ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati
Course Structure and Syllabus

(From Academic Session 2024-25 onwards)

B. TECH
MECHANICAL ENGINEERING

3rd SEMESTER

ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Course Structure
(From Academic Session 2024-25 onwards)

B. Tech 3rd Semester: Mechanical Engineering

Semester III

Sl. No.	Sub-Code	Subject	Hours per Week			Credit	Marks	
			L	T	P	C	CE	ESE
Theory								
1	MA241305A	Mathematics III-A	3	0	0	3	30	70
2	ME241301	Basic Thermodynamics	3	0	0	3	30	70
3	ME241302	Theory of Machines	3	0	2	4	30	70
4	ME241303	Machine Tools and Metal Cutting	3	0	0	3	30	70
5	ME241304	Mechanics of Materials	3	0	0	3	30	70
6	HS241306	Indian Knowledge Systems	2	0	0	2	-	50
7	AC241307	Language other than MIL	1	1	0	0 (PP/NP)	-	50
Practical								
1	ME241318	Programming in Python Lab	0	0	2	1	15	35
2	ME241314	Mechanics of Materials Lab	0	0	2	1	15	35
3	ME241319	Machine shop	0	0	2	1	15	35
4	SI241321	Social Internship	0	0	4	2	-	50
TOTAL			19	1	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
MA241305A	**Mathematics III-A**	**3-0-0**	**3**

Course Outcome (CO): After completion of the 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 Lectures)

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 Lectures)

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 Lectures)

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 Lectures)

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 Lectures)

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

Text Books/References:

1. Engineering Mathematics: Reena Garg
2. Advanced Engineering Mathematics: Reena Garg
3. Advanced Engineering Mathematics: Erwin Kreyszig
4. A text book of engineering Mathematics: N. P. Bali & M. Goel
5. Introduction to Probability Theory: P. G. Hoel, S. C. Port and C. J. Stone
6. A First Course in Probability: S. Ross

Course Code	Course Title	Hours per week L-T-P	Credit C
ME241301	**Basic Thermodynamics**	**3-0-0**	**3**

Course Outcomes:

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

- **CO1**: Apply the first law of thermodynamics to evaluate energy conversion, heat transfer, and work interactions in both closed and open systems, assessing their performance and efficiency in real-world applications.
- **CO2:** Estimate COP of a refrigerator and heat pump, entropy transfer, entropy of the system and universe, and entropy generation in thermodynamic processes and systems, applying the second law of thermodynamics.
- **CO3:** Estimate specific heats, internal energy, enthalpy, work and heat transfer, and the change in entropy for thermodynamic processes.
- **CO4:** Employ steam tables and Mollier diagrams for estimating various steam properties for given values of pressure and temperature for analyzing steam handling devices and vapor power cycle.
- **CO5:** Analyze thermal engineering devices by evaluating second law efficiency, identifying irreversibilities, and quantifying potential losses through the formulation of exergy balance equations.

MODULE 1: Introduction: Concepts of Thermodynamics: (4 Lectures)

Macroscopic and Microscopic concepts, System and its classification. Thermodynamic state, properties, process and cycles, Thermodynamic equilibrium, Energy interactions (Work transfer and its different modes, Heat transfer) illustrative problems.

MODULE 2: First law of Thermodynamics: (7 Lectures)

First law applied to non-flow as well as flow processes, Concepts of internal energy, Enthalpy, Specific heats, PMMI, Energy equations for flow systems, Application of energy equations to different engineering components such as boiler, turbine, heat exchangers, pumps, nozzles, etc.

MODULE 3: Second law of Thermodynamics: (5 Lectures)

Concept of heat Engine, Kelvin Planck and Clausius statements, Refrigerator and heat pump, equivalence two statements, reversibility and irreversibility, Carnot's Carnot cycle and reversed heat engine, Carnot's and corollary of carnot's theorem, Thermodynamic scales of temperature.

MODULE 4: Entropy: (6 Lectures)

Clausius theorem and inequality, Entropy change of irreversible process, Entropy Principle, Application of Entropy principles, entropy transfer mechanism, entropy generation in a closed and open systems, irreversibility, Third law of Thermodynamics.

MODULE 5: Properties of Substances: (7 Lectures)

Gases-Equation of state of an ideal gas, Specific heats, Internal energy, Enthalpy and Entropy change of ideal gas, Analysis of isochoric, isobaric, isothermal, isentropic, isenthalpic processes, representation of the above processes on P-v, T-s planes, Determination of work, heat, entropy and enthalpy changes during the above processes, Equation of state of Real Gases, Principle of corresponding state, Compressibility Factor. Maxwell relation, specific heat relations, relations for changes in internal energy, enthalpy and entropy, Clapeyron equation.

MODULE 6: Steam and Vapour cycle: (6 Lectures)

Phase transformation, Definition of sensible heat, Latent heat, Saturation temperature, generation of steam, quality of steam, concept of enthalpy of different steam, p-v and T-s diagrams, use of steam

tables and Mollier chart, Vapour Cycle (Rankine cycle), its application, methods used to improve Rankine cycle efficiency.

MODULE 7: Exergy Analysis: (7 Lectures)

Concept of exergy, Irreversibility, exergy balance, exergy transfer accompanying heat, exergy transfer accompanying work, flow exergy, exergy balance for control volume, Exergetic efficiency, Exergetic efficiencies of common components: turbines, pumps, nozzles etc.

Text Books:

1. Engineering Thermodynamics: P.K. Nag, McGraw Hill Publications, 6th edition 2017
2. Thermodynamics – An Engineering Approach: Cengel and Boles, Tata McGraw Hill Publications, 8th edition 2017
3. Thermal Engineering: R. K. Rajput, Laxmi Publications Ltd. 6th edition 2016
4. A Course in Thermal Engineering: S. Domkundwar, C.P. Kothandaraman, Anand Domkundwar, Dhanpat Rai and Co. 2017
5. Refrigeration and Air Conditioning: C.P. Arora, Tata McGraw Hill, 3rd edition 2017
6. A Textbook of Refrigeration & Air condition: R.S.Khurmi, S. Chand, 2019
7. Refrigeration and Air Conditioning: W.F. Stoecker and J.F. Jones, McGraw Hill International Edition, 2nd edition

Course Code	Course Title	Hours per week L-T-P	Credit C
ME241302	Theory of Machines	3-0-2	4

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

- **CO1:** Understand the principles of kinematic analysis and mobility in mechanisms to assess their motion characteristics.
- **CO2:** Analyze the role of friction in mechanical systems like clutch, brakes, belt and chain drive.
- **CO3:** Apply gearing principles to optimize motion control, power transmission efficiency, and system performance.
- **CO4:** Analyze cam-follower mechanisms to generate precise motion profiles, ensuring smooth and controlled mechanical movement.
- **CO5:** Analyze energy variations in rotating systems using turning moment diagrams and assess the role of flywheels in regulating speed fluctuations and ensuring operational stability.

MODULE 1: Fundamentals of Mechanism: (10 Lectures)

Definitions and types of kinematic joints, links, and pairs with illustration; kinematic chain & mechanism, different inversions of four bar chain, single slider and double slider crank chains & their applications; test for 4-bar mechanism by Grashoff's law, DOF, Kutzbach mobility criterion for planar and spatial mechanism, types and method for locating instantaneous center, analysis of reciprocating engine and four bar chain by instantaneous center method, Kennedy theorem.

MODULE 2: Friction & Friction Drives: (8 Lectures)

Types of friction, uniform pressure and uniform wear, friction clutches, rolling friction, flat belt, V belt and rope drives; velocity ratio in belt drives, law of belting, ratio of friction tensions in belts, power transmitted by belts and ropes, maximum power transmission by belt, chain drive; braking mechanisms, block and shoe brake, band brake, internal expanding shoe brake; absorption and transmission dynamometers.

MODULE 3: Gear and Gear Trains: (8 Lectures)

Classifications, definitions of terms used in gears, law of gearing, velocity of sliding, forms of teeth, length of path & arc of contacts, interference, minimum number of teeth required on pinion & wheel to avoid interference; simple, compound, reverted, and epicyclic gear trains; algebraic and tabular methods to find velocity ratios of gear trains, sun and planet gear, torques and tooth loads in epicyclic gear train, compound epicyclic gear train with bevel gear.

MODULE 4: Cam and Follower: (8 Lectures)

Definition and function of cam & followers, cam terminologies and profile, types of follower motions: uniform velocity motion, simple harmonic motion, uniform acceleration & retardation motion, cycloidal motion, any type of desired motion; displacement, velocity, and acceleration diagrams, cam profile construction with different followers having different motions and their applications; cam with specified contours.

MODULE 5: Flywheel and Turning Moment Diagram: (8 Lectures)

Turning moment diagrams for different types of engines, fluctuations of energy and speed of crank shaft, co-efficient of fluctuations of energy and speed, flywheels, dimensions of flywheel, operation of flywheel in punching press.

Text Books/References:

1. Theory of Machines: Dr. R.K. Bansal & Dr. J.S. Brar, Laxmi Publications(P) Ltd. 5th edition, 2016
2. Theory of Machines: Ratan S.S, McGraw Hill Education, 4th edition, 2017
3. Theory of Machines and Mechanisms: Prof. P. L. Ballaney, Khanna Publishers, 25th edition, 2014
4. Theory of Machines: Sadhu Singh, Pearson Education India, 3rd edition, 2011

Course Code	Course Title	Hours per week L-T-P	Credit C
ME241303	**Machine Tools and Metal Cutting**	**3-0-0**	**3**

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

- **CO1:** Analyze the working principles, classifications, and machining parameters of conventional and semi-automatic machines (lathe, shaper, planer, slotting, drilling, milling, and broaching) to determine their suitability for various manufacturing applications.
- **CO2:** Evaluate the mechanics of metal cutting, including chip formation, cutting forces, tool wear, and machinability, to enhance tool life and improve machining efficiency.
- **CO3:** Design work-holding and tool-holding devices such as jigs, fixtures, and indexing mechanisms, and develop CNC programs for precision machining.
- **CO4:** Compare various gear and thread manufacturing methods along with advanced machining and surface finishing techniques to achieve the desired dimensional accuracy and surface quality.
- **CO5:** Develop an optimal machining strategy by selecting appropriate cutting tools, cutting fluids, and machining parameters while considering economic and technical feasibility in manufacturing operations.

MODULE 1: (6 Lectures)

(a) Lathe: Lathe- Functions, Classification and Specification, Different parts, Drive mechanisms for speed, feed, depth of cut, Taper turning, Machining time. Lathe Accessories and Attachments.

(b) Semi-Automatics: Capstan and Turret lathes – Different parts – Tools —Work and Tool holding devices. Indexing and Bar Feeding Mechanisms. Tool layout and Tool Schedule chart.

MODULE 2: Shaper, Planer, Slotting & Broaching Operations (6 Lectures)

Shaper - Function, Classification and Specification – Quick return and feed mechanisms – Shaper operations – Cutting speed and Machining time calculations.

Planer - Function, Specification Table drives and feed mechanism

Broaching: Purpose, broaching tool and machine,

Slotting machine: Purpose, slotting tool and machine.

MODULE 3: Drilling, Manufacturing of threads and gears (6 Lectures)

Drilling machines – Classification – specifications – Parts drilling machine – spindle drive mechanisms – tool and work holding devices for operation, Types of drills and tool in hand nomenclature, Drill size and designation of drills.

Deep hole drilling, Introduction to reaming and tapping

Threads manufacturing – Different methods – Casting, Thread Chasing, Thread Rolling, Die and Tapping, Milling and grinding.

Gear manufacturing - Different Methods – Casting, Forming and Metal removal. Gear Cutting and Gear Generation Processes. Gear Finishing Operations.

MODULE 4: Milling (5 Lectures)

Introduction – Classification – Specifications - Principal parts of a milling machine. Elements of a milling cutter, milling processes – Up-milling – Down milling – Face milling – End milling. Cutting Speed, Feed and Depth of Cut – Machining Time. Indexing and Dividing Head

MODULE 5: Grinding and Surface Finishing (5 Lectures)

Grinding: Introduction – Kinds of grinding – Grinding Processes – Centreless Grinders – Surface Grinders – Tool and Cutter Grinder – Specifications. Grinding Wheel – Composition and specification. Selection of Grinding Wheel. Dressing, and Truing of grinding Wheel.

Surface Finishing**:** Introduction – Classification – Principle and Operations of Lapping, Honing, Super finishing, Polishing, Buffing, Tumbling and Burnishing.

MODULE 6: Cutting Tool Specification and Mechanics (8 Lectures)

Single point cutting tools – Reference planes – System of axes. Tool specifications – ASA & ORS systems Mechanics of metal cutting: Mechanism of chip formation – Type of chips. Orthogonal and oblique machining, Chip thickness ratio and velocity relationship, Stress, Strain and Strain rate, Merchant Theory of metal cutting, Measurement of cutting forces

Cutting variables and factors affecting them, Selection of tool angles

Tool wears and Tool life – Basic causes – Progressive tool wears – Tool life – Variables affecting tool life – Specifications and criteria for tool life. Machinability – Factors – Criterion

Tool materials and Cutting Fluids; Economics of machining.

MODULE 7: Tooling (6 Lectures)

Jigs and Fixtures – Elements of Jigs and Fixtures –Locating Methods and Devices. Clamping – Principles for Clamping, Clamping Devices. Indexing;

Basic concepts of CAD/CAM and CAPP.

Introduction to NC/CNC machines and CNC programming.

Text Books:

1. Manufacturing Science: A. Ghosh and A. K. Mallik, East West Press, 2nd edition, 2010.
2. Introduction to Machining Science : G. K. Lal, New Age International Pvt Ltd., 3rd edition 2007
3. Fundamentals of Metal Machining and Machine Tools: W. A. Knight and G. Boothroyd, CRC Press, 3rd edition 2005.
4. Metal Cutting Principles: M. C. Shaw, Oxford University Press, Second Edition, 2012
5. Nonconventional Machining: P. K. Mishra, Narosa Publishing House, 1st edition 1997
6. Fundamentals of Modern Manufacturing, Materials: M. P. Groover, Wiley India, 5th edition.

Course Code	Course Title	Hours per week L-T-P	Credit C
ME241304	**Mechanics of Materials**	**3-0-0**	**3**

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

- **CO1:** Compute principal stresses and strains and maximum shear stress using analytical and graphical methods.
- **CO2:** Solve complex problems involving bending, torsion in machine and structural elements and pressure in thin pressure vessels.
- **CO3:** Apply concepts related to strain energy, shear strain energy for various loading conditions.
- **CO4:** Analyze the shear force and bending moment for different beams with different loading.
- **CO5:** Solve problems related to the deflection of beams and the buckling of columns.

MODULE 1: Stresses and Strains: (12 Lectures)

Basic definitions and relationship, elastic constants, Poisson's ratio, thermal stresses, compound stresses and strains, state of stress at a point, general stress situation in 2D, principal stresses and planes, maximum shear stress, Mohr's circle, strain gauges and strain rosettes. Three-dimensional stress analysis, General stress systems, Transformation of stresses.

MODULE 2: Shear Force and Bending Moment in Beams: (6 Lectures)

Relationship between shear force and bending moment, calculations for various types of beams and loads, point of contraflexure, point where bending moment changes sign.

MODULE 3: Combined stresses: (12 Lectures)

Bending of beams: governing equations for bending stresses, shear stresses in beams, calculations of shear stresses, concept of shear center in beams, torsion of circular shafts: basic equation, torsional formula, torque and power relationships, shear stress and angle of twist, stresses due to combined bending and torsion of circular shafts. equivalent bending moment and equivalent twisting moment, thin-walled pressure vessels: stresses in thin cylindrical and spherical vessels, hoop and longitudinal stresses.

MODULE 4: Strain Energy: (5 Lectures)

Strain energy, shear strain energy, types of loading, energy calculations under different loading conditions.

MODULE 5: Slope and Deflection: (5 Lectures)

Beam differential equation, slope and deflection by different methods: double integration, Macaulay's, strain energy, Castigliano's first theorem.

MODULE 6: Euler's Theory of Columns: (5 Lectures)

Critical load, buckling load for columns, end conditions: pinned, fixed, and others, Euler's curve, buckling behavior of columns.

Text Books:

1. Mechanics of Materials: R. C. Hibbeler, Pearson, 10th edition 2016
2. A Textbook of Strength of Materials: R. K. Bansal, Laxmi Publication (P) Ltd., 6th edition 2018
3. Fundamentals of Strength of Materials: Debabrata Nag and Abhijit Chanda, Wiley India Pvt Ltd., 2nd edition 2010
4. Strength of Materials: S. Ramamrutham and R. Narayanan, Dhanpat Rai Publishing Company 20th edition 2020
5. Mechanics of Materials: E. P. Popov, Pearson Education India, 2nd edition 2015

6. Elements of Strength of Materials: S. P. Timoshenko, CBS Publishers and Distributors Pvt. LTD, 3rd edition 2021
7. Strength of Materials: R. Subramanian, Oxford University Press, 2nd edition 2010
8. Advanced Mechanics of Solids: L. Srinath, McGraw Hill Education, 3rd edition 2017

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)

- Definition, scope, and significance of IKS
- Sources of Indian knowledge: Vedas, Upanishads, Puranas, Smritis, and other texts
- 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
ME241318	**Programming in Python Lab**	**0-0-2**	**1**

Prerequisites: C- Programming

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

- **CO1**: Apply basic building blocks of python programming.
- **CO2**: Develop Python programs using control structures, functions, and data structures to solve real-world problems.
- **CO3:** Implement basics concepts of object-oriented programming using Python programs.
- **CO4:** Design and develop interactive graphical user interfaces (GUIs) using Python GUI libraries to create applications and simple games

MODULE 1: Introduction: (4 Lectures)

Introduction to importance of IDEs like Spyder (Anaconda)/PyCharm for professional programming, explore Python shell as a calculator and for inputting Python expressions directly, HelloWorld program in Python script, Python keyword and Identifiers, Indentation, Comments, Data Types in. Operators in Python: comparison, arithmetic, logical, Boolean, bitwise, assignment. Python: numbers, list, tuple, strings, set, dictionary, conversion between various data types.

MODULE 2: Basic Construct: (4 Lectures)

Input and Output in Python, if-else, for loop, while loop, break, pass, continue, creating Functions, functions with arguments, returning values form functions, lambda expressions, recursion, global and local variables, Importing other modules/packages and using their functions, creating random numbers/random-choice to create programs for simple guessing games like Rock –Paper-Scissors. Problems on 1D/2D/3D arrays using list. Problem solving using dictionary as look-up table.

MODULE 3: Object Oriented Programming: (4 Lectures)

Basics of Object-oriented programming: Class and Object. Defining variables and functions inside class. Creating objects, Inheritance, Multiple and Multi Level Inheritance, Function over-riding, the concept of composing objects of a different class in an object, problems on object composition

MODULE 4: GUI creation in Python: (Basic Concept) (6 Lectures)

GUI creation using Python's de-facto GUI package like tkinter or alternative packages like: wxPython, PyQt (PySide), Pygame, Pyglet, and PyGTK. Creating labels, buttons, entry (textbox), combobox, checkbutton, radiobutton, scrolledText (textarea), spinbox, progressbar, menubar, filedialog, tabs etc. Creating GUI simple games like Tic-Tac-Toe.

Text Books:

1. Think Python 2nd Edition - How to Think Like a Computer Scientist: Allen B Downey, O'Reilly publication, 2nd edition 2016
2. Learn Python 3 the Hard Way: Zed A. Shaw, Addison-Wesley, 3rd edition 2017
3. Head First Programming: A Learner's Guide to Programming using the Python Language: Paul Barry David Griffiths Barry Griffiths, O'Reilly publication, 1st edition 2009
4. Dive into Python 3: Mark Pilgrim, Apress publication, 2nd edition 2009

Course Code	Course Title	Hours per week L-T-P	Credit C
ME241314	**Mechanics of Materials Lab**	**0-0-2**	**1**

Course Outcome:

After completing this course, the students will

- **CO1:** Compute elongation, maximum stress, breaking stress, % age of reduction of area of the given specimen by using Universal Testing Machine.
- **CO2:** Compute the Modulus of Rigidity, Breaking Torque and Ultimate Shear Stress of a mild steel specimen by conducting Torsion Test.
- **CO3:** Compute the shear force and bending moment at any section of the simply supported beam.
- **CO4**: Compute the deflection and bending stress of simply supported subjected to concentrated load at the center.
- **CO5**: Verify the Euler buckling equation for steel columns of various lengths subjected to different end conditions.

MODULE 1: Torsion Test: (4 Lectures)

To determine Modulus of Rigidity (C), Breaking Torque (T) and Ultimate Shear Stress (τ) of a mild steel specimen by conducting Torsion Test.

MODULE 2: Tension Test: (4 Lectures)

To determine Elongation, Maximum stress, Breaking stress, % age of reduction of area of the given specimen.

MODULE 3: Shearing Force and Bending Moment: (4 Lectures)

To determine the shear force and bending moment at any section of the simply supported beam

MODULE 4: Deflection of Beams: (4 Lectures)

To determine the deflection and bending stress of simply supported subjected to concentrated load at the center.

MODULE 5: Buckling of Columns: (4 Lectures)

To verify the Euler buckling equation for steel columns of various lengths subjected to different end conditions.

Text Books:

1. A Textbook of Strength of Materials: R. K. Bansal, Laxmi Publication (P) Ltd., 6th edition 2018
2. Fundamentals of Strength of Materials: Debabrata Nag and Abhijit Chanda, Wiley India Pvt Ltd. 2nd edition 2010.

Course Code	Course Title	Hours per week L-T-P	Credit C
ME241319	**Machine Shop**	**0-0-2**	**1**

Course outcomes:

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

- **CO1:** Practice various turning operations on the given Mild Steel Work piece.
- **CO2:** Practice shaping operation on a given casted rectangular blank.
- **CO3:** Operate Milling Machine for gear cutting and understanding indexing principles.
- **CO4:** Produce a butt joint and lap joint with mild steel strip using Arc Welding.

MODULE 1: **(4 Lectures)**

To perform various turning operations on the given Mild Steel Work piece.

MODULE 2: **(4 Lectures)**

To produce a rectangular groove on a given casted rectangular blank with the help of shaping operations.

MODULE 3: **(4 Lectures)**

To perform gear cutting operation on milling machine.

MODULE 4: **(4 Lectures)**

To prepare a butt joint and lap joint with mild steel strip using Arc Welding.

Text Books:

1. Elements of Workshop Technology: S.K. Hajra Choudhury, Vol 2, Machine Tools Media Promoters & Pub. P Ltd, 15th edition 2016
2. Workshop Technology: Virender Narula, S.K. Kataria & Sons, 3rd edition, 2016
3. Workshop Technology: v. 2: W.A.J. Chapman, CBS Publishers, 4th edition 2007

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