

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati
Course Structure and Syllabus

(From Academic Session 2024-25 onwards)

B. TECH
CHEMICAL ENGINEERING

4th SEMESTER

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Course Structure
(From Academic Session 2024-25 onwards)

B. Tech 4th Semester: Chemical Engineering

Semester IV

Sl. No.	Course Code	Course Type	Course Title	Hours per Week			Credit	Marks	
				L	T	P	C	CE	ESE
Theory									
1	CHE241401	PCC	Heat Transfer Operations	3	0	0	3	30	70
2	CHE241402	PCC	Petroleum Refining and Petrochemicals	3	0	0	3	30	70
3	CHE241403	PCC	Chemical Engineering Thermodynamics	3	0	0	3	30	70
4	CHE241404	PCC	Chemical Reaction Engineering - I	3	0	0	3	30	70
5	CHE241405	PCC	Process Instrumentation	3	0	0	3	30	70
6	HS241406	HSMC	Finance and Accounting	3	0	0	3	30	70
7	AU241407	AU	Environmental Science	3	0	0	0 (P/NP)	-	100
Practical									
8	CHE241411	PCC	Heat Transfer Operations Lab	0	0	2	1	15	35
9	CHE241412	PCC	Petroleum Refining and Petrochemicals Lab	0	0	2	1	15	35
10	CHE241413	PCC	Chemical Engineering Thermodynamics Lab	0	0	2	1	15	35
11	PR241415	PR	Micro Project (Skill Based)	0	0	4	2	15	35
TOTAL				**21**	**0**	**10**	**23**	**240**	**660**
Total Contact Hours per week: 31									
Total Credit: 23									

Course Code	Course Title	Hours per week L-T-P	Credit
CHE241401	Heat Transfer Operations	3-0-0	3

Course Outcomes:
Students will be able to:

- **CO1**. Understand the principle of the heat conduction and evaluate heat flux for different shape of solids at different condition.
- **CO2**. Estimate the heat transfer coefficient related to convection and condensation selecting suitable correlations.
- **CO3**.Apply the laws of radiations to solve problems in relevant engineering fields.
- **CO4**. Estimate size of heat exchanger and evaporator by thermal analysis.
- **CO5**. Understand the Design aspect of heat exchanger.

MODULE 1: Heat Transfer by Conduction
One-dimensional Heat Conduction equation, Boundary conditions; One-dimensional steady state heat conduction for slab, cylinder, sphere, composite medium, Thermal conduct resistance, critical thickness of insulation, Fourier law, Finned surfaces, temperature dependent K (T), Transient conduction and use of temperature charts. Lumped system analysis for slabs and long cylinder and spheres.

MODULE 2: Heat Transfer by Convection
Flow over a body, flow inside a duct. Forced Convection: Hydrodynamic and thermal boundary layer, simultaneously developing laminar flow, Turbulent flow inside ducts, Heat transfer to liquid metals. Free Convection: Dimensionless parameters of Free Convection, Correlations of free convection on a vertical plate, Free Convection on a horizontal plate.

MODULE 3: Condensation
Nusselt equation for horizontal and vertical condenser, Drop and film type condensation, Effect of non-condensable gases. Boiling: Boiling of liquids. Nucleate and film boiling.

MODULE 4: Heat Transfer by Radiation
Concept of black body, Kirchoff's Law Emissivity, absorptivity, black body and grey body radiation. View factors, Radiation from non- luminous gases.

MODULE 5: Heat Exchangers
Classification, temperature distribution in heat exchangers, Overall heat transfer co-efficient, correction for LMTD for use with cross flow and multipass exchanger. NTU & HTU method of Heat Exchanger analyses.

MODULE 6: Evaporation
Classification and application, operation of single and multiple effect evaporators.

MODULE 7: Preliminary Design Aspect of Heat Transfer Equipments
Heat Exchangers: Hair pin (double pipe exchangers) 1-2 shell and tube exchangers, Extended surface heat exchangers, Calculation of Fin efficiency, LMTD, fouling factor.

Textbooks/ReferenceBooks:

1. B.K. Dutta, Heat transfer-Principles and applications, Prentice Hall India
2. M. Necati Ozisik, Heat Transfer – A basic approach, McGraw-Hill.
3. W. H. McAdams, Heat Transfer, McGraw-Hill.
4. M. Mikheyev, Fundamentals of Heat Transfer, Mir publications.
5. McCabe and Smith, Unit Operation of Chemical Engineering, McGraw-Hill Inc..

Course Code	Course Title	Hours per week L-T-P	Credit
CHE241402	Petroleum Refining and Petrochemicals	3-0-0	3

Objectives: This course will present an overview of the modern, integrated petroleum refinery system, its feedstock, products and the processes employed to convert crude oil and intermediate streams into finished petroleum and petrochemicals products.

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

- **CO1**. Understand the characterization of crude oil component and methods of evaluations.
- **CO2**. Able to recognize the different petroleum products specifications
- **CO3**. Able to understand the various operation technique of petroleum processing units mother unit and secondary treatments processes.
- **CO4**. Overview of the petrochemical intermediates and its products
- **CO5**. Familiar with the latest upcoming in refinery processes like Indmax process, bio-refinery etc.

MODULE 1: Introduction to Petroleum Refinery
Indian Petroleum Refineries, prospects and future, composition of crude oil, classification and evaluation of crude oil, properties and testing of petroleum products.

MODULE 2: Processing of Crude Oil
Dehydration and Desalting unit, Atmospheric and Vacuum distillation, Coking, Visbreaking, and Thermal Cracking, solvent Deasphalting, fluidized catalytic cracking, hydro-processing, hydro-treating and Hydro Cracking, Catalytic Reforming process, Alkylation and Isomerization, FCCU and Hydro Cracking process.

MODULE 3 Purification and Treatment Techniques of petroleum products
Production and treatment of LPG, CNG, Amine treatment process, Sulphur Recovery process, MEROX process, Hydrogen Generation process, Extraction of aromatics, Olefins and recovery operations from petroleum products, Odours to improve performance, Solvent Dewaxing, Treatment techniques for removal of objectionable gases/element, Lube oil Processing.

MODULE 4: Petrochemicals
Introduction and classification of petrochemicals; Chemicals from Natural and synthesis gas, Chemicals from olefins; Ethylene derivatives, Propylene derivatives and Butylene derivatives, Aromatics, intermediates for synthetic fibers and Plastic.

MODULE 5 Recent advances in Refinery and Petrochemical sectors
Indmax process, bio-refinery, ethanol production, future trends in petroleum refinery operations. (To be taught by Oil & Gas Specialist)

Text Books / Reference Books:

1. W.L..Nelson " Petroleum Refining Engineering " Mc Graw- Hill.
2. R.N.Watkins, " Petroleum Refinery distillation " Gulf Publishing Co.
3. Robert A Mayers " Hand book of petroleum refining process ".
4. James G Speight " The chemistry and technology of petroleum ".
5. J.H. Gary and G.E. Handwerk " Petrolem Refinery Technologies and economics "
6. B. K. Bhaskara Rao, "Modem Petroleum Refining Processes", 2nd' Edn., Oxford and IBH Publishing Company, New Delhi,1990.

Course Code	Course Title	Hours per week L-T-P	Credit
CHE241403	Chemical Engineering Thermodynamics	3-0-0	3

Course Objectives

This course introduces core thermodynamic principles with a focus on chemical engineering applications. Key topics include the laws of thermodynamics, thermodynamic property relations, phase and solution thermodynamics, vapour-liquid equilibrium (VLE), and chemical reaction equilibrium. Students will able to learn about analysis of systems and apply thermodynamic concepts to both ideal and non-ideal processes.

Course Outcomes

- **CO1**: Understand the basics of Chemical Engineering Thermodynamics and compute various parameters for system calculations.
- **CO2**: Explain the laws of thermodynamics and their applications to different system and thermodynamics scales.
- **CO3**: Analyze real gas behaviour and thermodynamic flow processes, and evaluate the performance of eco-friendly system.
- **CO4**: Describe the interaction of heat and work with surrounding and apply the principles of solution thermodynamics to calculate various thermodynamics functions.
- **CO5**: Compute phase equilibrium data for ideal and non-ideal systems, and evaluate the chemical reaction equilibria using equilibrium criteria

MODULE 1:

Introduction to thermodynamics, fundamental concepts, Zero law of thermodynamics, point and path function, internal energy, enthalpy, reversible vs. irreversible process, heat capacity, specific heat, concept of Cp_m, heat effects accompanying phase changes of pure substances, standard heat of reactions.

Conservation of energy and first law of thermodynamics, applications to steady state flow process.

Second and third laws of thermodynamics: Reversibility and irreversibility, entropy, Ideal gas temperature scale, Carnot cycle, free energies, Gibbs –Duhem equation.

MODULE 2:

Real gases: Equations of state, compressibility charts.

Thermodynamics of flow processes, Single and multi-stage compression, expansion through nozzles.

Refrigeration, Maxwell's relations and thermodynamic functions of pure substances.

Residual properties, thermodynamic property tables and diagrams.

PVT behaviour of fluids, Van der Waals equation, viral expansion, the law of corresponding states.

MODULE 3:

Solution thermodynamics: fundamental property relations, chemical potential and equilibrium, partial properties.

Fugacity, fugacity coefficient, generalized correlations for the fugacity coefficients, ideal and non-ideal solutions.

Activity coefficient models; mixing processes: property changes of mixing, heat effects of mixing processes.

MODULE 4:

Phase Equilibrium: Phase rule, Duhem's theorem, pure component Phase equilibria, vapour-liquid equilibria (VLE).

Raoult's Law and Modified Raoult's Law, high-Pressure VLE, Henry's law, equilibrium and phase stability, liquid-liquid, solid-liquid, vapour-liquid Equilibrium.

Chemical reaction equilibria: reaction co-ordinates, equilibrium criteria for homogeneous and heterogeneous reactions.
Equilibrium constant, effect of temperature and composition on equilibrium constant, equilibrium conversion, Phase rule and Duhem's theorem for reacting systems, multi-reaction equilibria.

Text Books:

1. Chemical Engineering Thermodynamics – J. M. Smith & H. C. Van Ness and M. M. Abbott (Tata McGraw Hill)
2. K. V. Narayanan, "A text book of chemical engineering thermodynamics"
3. Dodge, Chemical Engineering Thermodynamics, McGraw-Hill

Reference Books:

1. Weber, H. C. and Meissner, H. P., Thermodynamics for Chemical Engineers, John Wiley, (1970).
2. Wilson and Ric, Principles of Chemical Engineering Thermodynamics, McGraw-Hill

Course Code	Course Title	Hours per week L-T-P	Credit
CHE241404	Chemical Reaction Engineering-I	3-0-0	3

Course Outcomes: After completion of the course, the students will be able to

- **CO1**: *Identify* chemical reactions based on the form and number of kinetic equations and *compute* the kinetics of the given reaction system.
- **CO2**: *Analyze* and *apply* kinetic data using integral or differential method for development of kinetics and thermodynamics.
- **CO3**: *Sketch* and d*esign* the batch and steady state flow reactors, recycle reactor and Multiple reactor systems and quantitatively *evaluate* their performance.
- **CO4**: *Select* the best single reactor and multiple reactor systems for a particular job.
- **CO5**: *Compute* RTD from tracer test experiment and *use* it to diagnose Nonideal flow patterns in a reactor.

MODULE 1: Introduction to Chemical Reaction Engineering: Kinetics of Reactions
Classification of chemical reactions: single and multiple, elementary and nonelementary, homogeneous and heterogeneous reactions; Order and molecularity; Reaction rate and rate constant; Temperature dependency and Activation energy.

MODULE 2: Interpretation of Batch Reactor Data
Integral and differential methods of analysis of kinetic data; Constant and variable volume batch reactor; Half-life period; Test for zero order, first order, second order, auto catalytic reactions, series and parallel reactions, reversible reactions using integral method.

MODULE 3: Introduction to Reactor Design
Broad classification of reactors, Mass and energy balance around a reactor; Relationship between concentration and conversion for constant and varying density Batch and Flow system.

MODULE 4: Ideal Reactors for Single Reactions
Batch reactor, steady state mixed flow reactor, steady state plug flow reactor, holding time and space time, general graphical representation

MODULE 5: Design for single reactions
Comparison of single reactors, Plug flow reactor in series and in parallel, Mixed flow reactors in series and in parallel, Best arrangement of a set of ideal reactors, Recycle reactor, Autocatalytic reactions and Optimum recycle operation, Finding the best reactor setup.

MODULE 6: Basics of Nonideal Flow Reactor
Residence Time Distribution (RTD) for Chemical Reactors; Measurement of RTD, Characteristics of the RTD; RTD for Ideal Reactors; Diagnostics and Troubleshooting.

Textbooks/Reference Books:

1. Octave Levenspiel, Chemical Reaction Engineering, Wiley Eastern.
2. H. Scott Fogler, Elements of Chemical Reaction engineering, Prentice Hall.
3. D.M. Smith, Chemical Engineering Kinetics, McGraw Hill Publication.
4. S.M. Walas, Reaction Kinetics for Chemical Engineers, McGraw Hill Publication.

Course Code	Course Title	Hours per week L-T-P	Credit
CHE241405	Process Instrumentation	3-0-0	3

Course Outcomes:
Students will be able to:

- **CO1**: Describe various aspects of instruments and apply mathematical tools in response analysis of 1st and 2nd order instruments.
- **CO2**: Review the practical importance and relevance of process instruments in process plant.
- **CO3**: Understand the concept of working of transducers and its various types .
- **CO4**: Analyze and draw the outline of P & ID and PFD of various chemical processes.

MODULE 1:
Elements of instruments, Static characteristics, Dynamic characteristics, Application of Linear ODE and Laplace transform in instrumentation, Response of 1st order and 2nd order instruments.

MODULE 2:
Transducer elements, Different types of transducers

MODULE 3:
Temperature measuring instruments: Thermocouples, Resistance thermometers, Radiation pyrometers, Optical pyrometers, photoelectric pyrometers, Thermistors.

MODULE 4:
Measurement of pressure and vacuum: Bourdon tube, Diaphragm pressure gage, Bellows pressure gage, Pressure spring ,Mcleod gage, Pirani gage, Ionization gage, Thermocouple gage.

MODULE 5:
Composition measuring instruments: Gas Chromatography, Liquid Chromatography, UV- Vis Spectroscopy, Mass Spectrometry, Ion meter, Fuel Gas Analysis, Oxygen analysis, Polarography, Colorimetry, Combustible gas analysis.

MODULE 6:
Level measuring instruments: Direct measurement of liquid level (Dipstick, Hook type, Sight glass, Float type gage, Displacer type), Indirect measurement of liquid level (Hydrostatic head type, bubbler or purge type, Capacitance type, Ultrasonic type, Radiation type).

MODULE 7:
Surface area measuring instruments: BET, Scanning electron microscopy, Dynamic vapor sorption, Transmission Electron Microscopy

MODULE 8:
Instrumentation symbols, Introduction to Process Flow Diagrams and Piping and Instrumentation Diagram.

Textbooks/Reference Books:

1. Donald P. Eckman – Industrial Instrumentaion, Wiley Western Limited.
2. A.Suryanarayana, Instrumentation & Process Control, Khanna Publishers, New Delhi.
3. R. K. Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi.
4. R.F.Egerton, Physical Principles of Electron Microscopy Springer.
5. D. Patranabis, Principle of Industrial Instrumentation, McGra Hill Inc..

Course Code	Course Title	Hours per week L-T-P	Credit
HS241406	Finance and Accounting	3-0-0	3

Prerequisites: High School Education

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

- **CO1:** Develop a strong foundation in accounting principles, including the classification of accounts, the Double Entry System, the application of the Golden Rules of Debit and Credit, record financial transactions in journals, post them into ledgers, and prepare a Trial Balance.
- **CO2:** Understand the role of subsidiary books in accounting, including different types of cash
- books and their preparation; learn to reconcile differences between the Cash Book and Pass Book balances and prepare a Bank Reconciliation Statement
- **CO3:** Differentiate between capital and revenue expenditure, understand the concepts of bad debts and provisions for doubtful debts and gain the skills to prepare final accounts by incorporating necessary adjustments.
- **CO4:** Explore the concepts of savings and investment, including their benefits and differences, identify various investment avenues in physical and financial assets and understand the distinction between trading and investment to make informed financial decisions.
- **CO5:** Have a comprehensive understanding of financial markets, covering money and capital markets, key financial instruments, IPOs, stock exchanges, and mutual funds, and analyze the structure and functions of financial markets and assess different financial instruments used for investment.
- **CO6:** Acquire knowledge and skills in stock market investment and analysis, applying fundamental and technical analysis to evaluate stocks, learn to interpret stock market charts and patterns, assess stock price movements, and utilize various analytical tools for informed investment decisions.

MODULE 1: Introduction to Accounting

Concept and classification of Accounts, Transaction, Double Entry System of Book Keeping, Golden rules of Debit and Credit, Journal- Definition, Advantages, Procedure of Journalising, Ledger, Advantages, Rules regarding Posting, Balancing of ledger accounts, Trial Balance- Definition, Objectives, Procedure of preparation.

MODULE 2: Subsidiary Books, Cash Book and Bank Reconciliation

Name of Subsidiary Books, Cash Book- Definition, Advantages, Objectives, Types of Cash Book, Preparation of different types of Cash Books, Bank Reconciliation Statement, Reasons of disagreement between Cash Book with Pass Book balance, Preparation of bank Reconciliation Statement.

MODULE 3: Expenditures, Bad Debts and Final Accounts

Concept of Capital Expenditure and Revenue Expenditure, Bad Debts, Provision for Bad and Doubtful debts, Final Accounts: Preparation of Trading Account, Profit and Loss account and Balance Sheet with adjustments.

MODULE 4: Introduction to Saving and Investment

Savings: Concept, Benefits and saving alternatives, Disadvantage of Saving – Time Value of Money. Investment: Meaning, Advantage, Investment Avenues – Investment in Physical and financial assets, Difference between Saving and Investment; Trading- Meaning, Difference between Trading and Investment.

MODULE 5: Financial Market and Instruments.

Financial Markets and Instruments: Money Market, Capital Market, Money Market Instruments and features. Capital Markets and Features, New Issue Market and Stock Market; New Issue market-Initial Public Offering , Market Players, Secondary Market :Equity and Debentures, BSE and NSE, Index and its uses; Mutual Funds: Meaning and Types.

MODULE 6: Stock Market Investment and Analysis

Stock Market Investment: Fundamental Analysis- Economic Analysis-Industry Analysis and Technical Analysis - Tools of technical analysis, Understanding various types of charts and patterns-(Line chart, Bar Chart, Candlestick Chart Point and Figure Chart)

Textbooks/Reference Books

1. Dam, B. B.Sarda, R.A. Barman, R. Kalita, B., Theory and Practice of Accountancy- Vol. I, Gayatri Publication, 2019
2. Goel, D.K Goel, R. Goel,S. Accountancy, Avichal publishing company, 2020
3. Kevin, S., Security Analysis and Portfolio Management, Prentice Hall India., 2022
4. Pathak,B., Indian Financial System, Pearson Education, 2024
5. Chandra, P., The Invesment Game: How To win, Tata McGrawHill, 2012

Course Code	Course Title	Hours per week L-T-P	Credit
AU241407	Environmental Science	3-0-0	0

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

- CO1: Relate environment and its associated problems
- CO2: Explain basic ethics of living and protection of other organisms
- CO3: Applying sustainable development principles

MODULE 1: Introduction:
Environment and Ecology, Objectives of ecological study, Aspects of Ecology, Autecology, Synecology; Ecosystem, Structural and functional attributes of an ecosystem, Food chain and foodweb, Energy flow, Bio geochemical cycles

MODULE 2: Land: Use and Abuse
Land use: Impact of land–use on environmental quality, Land degradation, Control of land degradation, Wasteland, Wet lands

MODULE 3: Water Pollution
Introduction: Water quality standards, Water pollution

MODULE 4:
Air Pollution: Introduction, Air pollution system, Air pollutants, Air pollution laws

MODULE 5:
Noise Pollution: Introduction: Sources of noise pollution, Effects of noise, Physical effects, Physiological effects

MODULE 6:
Control of pollutions: Control of water pollution and management, Water pollution legislations, Water quality management in surface water; Control of air pollution, source correction method, Pollution control equipment; controls of Noise pollution

Textbooks/Reference Books

1. Dr Suresh Dhameja, Environmental engineering and management, 2010
2. Dr B.S. Chauhan, Environmental studies
3. Henry and Hence, Environmental science and engineering
4. Dr Susmitha Baskar, Environmental studies for undergraduate course
5. Clair Sawyer, Chemistry for environmental engineering and science

Course Code	Course Title	Hours per week L-T-P	Credit
CHE241411	Heat Transfer Operations Lab	0-0-2	1

Course Objectives

To understand the basic principle of heat transfer and operation of different heat transfer equipment.

Course Outcomes

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

- **CO1:** Conduct experiment to evaluate individual and overall heat transfer coefficient for heat exchanger with and without phase change.
- **CO2:** Measure the efficiency of extended surface heat exchanger.
- **CO3:** Perform experiment to estimate thermal conductivity of metal rod.

List of experiments:

Exp. No.	Details
1	Condensation
	To find the overall heat transfer coefficient for dropwise and filmwise condensation.
2	Condenser
	To determine over all heat transfer coefficient and film coefficient in vertical and horizontal condenser.
3	Pin-Fin
	To study temperature distribution along the length of a pin fin under free and forced convection heat transfer.
4	Thermal Conductivity
	To determine thermal conductivity of metal rod and plot temperature distribution along the length.
5	Heat exchanger
	To calculate overall heat transfer coefficient for shell and tube heat exchanger.

Text book

1. B.K. Dutta, Heat transfer-Principles and applications, Prentice Hall India
2. M. Necati Ozisik, Heat Transfer – A basic approach, McGraw-Hill.
3. W. H. McAdams, Heat Transfer, McGraw-Hill.

Reference book

1. Fundamentals of Heat Transfer by M. Mikheyev – Mir publications.

Course Code	Course Title	Hours per week L-T-P	Credit
CHE241412	Petroleum Refining and Petrochemicals Lab	0-0-2	1

Course Objectives

This course mainly deals with the different test related to petroleum and petrochemical industries assess product as well as raw material quality testing based on specific test.

Course Outcomes:

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

- **CO1:** Determine aniline point and diesel index of petroleum products.
- **CO2:** Determine smoke point for kerosene.
- **CO3:** Determine penetration index for bitumen.
- **CO4:** Determine softening point for bitumen.
- **CO5:** Determine cloud and pour point for diesel.

List of Experiments:

Expt. No	Details
1	Aniline Point Determine aniline point and diesel index of petroleum products.
2	Smoke point Determine smoke point for kerosene.
3	Penetration index Determine penetration index for bitumen.
4	Softening point Determine softening point for bitumen.
5	Cloud and pour point Determine cloud and pour point for diesel.

Course Code	Course Title	Hours per week L-T-P	Credit
CHE241413	Chemical Engineering Thermodynamics Lab	0-0-2	1

Course objectives

The objective of this course is to understand the fundamental properties of thermodynamics by performing hands on experiments.

Course outcomes:

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

- **CO1:** Dryness fraction of steam using separating & throttling calorimeter
- **CO2:** Estimate the amount of heat generated when a matter is burnt in Bomb calorimeter.
- **CO3:** Compute the thermal efficiency in steam distillation

Expanded Course description:

Exp. No.	Details
1	Separating and Throttling calorimeter
	Aim: To find out the dryness fraction of steam
2	Bomb Calorimeter
	Aim: To find the caloric value of fuel.
3	Steam Distillation
	Aim: Study of characteristics of steam distillation.

Course Code	Course Title	Hours per week L-T-P	Credit
PR241415	**Micro Project (Skill Based)**	**0-0-4**	**2**

Prerequisites: Knowledge of basic science

Objectives:

- To identify problems based on societal or research needs
- To acquaint with the process of solving the problem in a group
- To apply engineering knowledge to attempt solutions to the problems

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

- CO1: Analyze engineering problems and their solutions
- CO2: Apply modern engineering tools to attempt solutions to the problems
- CO3: Adapt with computational thinking and automation skills
- CO4: Realize the need of professional communications, team work and self-learning

General Guidelines:

1. Students shall form a group of 3 to 4 students.
2. Each group shall conduct field survey or literature survey in consultation with faculty supervisor/mentor or internal project committee of faculty members to identify the needs of the society.
3. Each group shall formulate the problems on the basis of their survey and submit the implementation plan to the concerned faculty supervisor/mentor or the committee.
4. A log book is to be maintained by each group, wherein the group can record the work progress. The supervisor shall monitor the progress.
5. The faculty supervisor/mentor or the committee may give inputs to the students during the project activities; however, focus shall be on self-learning.
6. Students in a group shall understand problem effectively, propose multiple solutions and select the best solution in consultation with faculty supervisor/mentor or the committee.
7. Students shall convert the best solution into a working model/prototype using various components of their domain areas.
8. Students shall demonstrate and validate the model with proper justification and a report is to be compiled in a standard format/template

Assessment Criteria:

The Micro Project shall be assessed based on the following criteria:

Sl No.	Component	Weightage
1	Proper identification of the problem	20
2	Quality of survey	15
3	Clarity of problem definition	10
4	Presence of innovation	5
5	Effective use of modern engineering tools	10
6	Cost effectiveness	5
7	Societal impact	10
8	Functioning of the working model	15
9	Fulfilment of standard engineering norms	5
10	Clarity in written and oral communication	5
		100

Examinations:

Sl No.	Type of examination/evaluation	Marks (50)
1	Mid-term presentation on Progress	10
2	Demonstration of the project	10
3	End-term presentation	25
4	Viva-voce examination	5

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