concept of Time)
- Metallurgy and material sciences (Iron Pillar, Wootz Steel, Ayurvedic alloys)
- Civil engineering & architecture (Temple architecture, Town planning, Water management)

MODULE 3: Indian Philosophical & Ethical Systems (6 Lectures)

- Key schools of Indian philosophy (Nyaya, Vaisheshika, Samkhya, Yoga, Vedanta)
- Concept of Dharma, Karma, and sustainable living
- Ethics in science and technology from an Indian perspective

MODULE 4: Traditional Medicine & Wellness Systems (4 Lectures)

- Foundations of Ayurveda, Yoga, and Siddha
- Holistic health and wellness practices
- Relevance of traditional medicine in modern healthcare

MODULE 5: IKS in Contemporary Applications (4 Lectures)

- Revival of traditional knowledge in modern science and engineering
- Case studies (e.g., Panchakarma in wellness tech, Vastu in architecture)
- Government initiatives (National Education Policy 2020, IKS Division under AICTE)

Text books:

1. "Indian Knowledge Systems" – Kapil Kapoor & Avadhesh Kumar Singh
2. "Ancient Indian Leaps into Mathematics" – B.S. Yadav
3. "Science and Technology in Ancient India" – O.P. Jaggi
4. "The Positive Sciences of the Ancient Hindus" – Brajendranath Seal
5. AICTE Model Curriculum for IKS (Available online)

Online Resources:

- NPTEL / SWAYAM courses on IKS
- AICTE-IKS Portal (https://iksindia.org/)
- Digital Library of India (https://dli.gov.in)

Course Code	Course Title	Hours per week L-T-P	Credit C
AC241307	**Language other than MIL**	**1-1-0**	**0**

Course Outcome (CO): After completion of the course, the students will be able to

- **CO1:** Demonstrate a clear understanding of basic grammar rules including subject-verb agreement, tenses, and cases, and apply them in constructing grammatically correct sentences.
- **CO2:** Identify and correct common grammatical and usage errors in written English, enhancing sentence effectiveness and clarity.
- **CO3:** Enhance their vocabulary through the use of synonyms, antonyms, idiomatic expressions, and phrasal verbs, improving both written and spoken communication.
- **CO4:** Apply verbal reasoning skills to comprehend, arrange, and complete sentences and paragraphs effectively.
- **CO5:** Develop strong reading comprehension skills using skimming, scanning, and intensive reading techniques to extract key information from various texts.
- **CO6:** Produce coherent and concise writing through precis writing and essay composition, demonstrating logical flow, clarity, and appropriate structure.

MODULE 1: Basic grammar usage **(10 Lectures)**

Subject-verb agreement, narration, tenses
Case: Subjective case, possessive case, objective case
Writing effective sentences, Spotting errors

MODULE 2: Vocabulary Building **(6 Lectures)**

Synonyms and Antonyms, One word substitution,
Idioms and Phrases and Phrasal Verbs

MODULE 3: Verbal ability **(8 Lectures)**

Cloze test
Sentence rearrangement, Sentence completion,
Paragraph Jumbles

MODULE 4: Writing and Reading Ability **(8 Lectures)**

Reading subskills, Skimming, Scanning and Intensive reading
Reading Comprehension, Precis Writing, Essay Writing

Text books

1. Objective General English: S.P.Bakshi, Arihant Publication India Ltd., 2021
2. Descriptive English: S.P.Bakshi, Arihant Publication India Ltd., 2016

Course Code	Course Title	Hours per week L-T-P	Credit C
CHE241311	**Fluid Flow Operations Lab**	**0-0-2**	**1**

Course Objectives: This course mainly deals with the understanding the basic fundamental principles of different fluid flow operations. Study of different fluid flow apparatus, pump characteristics can be performed by different experiments.

Course Outcomes: After the successful completion of the course student should be able to:

- **CO1:** Classify operational mechanism of different flow meters and to calculate their discharge co-efficient.
- **CO2:** Calculate actual and theoretical cavitation number for various cavitation conditions.
- **CO3:** Understand the working mechanism of centrifugal pump and to determine various flow and pump parameters.
- **CO4:** Verify Bernoulli's equation.

LIST OF EXPERIMENTS

MODULE 1: (a) Aim: To determine co-efficient of discharge for venturimeter
(b) Aim: To determine coefficient of discharge of rotameter
(c) Aim: To determine coefficient of discharge of orificemeter

MODULE 2: Aim: To compare the actual and theoretical cavitation number at cavitation condition.

MODULE 3: Aim: Study of centrifugal pump characteristics.

MODULE 4: Aim: To verify Bernoulli's equation experimentally.

Text book

1. McCabe and Smith, Unit Operation of Chemical Engineering, McGraw-Hill Inc..
2. Badger and Banchero, Introduction to Chemical Engineering, McGraw-Hill Inc..

Reference book

1. Coulson and Richardson, Chemical Engg. Vol-II, Butterworth and Heinemann.

Course Code	Course Title	Hours per week L-T-P	Credit C
CHE241312	**Chemical Process Industries Lab**	**0-0-2**	**1**

Course Objectives: This course mainly deals with the understanding of basic fundamental principles of different chemical process industries by performing different experiments for characterization of raw materials or products.

Course Outcomes: After the successful completion of the course student should be able to:

- **CO1.** Analyze composition of Portland cement
- **CO2:** Analyze soap quality by determining the free moisture content.
- **CO3.** Characterize oil by determining the saponification and iodine value

LIST OF EXPERIMENTS

MODULE 1: Aim: Analysis of Portland cement.

MODULE 2: Aim: Determination of free moisture content in a given sample of soap.

MODULE 3: Aim: Determination of Iodine value in a given sample of oil

MODULE 4: Aim: Determination of saponification value in a given sample of oil.

Text book

1. Dryden, Outlines of Chemical Technology.
2. Shukla and Pandey, Chemical Technology

Reference book

1. Shreve, Chemical Process Industries

Course Code	Course Title	Hours per week L-T-P	Credit C
CHE241313	**Mechanical Operations Lab**	**0-0-2**	**1**

Course Objectives: This course mainly deals with different equipment's related to mechanical operations in chemical industries.

Course Outcomes: After the successful completion of the course student should be able to:

- **CO1:** Operate different size reduction equipments and select the appropriate equipment for an intended purpose
- **CO2:** Evaluate screen effectiveness
- **CO3:** Separate solid from solid-gas, solid-liquid and solid-solid mixture.
- **CO4:** Design a thickener

LIST OF EXPERIMENTS

MODULE 1: Aim: To determination of critical speed and efficiency of ball mill.

MODULE 2: Aim: To determination power consumption of hammer mill.

MODULE 3: Aim: To determine efficiency of cyclone separator.

MODULE 4: Aim: To determine screen efficiency using differential and cumulative screen analysis.

MODULE 5: Aim: Experiment on batch sedimentation and thickener designing.

MODULE 6: Aim: To separate liquid from a solid liquid mixture.

MODULE 7: Aim: To separate solid from solid-solid mixture using gravity difference.

MODULE 8: Aim: To study the operation of size reduction.

MODULE 9: Aim: To study the performance of the Roll mill.

Text book

1. McCabe and Smith, Unit Operation of Chemical Engineering, McGraw-Hill Inc..
2. Coulson and Richardson, Chemical Engg. Vol-II, Butterworth and Heinemann.
3. Badger and Banchero, Introduction to Chemical Engineering, McGraw-Hill Inc..

Reference book

1. GG Brown, Unit Operations, CBS Publishers and Distributors

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