

CURRICULUM & SYLLABI
M. Tech. CHEMICAL ENGINEERING

Effective from AY: 2025-26



DEPARTMENT OF CHEMICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY
ANDHRA PRADESH, INDIA – 534 101


M.TECH IN CHEMICAL ENGINEERING (COURSE STRUCTURE)

| Course Code | Course Name | L | T | P | C | Cat. Code |
|---------------------|--|----|---|---|-----------|-----------|
| Semester I | | | | | | |
| 25CH601 | Advanced Reaction Engineering | 4 | 0 | 0 | 4 | PCC |
| 25CH602 | Advanced Thermodynamics | 4 | 0 | 0 | 4 | PCC |
| 25CH603 | Computational Methods in Chemical Engineering | 2 | 0 | 0 | 2 | PCC |
| 25CH604 | Computational Methods in Chemical Engineering Laboratory | 0 | 0 | 3 | 2 | PCC (P) |
| 25CH6XX | Departmental Elective I | 4 | 0 | 0 | 4 | DEC |
| | Open Elective Course (MOOCs) | 0 | 0 | 0 | 2 | OEC |
| | | 14 | 0 | 3 | 18 | |
| Semester II | | | | | | |
| 25CH605 | AI & ML in Chemical Engineering | 4 | 0 | 0 | 4 | PCC |
| 25CH606 | Advanced Transport Phenomena | 4 | 0 | 0 | 4 | PCC |
| 25CH6XX | Departmental Elective II | 4 | 0 | 0 | 4 | DEC |
| 25CH607 | Analytical and Instrumentation Techniques in Chemical Engineering Laboratory | 0 | 0 | 3 | 2 | PCC(P) |
| 25HS601 | Advanced Technical Communication | 2 | 0 | 0 | 2 | HEC |
| | | 14 | 0 | 3 | 16 | |
| Semester III | | | | | | |
| 25CH698 | Project Work – Part A | 0 | 0 | 0 | 13 | DISS. |
| | | | | | 13 | |
| Semester IV | | | | | | |
| 25CH699 | Project Work – Part B | 0 | 0 | 0 | 13 | DISS. |
| | | | | | 13 | |
| | Total Credits | | | | 60 | |

**List of Elective Courses offered by the Chemical Engineering Department**

| Departmental Elective I | | Departmental Elective II | | L | T | P | C |
|-------------------------|---------------------------------|--------------------------|--|---|---|---|---|
| 25CH608 | Fuel Cell Technology | 25CH613 | Solid Waste and Hazard Management | 4 | 0 | 0 | 4 |
| 25CH609 | Energy Resources and Systems | 25CH614 | Water and Wastewater Treatment | 4 | 0 | 0 | 4 |
| 25CH610 | Waste to Energy | 25CH615 | Advanced Separation Processes | 4 | 0 | 0 | 4 |
| 25CH611 | Hydrogen Generation and Storage | 25CH616 | CO ₂ Capture, Sequestration and Utilization | 4 | 0 | 0 | 4 |
| 25CH612 | Bioenergy and Biofuels | 25CH617 | Industrial Safety Management | 4 | 0 | 0 | 4 |



1st Semester



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|---------------------------------------|--------------------------------------|------------------------------|-------------------------------|
| Course Code: 25CH601 | Advanced Reaction Engineering | L-T-P 4-0-0 | Credits 4 Cr |
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Pre-Requisites: UG courses in Chemical Reaction Engineering, Fluid Mechanics, Heat transfer, and Mass transfer.

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

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| CO1 | Analyze ideal homogenous reactor design and performance by applying design principles for isothermal batch, semi-batch, and flow reactors |
| CO2 | Evaluate non-ideal reactor behaviour for real time applications by applying concepts of residence time distribution and mixing models |
| CO3 | Design and analyze heterogenous Gas-Solid reactors by applying reaction kinetics to fixed and fluidized bed systems with/ without diffusion limitations |
| CO4 | Design and analyze heterogenous gas-liquid reactors by applying concepts of mass transfer theory for mechanically agitated and bubble column reactors |

Detailed syllabus

Homogeneous reactor design and analysis: Ideal reactors, Review of isothermal design for batch, semi-batch and flow reactors, Multiple reaction networks: Yield selectivity concepts.

Wei-Prater analysis for first order networks, reaction networks of general order, Reactor energy balance and its applications to reactor design and analysis. Homogeneous reactor design and analysis-II: Non-ideal reactors- Review of the basic concepts of residence time distributions, single parameter models for real reactor behavior

Macromixing and micro mixing, segregated flow model and Zweitering's analysis of maximum mixedness, IEM and other models for micro mixing. Heterogeneous reactors.

Gas-solid systems- Review of kinetics of gas-solid catalytic reactions with and without diffusion limitation

Reactor design for fixed and fluidized bed reactors, Selected case studies, non-catalytic gas-solid reactions: review of kinetics; reactor design case studies.

Heterogeneous reactors-II: Gas-liquid systems- Basic theories of mass transfer with chemical reaction model systems and model reactors, Reactor design for mechanically agitated and bubble column reactors. Selected case studies

Text Books

1. Fogler H.S., Elements of Chemical Reaction Engineering, Prentice Hall of India, 2008
2. Levenspiel O., Chemical Reaction Engineering: An Indian Adaptation, John Wiley & Sons, 2021, 3rd Edition.
3. Fromment G.F., Bischoff K.B, Chemical Reactor Analysis and Design, John Wiley, 2010.

Reference Books

1. Schmidt L.D., The Engineering of Chemical Reactions, Oxford, 2007.
2. Harriott P., Chemical Reactor Design, CRC Press, 2002.
3. James J. Carberry, Chemical and catalytic reaction engineering, Dover Publications, 2001.



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|---------------------------------------|--------------------------------|------------------------------|-------------------------------|
| Course Code: 25CH602 | Advanced Thermodynamics | L-T-P 4-0-0 | Credits 4 Cr |
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Pre-Requisites: UG course in chemical engineering thermodynamics I and II.

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

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| CO1 | Develop Thermodynamic models based thermodynamic data. |
| CO2 | Solve problems in thermodynamics with emphasis on phase equilibria. |
| CO3 | Identify the molecular level properties influencing the macroscopic thermodynamic properties |
| CO4 | Estimate macroscopic properties based on molecular level interactions. |

Detailed syllabus

Application of First Law, Legendre transforms of energy and reformulation of second law in terms of the Legendre transforms, Maxwell relations, Maximum work theorem., third law of thermodynamics, Residual property, Equations of States, Phase Behavior of Pure Materials, Solution thermodynamics and Partial Molar Properties, Equilibrium Criteria for Multi-component Mixtures, Excess Properties and Activity Coefficient Models.

Vapour Liquid Equilibrium, Liquid-Liquid Equilibrium, Electrolyte solution, spinodal decomposition, Vapour-Liquid-Liquid equilibrium, Osmotic Effects, Solid Liquid Equilibrium. Application of VLE, LLE, VLLE and SLE

Classical mechanics: Lagrangian formulation, Constants of motion, Hamilton's principle, phase space, concept of statistical ensemble, Statistical independence of macroscopic bodies, Liouville equation, Measurements and ensemble averages. Microcanonical, canonical and Grand-canonical ensembles. Gibbs entropy formula and Boltzmann entropy formula, Partition functions, Fluctuations and stability.

Ideal gas: Analytical derivations of the partition functions of ideal gas in various ensembles and thermodynamic properties, Liquids: Distribution functions, pair correlation function $g(r)$ and experimental measurement of $g(r)$ by diffraction, Mean field theory and perturbation theory.

Text Books

1. S.I. Sandler, Chemical, Biochemical and Engineering Thermodynamics, 4th Edition, Wiley India, 2006.
2. J.M. Smith, H.C. Van Ness and M.M. Abbott, Introduction to Chemical Engineering Thermodynamics, 7th Edition, McGraw Hill International, 2004.

Reference Books

1. H. B. Callen, Thermodynamics and an Introduction to thermostatics, 2nd Edition, John Wiley and Sons, 2006.
2. S.I. Sandler, An Introduction to Applied Statistical Thermodynamics, 1st Edition, John Wiley & Sons, 2010.
3. J.M. Prausnitz, R.N. Lichtenthaler, E. Gomes de Azevedo, Molecular Thermodynamics of Fluid-Phase Equilibria, 3rd Edition, Prentice Hall, 1998.



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|---------------------------------------|--|------------------------------|-------------------------------|
| Course Code: 25CH603 | Computational Methods in Chemical Engineering | L-T-P 2-0-0 | Credits 2 Cr |
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Pre-Requisites: Nil

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

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| CO1 | Formulate lumped and distributed parameter mathematical models for chemical processes |
| CO2 | Calculate degrees of freedom for the developed mathematical models |
| CO3 | Solve the model equations describing chemical processes and equipment |
| CO4 | Analyze the results of the solution methods. |

Detailed syllabus

Vectors: Linear combination of vectors, dependent/independent vectors; Orthogonal and orthonormal vectors; Gram-Schmidt Orthogonalization; Contraction Mapping: Examples Onto, into, one to one function, Definition; Applications in Chemical Engineering,

Introduction of vector space: Metric, Norm, Inner Product space; completeness of space. Eigen value Problem: Various theorems; Solution of a set of algebraic equations; Solution of a set of ordinary differential equations; Solution of a set of non-homogeneous first order ordinary differential equations (IVPs). Applications of eigenvalue problems: Stability analysis; Bifurcation theory.

Partial Differential equations: Classification of equations; Boundary conditions; Principle of Linear superposition, Special ODEs and Adjoint operators: Properties of adjoint operator; Theorem for eigenvalues and eigenfunctions.

Solution of linear, homogeneous PDEs by separation of variables: Cartesian coordinate & different classes of PDEs; Cylindrical coordinate system; Spherical Coordinate system, Solution of non-homogeneous PDEs by Green's theorem, Solution of PDEs by Similarity solution method, Integral method, Laplace transformation, Fourier transformation.

Numerical solution: First-order ordinary differential equations. Euler's and Taylor's method for single ODE, Runge-Kutta method for single ODE, Predictory-corrector methods for single ODE, explicit and implicit methods (Adams-Bashforth and Adams-Moulton). Applications to rate equations Higher-order ordinary differential equations.

Applications to Chemical Engineering: Applications of computational techniques to different chemical engineering problems e.g. Calculation of specific volume of real gas binary mixtures, rate equations, material and energy balance, equipment design, handling of experimental data and curve fitting, bubble and dew point calculations, process control etc.

Text Books

1. S. Pushpavanam, Mathematical methods in chemical engineering. Taylor & Francis, 1st edition (2007).
2. G. R. Rice, D.D. Duong, Applied mathematics and modeling for chemical engineering. Wiley-Blackwell; 2nd edition (2012).
3. B.K. Dutta, Mathematical Methods in Chemical and Biological Engineering. CRC Press; 1st edition (2016)

References Books

1. N.W. Loney, Applied mathematical methods for chemical engineers. CRC Press; 3rd edition (2015).
2. O.C. Hanna and O.T. Sandall, Computational Methods in Chemical Engineering, Prentice Hall (1995).



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|---------------------------------------|---|------------------------------|-------------------------------|
| Course Code: 25CH604 | Computational Methods in Chemical Engineering Laboratory | L-T-P 0-0-3 | Credits 2 Cr |
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Pre-Requisites: Nil

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

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| CO1 | Understand the fundamental mathematics and to solve problems of algebraic equations, differential equations, simultaneous equation and partial differential equations. |
| CO2 | Convert problem solving strategies to procedural algorithms and to write program structures. |
| CO3 | Solve engineering problems using computational techniques. |
| CO4 | Assess reasonableness of solutions and select appropriate levels of solution sophistication. |

Detailed syllabus

Design and analysis of experiments: Treatment and interpretation on engineering data: Curve fitting, Non-linear least square regression.

Interpolation: Newton's Forward/Backward interpolation formula, Lagrange's interpolation formula and experiments their application. Tests of significance, Analysis of variance.

Formulation of physical problems: Mathematical statement of the problem, Representation of problems, Formulation on extraction in single & multiple stages, Radial heat transfer through a cylindrical conductor, salt accumulation in stirred tank.

Numerical solution of linear & nonlinear algebraic equations: Linear systems of equations, solutions by Creamer's Rule, Matrix methods, Gaussian, Gauss-Jordan, Jacobean, Gauss Seidel and Relation methods. Non-linear equations: Bisection, Regula-falsi, Secant and Newton-Raphson methods.

Numerical solution of ordinary differential equations: Ordinary differential equations: Runge Kutta, Euler's and Milne's predictor corrector methods, Solution of boundary value problems.

Finite differences: Finite differences, Partial differential equations, Solutions of elliptic, parabolic, and hyperbolic types of equations.

Optimization: Types of optimization problems, optimization of a function of single variable, unconstrained minimization, constrained minimization.

Text Books

1. S. K. Gupta, Numerical Techniques for Engineers, Wiley Eastern, 1995.
2. G. R. Rice, D.D. Duong, Applied mathematics and modeling for chemical engineering. Wiley- Blackwell; 2nd edition, 2012.
3. M.E. Davis, Numerical Methods and Modelling for Chemical Engineers, John Wiley & Sons, 2013.

References Books

1. H.S. Mickley, T.K. Sherwood and C.E. Reid, Applied Mathematics in Chemical Engineering", II Edn., Tata McGraw Hill, New Delhi, 1978.
2. B.A. Finlayson, Introduction to Chemical Engineering Computing, John Wiley & Sons, New Jersey, 2006.



2nd Semester



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|---------------------------------------|--|------------------------------|-------------------------------|
| Course Code: 25CH605 | AI & ML in Chemical Engineering | L-T-P 4-0-0 | Credits 4 Cr |
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Pre-Requisites: Nil

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

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| CO1 | Understand the scope of Artificial Intelligence (AI) in simulating the human behaviour |
| CO2 | Analyze the components of AI and its capability to address the nonlinear chemical processes |
| CO3 | Assess the suitability of various AI approaches to solve optimization problems |
| CO4 | Develop AI-based models to validate the chemical processes through different mathematical approach. |

Detailed syllabus

Introduction to Artificial Intelligence (AI) and Machine Learning (ML); Types of learning problems: Supervised, Unsupervised, Semi-supervised; Overview of optimization techniques;

Introduction to software tools used in AI & ML; Solving problems in Chemical Engineering (like decision support system, process control, modeling and simulation) applying rule-based AI & ML tools and lifecycle:

Data preprocessing: Data visualization, Outlier detection, & Smoothing techniques, Data scaling (Need for Scaling – Scale invariance, Standardization, Normalization), Dimensionality reduction, Feature extraction, selection

Model Evaluation & identification: Performance metrics, analysis, Model selection, Hybrid cross-Validation methods

Model development: (a) Classification – (Logistic regression, Naïve Bayes classifier, K-nearest neighbors, Support vector machines, Decision trees, Random forests, Boosting), (b) Regression - (Linear regression – simple, multiple, Kernel, Regression analysis, Box-Jenkins models (ARMA, ARIMA), Neural Network).

Text Books

1. Hastie, T., Tibshirani, R., Friedman, J.H., The Elements of Statistical Learning Data Mining, Inference, and Prediction, Second Edition, Springer, 2009
2. Abu-Mostafa, Y.S., Magdon-Ismail, M., Hsuan-Tein, L., Learning from Data. AMLBook, 2012.
3. Bishop, C., Pattern Recognition and Machine Learning. Springer-Verlag, 2006.

Reference Books

1. Gareth, J., Witten, D., Hastie. T., Tibshirani, R., An Introduction to Statistical Learning with Applications in R, Springer-Verlag, 2013.
2. Müller, A. C., Gudio, S., Introduction to Machine Learning with Python, O'Reilly Media, Inc., 2016.
3. Shalev-Shwartz, S. and Ben-David, S., Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press., 2014.



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|---------------------------------------|-------------------------------------|------------------------------|-------------------------------|
| Course Code: 25CH606 | Advanced Transport Phenomena | L-T-P 4-0-0 | Credits 4 Cr |
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Pre-Requisites: UG courses in Fluid Mechanics, Heat Transfer, Mass Transfer, and Chemical Reaction Engineering.

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

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| CO1 | Understand the physics behind the transport of momentum, heat and mass transport. |
| CO2 | Derive the fundamental transport equations that govern momentum, heat and mass transfer and associated initial and boundary conditions. |
| CO3 | Understand the mechanisms for momentum transfer its influence on heat and mass transfer. |
| CO4 | Develop models and suitable assumptions for their simplification without the loss of generality. |
| CO5 | Apply mathematics and numerical methods to solve the governing equations both analytically and numerically. |

Detailed syllabus

Equations of change for isothermal systems, Velocity distributions with more than one independent variable, Velocity distributions in turbulent flow, Interphase transport in isothermal systems, Macroscopic balances for isothermal systems.

Temperature distributions in solids and in laminar flow, Equations of change for non-isothermal systems, Temperature distributions with more than one independent variable, Temperature distributions in turbulent flow, Interphase transport in non-isothermal systems. Macroscopic balances for non-isothermal systems.

Concentration distributions in solids and in laminar flow, Concentration distributions with more than one independent variable, Concentration distributions in turbulent flow. Interphase transport in multicomponent systems, Macroscopic balances for multi-component systems.

Text Books

1. Bird R. B., Stewart W. E. and Light Foot E. N., Transport Phenomena, John Wiley & Sons, 2nd Edition, 2007.
2. Geankopolis C. J., Transport Processes and Unit Operations, Prentice Hall (India) Pvt. Ltd., 4th Edition, 2004.
3. Mauri Robert, Transport Phenomena in Multiphase Flows, Springer International Publishing, 2015.

Reference Books

1. Koichi Asano, Mass Transfer: From Fundamentals to Modern Industrial Applications, Wiley-VCH, 2006.
2. Thomson W. J., Transport Phenomena, Pearson education, 2001.
3. W.M. Deen, Analysis of Transport Phenomena, Oxford University Press, 2nd Edition, 2013.



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|---------------------------------------|---|------------------------------|-------------------------------|
| Course Code: 25CH607 | Analytical and Instrumentation Techniques in Chemical Engineering Laboratory | L-T-P 0-0-3 | Credits 2 Cr |
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Pre-Requisites: UG course in chemical process dynamics and control.

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

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| CO1 | Understand the theoretical principles, instrumentation and applications of various analytical instruments |
| CO2 | Determine the physical, chemical and mechanical properties of substance using sophisticated instruments |
| CO3 | Analyze the chemicals using spectrometry and chromatography methods. |
| CO4 | Execute qualitative and quantitative analysis of chemical species using thermal and electrochemical methods. |

Detailed syllabus

Determination of concentration of an unknown sample using spectrometry instruments like atomic absorption, UV-Visible spectrophotometers.

Identification of the functional groups present in the given samples using Fourier transform infrared spectroscopy.

Testing the mechanical strength of the given material using universal testing machine and analyze the properties of the material using BET Surface area analyzer.

Quantitative analysis by Gas Chromatography and High-performance liquid chromatography.

Electrochemical method of chemical analysis.

Characterization of materials using Thermogravimetric analyzer.

List of Equipment/Techniques

1. Absorption spectroscopy (atomic absorption, UV-Visible)
2. Vibrational spectroscopy (Infrared spectrophotometer)
3. Flame photometer
4. Gas chromatograph & High-performance liquid chromatography
5. Ion chromatography
6. Thermogravimetric analyzer
7. Differential scanning calorimeter
8. Differential thermal analyzer
9. BET surface area analyzer
10. Universal Testing Machine
11. Electrochemical analysis (polarography, pulse polarographic methods, anodic stripping voltammetry)
12. Conductivity meter
13. Optical microscope

References Books

1. R.S Khandpur, Handbook of Analytical Instruments, McGraw Hill Education (India) Pvt. Ltd publications, 3rd edition, 2015.
2. F. Rouessac and A. Rouessac, Chemical Analysis: Modern Instrumentation Methods and Techniques, Wiley publishers, 2nd edition, 2005.



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|---------------------------------------|---|------------------------------|-------------------------------|
| Course Code: 25HS601 | Advanced Technical Communication | L-T-P 2-0-0 | Credits 2 Cr |
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Pre-Requisites: Nil

Course Outcomes:

At the end of the course, the student will be able to

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| CO1 | To gain foundational understanding of science communication |
| CO2 | To critically analyze and communicate scientific ideas |
| CO3 | To conceptualize and refine a research topic using scientific process |

Detailed syllabus

Key characteristics of scientific writing- types of documents (journal articles, conference papers, reports, theses) IMRAD structure in detail (Introduction, Methods, Results, Discussion)-abstract- drafting titles

Scientific language- (clarity, brevity, precision)-common errors and how to fix them (grammar, style, tone)-organizing and synthesizing information-literature review and referencing-citation styles- using reference managers

Research paper writing and its constituents-research publication and ethics

Writing proposals (grants, research, project)- presenting research

Reference Books

1. Bagla, Pallava, and V. V. Binoy, editors. Bridging the Communication Gap in Science and Technology: Lessons from India. Springer Nature, 2017
2. Dean, Cornelia. Am I Making Myself Clear? A Scientist's Guide to Talking to the Public. Harvard University Press, 2009.
3. Gastel, Barbara, and Robert A. Day. How to Write and Publish a Scientific Paper. 8th ed., Cambridge University Press, 2016.
4. Hofmann, Angelika H. Scientific Writing and Communication: Papers, Proposals, and Presentations. 5th ed., Oxford University Press, 2022.
5. Schimel, Joshua. Writing Science: How to Write Papers That Get Cited (and Proposals That Get Funded). Oxford University Press, 2012.
6. van Dam, Frans, Liesbeth de Bakker, Anne M. Dijkstra, and Eric A. Jensen, editors. Science Communication: An Introduction. World Scientific Series on Science Communication, vol. 1, World Scientific Publishing Co. Pte Ltd, 2020.

**Elective-1 Courses offered by Chemical Engineering Department**

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|---------------------------------------|-----------------------------|------------------------------|-------------------------------|
| Course Code: 25CH608 | Fuel Cell Technology | L-T-P 4-0-0 | Credits 4 Cr |
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Pre-Requisites: Nil

Course Outcomes:

At the end of the course, the student will be able to

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| CO1 | Know the basics and working principles of the fuel cell technology. |
| CO2 | Select the suitable materials for electrode, catalyst, membrane for the fuel cells. |
| CO3 | Understand the pressure drop and velocity distribution in single cell as well as stack. |
| CO4 | Design and stack making process for real field applications. |

Detailed syllabus

Basic principles, classifications, heat of reactions, enthalpy of formation of substances, Gibbs free energy of substances, Efficiency, power, heat due to entropy change and internal ohmic heating.

Nernst equation and open circuit potential, pressure and temperature effect -Stoichiometric coefficients and reactants utilization - Mass flow rate calculation - voltage and current in parallel and serial connection—Over potentials and polarizations - Activation polarization - Tafel equation and exchange current density –Ionic conductivity, catalysts, Temperature and humidification effect, electro-osmotic Drag effect.

PEM Fuel Cell components: Anode and Cathode materials, catalysts, membrane, Fuels for fuel cells- PEM Fuel cell stacks - Rate of mass transfer of reactants and products – water management – current collections and gas removal- Bipolar plates- flow distribution – Heat and water removal from the stack.

Fuel cell systems analyze: Energy systems, power- Train or Drive-Train Analysis – PEMFC powered Bus- Flow Sheet and conceptual Design-Detailed Engineering Designs.

Text Books

1. J. Larminie and A. Dicks, Fuel Cell Systems Explained, 2nd Edition, John Wiley & Sons Inc., 2000.
2. F. Barbir, PEM Fuel Cells Theory and Practice, Elsevier Academic Press, 2005.
3. G. Hoogers, Fuel Cell Technology, Handbook, SAE International, 2003.

Reference Books

1. B. Viswanathan and M.A. Scibioh, Fuel Cell Principles and Applications, University Press, 2006.
2. S. Supramaniam, Fuel Cells: From Fundamentals to Applications, Springer; 2006.



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|---------------------------------------|-------------------------------------|------------------------------|-------------------------------|
| Course Code: 25CH609 | Energy Resources and Systems | L-T-P 4-0-0 | Credits 4 Cr |
|---------------------------------------|-------------------------------------|------------------------------|-------------------------------|

Pre-Requisites: Nil

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

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| CO1 | Understand the various forms of energy such as chemical, nuclear, solar, mechanical, electrical, internal, thermal, and bioenergy in living systems. |
| CO2 | Analyze common phenomena and activities as examples of energy transformations across different energy forms. |
| CO3 | Explain the comprehensive coverage of energy resources and their conversion technologies. |
| CO4 | Evaluate the impact of energy utilization on the environment and propose sustainable energy solutions. |

Detailed syllabus

Introduction, major sources of energy: renewable and non-renewable, primary and secondary energy sources, energy scenario, prospects/need of alternate energy sources, conventional and nonconventional energy sources; solar energy; wind energy; nuclear energy; geo-thermal, hydro energy sources; tidal energy; energy from biomass; energy from coal; and other energy resources: hydrogen, fuel cells; environmental aspects of energy utilization-renewable energy resources and their importance; combustion process: combustion stoichiometry and combustion thermodynamics; gas burners; oil burners; coal burning equipment; Integrated energy system: concept of integration of conventional and non-conventional energy resources and systems; energy conservation & management.

Text Books

1. S. Sarkar, Fuel & combustion, Orient Longman, 3rd Ed., 2009.
2. B. H. Khan, Non-conventional energy resources, McGraw Hill, New Delhi. 2017.

Reference Books

1. C. S. Solanki, Renewable energy Technology, Prentice Hall Publication, 2008.
2. S. P. Sukhatme, Solar Energy, Tata McGraw Hill, New Delhi, 1996.
3. T. Ghosh, M. Prelas, Energy Resources and Systems, Springer Netherlands, 2009.



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|---------------------------------------|------------------------|------------------------------|-------------------------------|
| Course Code: 25CH610 | Waste To Energy | L-T-P 4-0-0 | Credits 4 Cr |
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Pre-Requisites: Nil

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

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|-----|---|
| CO1 | Demonstrate technologies for generation of energy from solid waste |
| CO2 | Select thermochemical conversion methods |
| CO3 | Identify sources of energy from biochemical conversion |
| CO4 | Analyze the environmental and health impact of waste to energy conversion |

Detailed syllabus

Introduction: Characterization of Wastes, Agricultural Residues and Wastes Including Animal Wastes, Industrial Wastes, Municipal Solid Wastes. Waste Processing Types and Composition of Various Types of Wastes, Characterization of Municipal Solid Waste, Waste Collection and Transportation, Waste Processing-Size Reduction, Separation, Waste Management Hierarchy, Waste Minimization and Recycling of Municipal Solid Waste.

Thermochemical Conversion: Incineration, Pyrolysis, Gasification of Waste Using Gasifiers, Environmental and Health Impacts of Incineration; Strategies for Reducing Environmental Impacts. Energy Production from Wastes through Incineration, Gasification, Pyrolysis, Syngas Utilization.

Biochemical Conversion: Anaerobic digestion of sewage and municipal wastes, Anaerobic digestion biogas production, and present status of technologies for conversion of waste into energy, Design of waste to energy plants for cities and villages, Energy production from wastes through fermentation and transesterification, Cultivation of algal biomass from wastewater and energy production from algae, Energy production through anaerobic digestion and fermentation, Introduction to microbial fuel cells, Reactor configurations for methane production, Energy assessment.

Energy production from waste plastics, Heat recovery: concept of conversion efficiency, waste heat recovery classification, advantages and applications, commercially viable waste heat recovery devices.

Environmental and health impacts-Case Studies: environmental and health impacts of waste to energy conversion, waste to energy- potentials and constraints in India, eco-technological alternatives for waste to energy conversions.

Text Books

1. Robert C. Brown, Thermo-chemical Processing of Biomass: Conversion into Fuels, Chemicals and Power, John Wiley and Sons, 2019.
2. Sergio Capareda, Introduction to Biomass Energy Conversions, CRC Press, 2013.

Reference Books

1. Krzysztof J Ptasiński, Efficiency of Biomass Energy: An Exergy Approach to Biofuels, Power and Biorefineries, John Wiley & Sons, 2016.
2. Vesilind, P. A., Worrell W. A., Solid Waste Engineering, Cengage India, 2nd Edition, 2016.



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|---------------------------------------|--|------------------------------|-------------------------------|
| Course Code: 25CH611 | Hydrogen Generation and Storage | L-T-P 4-0-0 | Credits 4 Cr |
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Pre-Requisites: Nil.

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

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| CO1 | Understand the basic properties of hydrogen, including its chemical and physical characteristics, and its role as an energy carrier |
| CO2 | Select a suitable hydrogen generation and storage technique based on the mechanisms, performance characteristics, and applicability |
| CO3 | List the safety considerations and regulations related to hydrogen handling |
| CO4 | Analyze the economic viability and environmental impact of hydrogen generation and storage systems |

Detailed syllabus

Introduction: Basic Properties of Hydrogen; Engineering Thermodynamics; Hydrogen and Environment; Hydrogen and Sustainability; Hydrogen Production Methods; Green Hydrogen Sources; Hydrogen as an Energy Carrier; Historical Background and Current Applications.

Hydrogen Generation Methods: Steam methane reforming; Electrolysis (alkaline; PEM, and solid oxide electrolysis); Coal/Biomass Gasification; Solar and Wind-based Hydrogen Production; Emerging Hydrogen Generation Technologies.

Hydrogen Storage Techniques: Compressed Gas Storage; Liquid Hydrogen Storage; Chemical Storage (hydrogenation, metal hydrides); Physical Storage Using Nanostructured and Porous Materials; Underground Hydrogen Storage; Emerging Hydrogen Storage Technologies.

Performance and Efficiency: Efficiency Considerations in Hydrogen Generation; Energy Losses and Efficiency of Different Storage Methods; Performance Assessment of Hydrogen Production and Storage Systems.

Safety and Regulations: Safety Considerations in Hydrogen Handling and Storage; Codes and Standards for Hydrogen Storage Systems; Risk Assessment and Mitigation Strategies; Case Studies of Hydrogen- related Incidents.

Text Books

1. Gupta, R. B., Hydrogen Fuel: Production, Transport, and Storage, CRC press, 2008.
2. Zhang, J. Z., Li, J., Li, Y., Zhao, Y., Hydrogen Generation, Storage and Utilization, John Wiley & Sons, 2014.
3. Dinçer, I., Zamfirescu, C., Sustainable Hydrogen Production, Elsevier, 2016.
4. Altalhi, T. A., Adnan, S. M., Amin, M. A., Materials for Hydrogen Production, Conversion, and Storage, John Wiley & Sons, 2023.

Reference Books

1. Winter, C. J., Nitsch, J., Hydrogen as an Energy Carrier: Technologies, Systems, Economy, Springer Science & Business Media, 2012.
2. Sherif, S. A., Goswami, D. Y., Stefanakos, E. L., Steinfeld, A., Handbook of Hydrogen Energy, CRC press, 2014.



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|---------------------------------------|-------------------------------|------------------------------|-------------------------------|
| Course Code: 25CH612 | Bioenergy and Biofuels | L-T-P 4-0-0 | Credits 4 Cr |
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Pre-Requisites: Nil.

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

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|------------|--|
| CO1 | Knowledge of renewable feedstock and resource utilization related to bioenergy |
| CO2 | Understanding of the existing and emerging biomass to energy technologies |
| CO3 | Analyze the advanced process of the bioenergy systems |
| CO4 | Develop critical thinking about energy sustainability and economic parameters |

Detailed syllabus

Introduction to fundamental concepts of biofuels and bioenergy. Systems thinking, biopower, bioheat, biofuels, advanced liquid fuels, drop-in fuels.

Biomass Feedstocks: Harvested feedstocks for first, second and third generation biofuels, residue Feedstocks from agricultural, forestry and farm waste, organic components of residential, commercial, institutional and industrial waste. Biomass conversion technologies: Biorefineries and end products.

Biochemical conversion: hydrolysis and fermentation, anaerobic digestion, trans-esterification. Biofuel production, characterization and storage.

Thermochemical conversion: combustion, gasification, pyrolysis, other technologies, scale-up, characterization, Biohydrogen

Life Cycle Analysis: General understanding of LCA, cradle-to-grave, field-to-wheels concepts, goal and scope determination, defining LCA boundaries. Life cycle inventory, life cycle assessment 3 Sustainability: General principles, environmental sustainability, bioenergy

Bioenergy & Environment: Criteria pollutants, carbon footprint, emissions of biomass to power generation applications, emissions from biofuels, indirect land use change (ILUC) issues, value-added processing of biofuel residues/wastes

Text Books

1. John Love, John A. Bryant, Biofuels and Bioenergy, Wiley- Blackwell, 2017.
2. D.L. Klass, Biomass for renewable energy, fuels, and chemicals. Academic Press, 1998.
3. Biohydrogen, Ashok Pandey, S. Venkata Mohan, Jo-Shu Chang, Patrick C. Hallenbeck, Christian Larroche, second edition, Elsevier, 2019.

Reference Books

1. Robert C. Brown, Biorenewable Resources: Engineering New Products from Agriculture. Wiley-Blackwell Publishing, 2nd Edition, 2013.
2. Ycbo Li and Samir Kumar Khanal, Bioenergy: Principles and Applications. Willey Blackwell, 2016.
3. Sunggyu Lee and Y.T. Shah, Biofuels and Bioenergy Processes and Technologies. CRC Press, University Press, 2019.
4. Sergio C. Capareda, Introduction to Biomass Energy Conversions, CRC Press, 2013.

**Elective-II Courses offered by Chemical Engineering Department**

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|---------------------------------------|--|------------------------------|-------------------------------|
| Course Code: 25CH613 | Solid Waste and Hazard Management | L-T-P 4-0-0 | Credits 4 Cr |
|---------------------------------------|--|------------------------------|-------------------------------|

Pre-Requisites: Nil

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

| | |
|------------|---|
| CO1 | Understand the concept of solid waste management. |
| CO2 | Recognize the various classifications and characteristics of solid waste. |
| CO3 | Identify the methods of collection of solid waste. |
| CO4 | Evaluate the method of management of solid waste. |

Detailed syllabus

Municipal Solid Waste Management: Legal and Organizational foundation: waste generation technological society – major legislation, monitoring responsibilities, sources and types of solid waste – sampling and characterization – Determination of composition of MSW – storage and handling of solid waste – Future changes in waste composition.

Separation and Processing and Transformation of Solid Waste: unit operations user for separation and processing, Materials Recovery facilities, Waste transformation through combustion and aerobic composting, anaerobic methods for materials recovery and treatment – Energy recovery – Incinerators Transfer and Transport: Transport operation and methods, transfer station types and design requirements.

Landfills: Site selection, design and operation, drainage and leachate collection systems – requirements and technical solution, designated waste landfill remediation – Integrated waste management facilities.

Hazardous Waste Management: Identification of hazardous wastes-sources and characteristics, Hazardous waste regulations, minimization of hazardous waste, handling and storage of waste-collection and transport, e-waste - sources, collection, treatment and reuse management.

Hazardous waste treatment and Design: Hazardous waste treatment technologies - Design and operation of facilities for physical, chemical and thermal treatment of hazardous waste – Solidification, chemical fixation and encapsulation, incineration. Hazardous waste landfills: Site selection, design and operation – remediation of hazardous waste disposal sites.

Text Books

1. G. Tchobanoglous, H. Theisen, and S. Vigil, Integrated Solid Waste Management: Engineering Principles and Management Issue, McGraw-Hill Publication, 1993.
2. John Pichtel, Waste Management Practices: Municipal, Hazardous and Industrial, CRC Press, 2nd Edition, 2014.
3. Vesilind PA, Worrell W and Reinhart D, Solid Waste Engineering, Brooks/Cole Thomson Learning Inc., 2nd Edition, 2010.

Reference Books

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, Environmental Engineering, McGraw Hill Education, 1st Indian Edition, 2017.
2. Tchobanoglous G and Kreith F, Handbook of Solid Waste Management, McGraw-Hill Education, 2nd Edition, 2002.
3. Richard J. Watts, Hazardous Wastes - Sources, Pathways, Receptors, John Wiley and Sons, 1st Edition, 1998.



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|---------------------------------------|---------------------------------------|------------------------------|-------------------------------|
| Course Code: 25CH614 | Water and Wastewater Treatment | L-T-P 4-0-0 | Credits 4 Cr |
|---------------------------------------|---------------------------------------|------------------------------|-------------------------------|

Pre-Requisites: Nil

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

| | |
|------------|--|
| CO1 | Describe different methods for wastewater treatment and environmental effects of wastewater. |
| CO2 | Know the five stages of wastewater treatment and alternative strategies for providing these levels of treatment. |
| CO3 | Impart knowledge on the various advances in wastewater treatment process across the industries. |
| CO4 | Analyze the various wastewater treatment processes and operations, and optimization. |

Detailed syllabus

Introduction: An Overview of Water and Wastewater Treatment, need for wastewater treatment: water scenario, escalating demand, pollution of existing sources. Waste water sources – industrial, agricultural & domestic. Assessment of wastewater composition: General characteristics-TSS, TDS, BOD, COD, pH, Specific characteristics – analysis for various ionic species, heavy metals and other identified pollutants.

Conventional Treatment of Wastewater: Primary, secondary aim of the treatment. Particulate Removal (primary), screens filters, rapid & gravity filters. Secondary treatment - Aerobic treatment; Suspended growth aerobic treatment processes, Activated sludge process and its modifications. Attached growth aerobic processes, Trickling filters and Rotating biological contactors, Membrane biological reactor. Anaerobic treatment- Suspended growth, attached growth, fluidized bed and sludge blanket systems, Nitrification, denitrification, Phosphorus removal. Sludge Treatment -Thickening; Digestion; Dewatering; Sludge drying; Composting, Low-cost wastewater systems Ponds and Lagoons; Wetlands and Root-zone systems.

Chemically induced mechanical operations: coagulation, clarifiers, oxygenation, precipitation, adsorption, ion exchange and membrane processes. Removal of trace level pollutants- disinfection using chlorine, UV, UF.

Sequencing of unit operations - processes– operational aspects including batch and continuous systems. Volume reduction concept of water recovery and recycle.

Text Books

1. G. Tchobanoglous and Metcalf & Eddy, Wastewater Engineering Treatment and Reuse, 4th Edition, Tata McGraw-Hill Publishing Company, New Delhi, 2003.
2. S.J. Arceivala, Wastewater Treatment for Pollution Control, Tata McGraw Hill, 1998.
3. W.W. Eckenfelder, Industrial Water Pollution Control, 3rd Edition, McGraw Hill, Boston, MA, 2000.

Reference Books

1. E.F. Eldridge, Industrial Waste Treatment Practice, McGraw-Hill Book Company, Inc., New York, 2021.
2. C.P.L. Grady, G. T. Daigger, and H. C. Lim., Biological Wastewater Treatment, 3rd Edition, Rev. and Expanded, Marceldekker, New York, 2011.



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|---------------------------------------|--------------------------------------|------------------------------|-------------------------------|
| Course Code: 25CH615 | Advanced Separation Processes | L-T-P 4-0-0 | Credits 4 Cr |
|---------------------------------------|--------------------------------------|------------------------------|-------------------------------|

Pre-Requisites: Nil

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

| | |
|------------|---|
| CO1 | Understand various conventional and modern separation techniques in chemical engineering processes |
| CO2 | Realize the fundamentals of membrane separation and charged based separation techniques |
| CO3 | Apply the knowledge of surface and ionic properties in the separation process |
| CO4 | Design different membrane modules, chromatographic and ion exchange systems for intended applications |

Detailed syllabus

Membrane separations: Types and choice of membrane, plate and frame tubular spiral wound and hollow fiber membrane reactors and their relative merits, commercial pilot plant and laboratory membrane permeators involving dialysis, reverse osmosis, nanofiltration, ultrafiltration, microfiltration and Donnan dialysis, economics of membrane operators, ceramic membranes. pervaporation and permeation techniques for solids liquids and gases. Recent advances in separation techniques based on size surface properties, ionic properties and other special characteristics of substances, process concept theory, and equipment used in crossflow filtration, crossflow electro filtrations.

Separation by adsorption Techniques and Ionic separations: Mechanism types and choice of adsorbents, normal adsorption techniques, affinity chromatography and immune chromatography. Types of equipment and commercial processes, recent advances and process economics, controlling factors, applications, types of equipment employed for electrophoresis, dielectrophoresis, ion exchange chromatography and electro dialysis, commercial processes.

Other Techniques: Separation involving lyophilization, industrial viability and examples, zone melting, adductive crystallization, other separation processes, supercritical fluid extraction, oil spill management, industrial effluent treatment by modern techniques- dual function filter surface based solid-liquid separations involving a second liquid sirofloc filter.

Text Books

1. B. Sivasankar, Bioseparations – Principles and Techniques, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
2. J.D. Seader, Ernest J.Henley and D. Keith Roper, Separation process Principles, 3rd edition, John Wiley & Sons Australia, Limited, 2010.

Reference Books

1. KaushikNath, Membrane Separation processes, PHI, New Delhi 2008.
2. R.W. Rousseau, Handbook of Separation Process Technology, John Wiley, New York, 1987.



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|---------------------------------------|--|------------------------------|-------------------------------|
| Course Code: 25CH616 | CO₂ Capture, Sequestration and Utilization | L-T-P 4-0-0 | Credits 4 Cr |
|---------------------------------------|--|------------------------------|-------------------------------|

Pre-Requisites: Nil

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

| | |
|------------|--|
| CO1 | Identify the necessity of CO ₂ capture, storage and utilization |
| CO2 | Distinguish the CO ₂ capture techniques |
| CO3 | Evaluate CO ₂ storage and sequestration methods |
| CO4 | Assess environmental impact of CO ₂ capture and utilization |

Detailed syllabus

Introduction: Global Status of CO₂ Emission Trends; Policy and Regulatory Interventions in Abatement of Carbon Footprint; Carbon Capture, Storage and Utilization (CCS&U).

CO₂ Capture Technologies from Power Plants: Post-Combustion Capture; Pre-Combustion Capture; Oxy-Fuel Combustion; Chemical Looping Combustion; Calcium Looping Combustion.

CO₂ Capture Agents and Processes: Capture Processes; CO₂ Capture Agents; Adsorption; Ionic Liquids; Metal Organic Frameworks.

CO₂ Storage and Sequestration: Geological Sequestration Methods; Biomimetic Carbon Sequestration.

CO₂ Utilization: CO₂ Derived Fuels for Energy Storage; Polymers from CO₂; CO₂ Based Solvents; CO₂ to Oxygenated Organics; Conversion into Higher Carbon Fuels; High Temperature Catalysis.

Environmental Assessment of CO₂ Capture and Utilization: Need for Assessment; Green Chemistry and Environmental Assessment Tools; Life Cycle Assessment (LCA); ISO Standardization of LCA; Method of Conducting an LCA for CO₂ Capture and Utilization.

Text Books

1. Peter Styring, Elsje Alessandra Quadrelli, Katy Armstrong, Carbon dioxide Utilization: Closing the Carbon Cycle, Elsevier, 2015.
2. Goel, M., Sudhakar, M., Shahi, R. V., Carbon Capture, Storage and, Utilization: A Possible Climate Change Solution for Energy Industry, TERI, Energy and Resources Institute, 2015.

Reference Books

1. Amitava Bandyopadhyay, Carbon Capture and Storage, CO₂ Management Technologies, CRC Press, 2014.
2. Fennell P, Anthony B, Calcium and Chemical Looping Technology for Power Generation and Carbon Dioxide (CO₂) Capture, Woodhead Publishing Series in Energy: No. 82, 1st Edition, 2015.



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|---------------------------------------|-------------------------------------|------------------------------|-------------------------------|
| Course Code: 25CH617 | Industrial Safety Management | L-T-P 4-0-0 | Credits 4 Cr |
|---------------------------------------|-------------------------------------|------------------------------|-------------------------------|

Pre-Requisites: Nil

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

| | |
|------------|--|
| CO1 | Interpret the theoretical concepts and practices of industrial safety |
| CO2 | Examine the state of safety in an organization based on various indices |
| CO3 | Develop different types of safety procedures and formats and prepare reports |
| CO4 | Illustrate how the basic principles of management can be applied in safety |

Detailed syllabus

Concept of safety, Goals of safety engineering, History of safety movement, Theories and principles of accident causation, Roles of Stake holders in safety: management, supervisors, workmen, trade unions, government, voluntary organizations etc., Workers' participation in safety management Engineering, education and enforcement (3 E's) of safety.

Indices of safety performance, Definitions: Accident, Injury, Unsafe acts, Unsafe conditions, Dangerous occurrence, Reportable accidents, Classification of injuries, Accident reporting and investigation, Personal Protective Equipment Work permit, Plant safety inspection Safety audit, Job safety analysis, First aid: principles, aims and objectives, Product safety, Cost analysis, Human factors in safety management, Behavior-based safety.

Health and safety management: Safety organization, Organizational management, Employee awareness, Safety in System life cycle, developing a system safety programme, Closed-loop process, Benchmarking, HSE policy, Risk management: techniques, strategies and programmes, application of business management models in safety management.

Disaster management: importance, types of disasters, On-site and off-site emergency plans, mock drills, Oil-spill contingency plan, Cases of important industrial disasters, Natural disasters: predictions, rescue, relief and rehabilitation, Legal provisions.

References Books

1. Nicholas J. Bahr. System Safety Engineering and Risk Assessment – A Practical Approach: Taylor & Francis, 2nd Edition, 2018.
2. Mc Cornick and Sanders. Human Factors in Engineering and Design, McGraw Hill, New York, 1993.
3. Jeremy Stanks. The Manager's Guide to Health & Safety at Work, 8th Edition, Kogan Page Ltd., UK, 2006.

Reference Books

1. UNEP, Paris APELL – A Process for responding to technological accidents - A Handbook. Industry & Environment Office, UNEP, 1998.
2. National Safety Council, USA Accident Prevention Manual for Business and Industry, Vol. I, 13th Edition, 2009.



3rd Semester



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|---------------------------------------|------------------------------|------------------------------|--------------------------------|
| Course Code: 25CH698 | Project Work – Part A | L-T-P 0-0-0 | Credits 13 Cr |
|---------------------------------------|------------------------------|------------------------------|--------------------------------|

Pre-Requisites: Nil

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

| | |
|------------|---|
| CO1 | Identify a domain-specific research problem in chemical engineering based on current scientific and industrial challenges |
| CO2 | Review relevant literature to identify research gaps, define objectives, and outline the project scope and methodology. |
| CO3 | Develop and implement an experimental setup, model, or simulation to achieve the project objectives. |
| CO4 | Analyze and interpret results using appropriate tools to draw valid conclusions and recommend future research directions. |

Detailed syllabus

Students are expected to identify a real-world, contemporary problem in the field of chemical engineering and apply advanced engineering principles and methodologies to develop viable solutions. This may involve designing and building experimental setups or prototypes, developing simulation models or computational codes, formulating new processes or syntheses, or establishing empirical correlations. The relevance, technical depth, and overall worthiness of the proposed project will be evaluated and approved by a departmental panel.

Dissertation Evaluation:

1. The dissertation shall be submitted as per the schedule given in the academic calendar.
2. The dissertation supervisor will periodically review the progress of the student and finally give his/her assessment of the work done by the student.
3. The Dissertation Part – A will be evaluated for 100 marks, with the following weightages: The student will be evaluated by the panel based on the below criteria.

| Task | Description | Weightages (%) |
|-------------|---|-----------------------|
| I | Understanding of Research Topic | 10 |
| II | Literature Survey | 20 |
| III | Defining the Objectives and Solution Methodology | 30 |
| IV | Performance of the Task | 30 |
| V | Publication details (Paper, Chapter, Conference Proceeding, etc.) | 10 |



4th Semester



| | | | |
|---------------------------------------|------------------------------|------------------------------|--------------------------------|
| Course Code: 25CH699 | Project Work – Part B | L-T-P 0-0-0 | Credits 13 Cr |
|---------------------------------------|------------------------------|------------------------------|--------------------------------|

Pre-Requisites: Refer to 3rd Semester.

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

| | |
|------------|--|
| CO1 | Identify the materials and methods for carrying out experiments/develop a code |
| CO2 | Execute the research methodology with a concern for society, environment and ethics |
| CO3 | Analyze, discuss and justify the results/trends and draw valid conclusions |
| CO4 | Prepare the report as per recommended format and present the work orally adhering to stipulated time |
| CO5 | Explore the possibility to publish/present a paper in peer reviewed journals/conference proceedings without plagiarism |

Description:

Students are expected to choose real-world contemporary problem and apply the engineering principles learned, to solve the problem through building prototypes or simulations or writing codes or establishing processes/synthesis/correlations etc. The department constituted panel will decide the suitability and worthiness of the dissertation.

Dissertation Evaluation:

1. The dissertation shall be submitted as per the schedule given in the academic calendar.
2. The dissertation supervisor will periodically review the progress of the student and finally give his/her assessment of the work done by the student.
3. The Dissertation Part – B will be evaluated for 100 marks, with the following weightages and evaluation criteria:

The student will be evaluated by the panel based on the below criteria as a continuation of Dissertation Part A.

| Task | Description | Weightages (%) |
|-------------|---|-----------------------|
| I | Performance of the Task | 30 |
| II | Dissertation Preparation | 15 |
| III | Review (Presentation & Understanding) | 15 |
| IV | Viva-Voce | 30 |
| V | Publication details (Paper, Chapter, Conference Proceeding, etc.) | 10 |