

1st Semester

1st Semester	APPLIED MATHEMATICS-I FOR CSE STREAM	M26BMATS101
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Calculus	A sound understanding of higher secondary mathematics, including algebra, trigonometry, coordinate geometry and basic calculus.
2	Vector Spaces	Knowledge of matrices and systems of linear equations. Understanding of vectors in two and three dimensions. Familiarity with matrix rank and elementary linear algebra concepts. Basic knowledge of eigenvalues and eigenvectors.
3	Basic Concepts of Linear algebra:	Knowledge of matrices and determinants. Basic matrix operations (addition, multiplication, transpose). Understanding of solving simultaneous linear equations. Familiarity with elementary algebra.
4	Linear Transformations	Understanding of vector spaces, subspaces, basis and dimension. Knowledge of matrices and matrix representations. Familiarity with matrix multiplication and inverse of matrices. Basic understanding of rank, nullity and eigenvalues/eigenvectors.

2. Syllabus

Applied Mathematics-I for CSE Stream SEMESTER – I			
Course Code	M26BMATS101	CIE Marks	50
Total Number of Teaching-Learning Hours/Sem (L: T: P:TW:SL)	3:0:2:30	SEE Marks	50
		Total Marks	100
Credits	4	Exam Hours	03
Course Objectives:			
1. Apply multivariable differential calculus to analyze functions of several variables, evaluate partial derivatives, Jacobians, Taylor series expansions and solve optimization problems involving maxima and minima. 2. Understand vector calculus concepts including gradient, divergence, curl and coordinate systems and apply them to solve engineering and physical science problems. 3. Solve systems of linear equations using matrix methods, determine eigenvalues and eigenvectors perform matrix diagonalization and apply these techniques to engineering applications. 4. Analyze and represent linear transformations using matrices, determine rank and nullity verify invertibility and apply the Rank–Nullity Theorem.			
Module -1			
Calculus: Partial differentiation, Total derivative, differentiation of composite functions, Jacobian, Statement of Taylor's and Maclaurin's series expansion for two variables. Maxima and minima for the function of two variables.			
Module -2			
Vector Calculus: Scalar and vector fields, Gradient, Directional derivatives, Divergence and Curl - physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential. Introduction to polar coordinates and polar curves (No problems). Curvilinear Coordinates: Scale factors, Base vectors, Cylindrical polar coordinates, Spherical polar coordinates, Transformation between Cartesian and curvilinear systems, orthogonality.			
Module -3			
System of Linear Equation, Eigen values and Eigenvector: Elementary row transformation of a matrix, Echelon form, Rank of a matrix. Consistency and solution of system of linear equations: Gauss elimination method, Gauss Jordan method. Eigenvalues and Eigenvectors, Diagonalization of the matrix, Modal matrix. Applications: Traffic flow and Chemical balance equation.			
Module -4			

Vector Space: Definition and examples subspace: Definition and examples. Linear Combinations, linear span, linearly independent and dependent sets, Basis and Dimension, row space and column space of a matrix, Coordinates vector, inner products and orthogonality.
Module -5
Linear Transformation: Definition and examples, algebra of linear transformations, matrix of a linear transformation. Singular, non-singular linear transformations and invertible linear transformations. Rank and nullity of linear transformations, Rank-Nullity theorem
List of Laboratory experiments (2 hours/week per batch)
1. Drone Battery Optimization using Partial Derivatives and Jacobian: SkyDeliver Pvt. Ltd. is testing delivery drones. Flight time depends on payload and battery temperature. Engineers want to identify which factor most affects flight time and use Jacobian for sensor calibration.
2. Smart Bridge Monitoring using Taylor and Maclaurin Series. A smart bridge uses sensors to monitor vibrations. For small vibrations, exact computations are expensive, so engineers approximate displacement using Taylor series.
3. Smart City Air Pollution Analysis using Gradient, Divergence and Curl. Environmental engineers monitor pollution concentration and wind flow to identify pollution hotspots and circulation
4. Smart Traffic Management using Gauss Elimination Method. A smart city monitors vehicles entering and leaving three interconnected road junctions. Engineers must determine the traffic volume at each junction to optimize signal timings.
5. Analyzing Orthogonality and Signal Similarity Using Inner Products A communication system receives two digital signals represented by vectors S_1 and S_2 . Engineers compute their inner product $S_1 \cdot S_2$, showing that the signals are orthogonal and can be separated with minimal interference.
6. Earthquake Resistant Building Analysis using Eigenvalues and Eigenvectors. Structural engineers analyze a two-storey building to study its vibration characteristics during earthquakes. Eigenvalues indicate natural frequencies, while eigenvectors describe vibration modes.
7. AI Feature Selection using Linear Independence. A healthcare company is developing an AI model to predict diabetes. Patient attributes include Age, BMI, Glucose Level and Cholesterol. Before training the model, engineers must remove redundant features to reduce computation and improve accuracy. Linear algebra helps determine whether the feature vectors are linearly independent.
8. Medical Image Compression using Basis and Dimension. A hospital stores thousands of MRI and CT scan images every day. These images occupy significant storage. Engineers use linear algebra to represent image data using a minimum number of basis vectors, reducing storage while preserving important information.
9. Computer Graphics using Linear Transformations. A game development company is designing a 2D graphics engine. Every image displayed on the screen undergoes rotation, scaling or reflection. Engineers use transformation matrices to perform these operations efficiently.
10. Data Compression and Communication Systems using Rank–Nullity Theorem. A communication company encodes digital messages before transmission. Engineers analyze the encoding matrix to determine how much information is retained and how much redundancy exists.
Suggested software: Mathematica/MatLab/Python/Scilab
TEXTBOOKS: 1. B. S. Grewal, “Higher Engineering Mathematics”, Khanna publishers, 45th Ed.2025. 2. E. Kreyszig: “Advanced Engineering Mathematics”, John Wiley & Sons, 10th Ed. (Reprint), 2018. 3. Seymour Lipschutz and Marc Lipson, Linear Algebra, Schaum’s outlines series, 4th Ed., 2008.

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding the concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course with 4 credits including Practical Component**

Components			Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)		3	60%	20	08
2	Alternate Assessment (B)		2	40%	10	---
3	Practical Component (C)	Conduction & Record	1	60%	12	5
		Project Work	1	40%	08	---
	Total Marks				50	20

Final CIE Marks = A + B + C**A** = Average of best two Test marks**B** = Average of two Alternate Assessment marks**C** = Sum of Lab Conduction and project work

Self-Learning (SL): The teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The faculty must collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE) For Theory Course with 3 or 4 credits

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BMATS101.1	Apply the concepts of multivariable calculus, vector calculus, curvilinear coordinate systems, and Taylor's series to analyze and solve engineering problems involving optimization, vector fields, and coordinate transformations.
M26BMATS101.2	Analyze systems of linear equations, vector spaces, eigenvalue problems, and linear transformations using matrix methods to solve engineering applications such as traffic flow, chemical balancing, and related mathematical models.

M26BMATS101.3	Analyze a real-world engineering problem, develop an appropriate mathematical model using concepts learned in the course, implement the solution using suitable software/tools, and interpret the results.
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CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BMATS101.1	3	3	-	-	-	-	-	-	-	-	-
M26BMATS101.2	3	3	-	-	-	-	-	-	-	-	-
M26BMATS101.3	-	-	-	-	3	-	-	-	-	-	-
M26BMATS101	3	3	-	-	3	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 7: Affordable and Clean Energy,	Provides tools for analysing fluid flow, electromagnetic fields, heat transfer, weather prediction, renewable energy systems, and environmental engineering.
2	SDG 9: Industry, Innovation and Infrastructure	Builds the mathematical foundation for data science, machine learning, signal processing, communications, and advanced engineering applications.
3	SDG 13: Climate Action	Develops mathematical modelling and optimisation techniques used in engineering design, resource optimisation, climate modelling, and scientific research.

1st / 2nd Semester	Basic Science APPLIED PHYSICS FOR CSE STREAM	M26BPHYS102/ 202
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Optics	Geometrical optics, physical optics, Snell's law, total internal reflection, wave-particle duality.
2	Mathematics	Matrices, calculus, linear algebra, differential equations, complex numbers, probability theory.
3	Fundamental Electronics Knowledge	Basic digital logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR), Boolean algebra, circuit analysis basics.
4	Basics of Electrical Conductivity	Properties of solids, semiconductor physics, electronic band structure, phonons, basics of superconductivity.
5	Basic Principles of Physics	Laws of motion, kinematics, dynamics, electromagnetism, energy conservation, introductory quantum mechanics.

2. Syllabus

Applied Physics for CSE Stream			
Course Code	M26BPHYS102/202	CIE Marks	50
Total Number of Teaching-Learning Hours/Sem (L: T: P:TW:SL)	02:02:0: 20:00 = 84 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives The course aims to: 1. Develop a strong foundation in Quantum mechanics by introducing wave-particle duality, Schrödinger wave equation, and Quantum behavior of particles. 2. Provide knowledge of LASER and Optical fiber technologies, emphasizing the principles of Laser operation, light propagation, Fiber Optics, and their applications in communication systems. 3. Introduce the Physics underlying animation and integrated circuit fabrication, enabling students to understand motion analysis, animation principles, and basic semiconductor manufacturing processes. 4. Familiarize students with the fundamentals of Quantum information and Quantum computing, including Qubits, matrix formalism, Quantum states, and Quantum gate operations. 5. Develop an understanding of superconductivity and magnetic materials, highlighting their physical principles, engineering characteristics, and applications in Quantum computing, data storage, and modern electronic devices.			
Module 1: Quantum Mechanics			
Dual nature of radiation and de Broglie Hypothesis, de-Broglie wavelength of an accelerated electron; Heisenberg's Uncertainty Principle and its application: Nonexistence of electron inside the nucleus-non-relativistic and Proof of transfer of energy from radiation to matter and vice-versa; Wave Function, Physical Significance and properties; Eigen functions and Eigen Values, Time independent Schrödinger wave equation, and its application: Particle inside one-dimensional infinite potential well, Probability density and waveforms, one-dimensional Step potential; Numerical Problems.			
Module 2: Lasers and Optical fibres			
LASER: Characteristics of a LASER beam, Interaction of Radiation with Matter, Einstein's A and B Coefficients, Expression for Energy Density, Population Inversion, Metastable State, Requisites of a laser system, He-Ne laser, Semiconductor Diode Laser, Applications: Bar code scanner, Laser Printer, Numerical Problems.			
Optical Fiber: Principle and Structure, Propagation of Light, Acceptance angle and Numerical Aperture (NA), Derivation of Expression for NA, Modes of Propagation, RI Profile, Classification of Optical Fibers, Attenuation and Fiber Losses, Dispersion, Applications: Fiber Optic networking, Bandwidth Calculation of an Optical fibre. Numerical Problems.			

Module -3: IC fabrication and Physics of Animation

Fabrication of basic Chip for IC's: Introduction- General steps for IC fabrications, Layering: wet oxidation, dry oxidation, Methods of deposition: Physical Vapour Deposition (PVD), Chemical vapour Deposition (CVD), Plasma Enhanced CVD (PECVD), Atmospheric Pressure Chemical Vapor Deposition (APCVD), Patterning: Oxide removal processing, Methodology of etching, Process of diffusion of dopant.

Physics of Animation: Concept of motions in animation, Frames and Frames per Second, Timing and spacing in Animations, Size and Scale, Weight and Strength, Constant Force and Acceleration, Odd rule, Odd-rule Scenarios – Odd rule multipliers with examples, Motion Graphs, Examples of Character Animation: Jumping, Parts of Jump, Jump Magnification, Stop Time, Walking: Strides and Steps, Numerical Problems.

Module 4: Quantum Computing**Principles of Quantum Information & Quantum Computing:**

Introduction to Quantum Computing, Moore's law & its end, Differences between Classical & Quantum computing. Quantum Entanglement and superposition.

Dirac representation and Qubits: Dirac notations (Bra- $\langle |$ and ket- $| \rangle$), Concept of qubit and its properties. Single and Two qubits. Extension to N qubits, Representation of qubit using Bloch sphere.

Matrix operation: Matrix representation of $|0\rangle$ and $|1\rangle$ states, Conjugate of a matrix, Transpose of a matrix. Unitary matrix (U), Row and Column Matrices, Inner Product, Identity Operator (I), Applying I to $|0\rangle$ and $|1\rangle$ states, Pauli Matrices and its operations on $|0\rangle$ and $|1\rangle$ states, Normalization rule, Orthogonality, Orthonormality and Probability of Quantum states.

Quantum Gates: Single Qubit Gates: Quantum Not Gate, Pauli – X, Y and Z Gates, Hadamard Gate, Phase Gate (or S Gate), T Gate.

Multiple Qubit Gates: Controlled Qubit and Target Qubit, Controlled NOT (C-NOT) Gate, Swap gate, Controlled Z gate, Toffoli gate (CC-NOT). Numerical Problems.

Module 5: Superconductivity and Magnetic materials

Superconductivity: Introduction to Superconductors, Temperature dependence of resistivity, Meissner's Effect, Critical Field, Temperature dependence of Critical field, Types of Super Conductors, BCS theory, Josephson Junction, SQUID, Applications in Quantum Computing: Charge, Phase and Flux qubits, Numerical Problems.

Classification of Magnetic Materials: Diamagnetic, Paramagnetic and Ferromagnetic materials, Soft and Hard Magnetic Materials.

Applications of Magnetic Materials: Recording: History of recording, Magnetic recording Media, recording head and recording Process, Numerical problems.

TEXTBOOKS:

1. Gupta and Gaur, Engineering Physics, (Reprint), Dhanpat Rai Publications, 2016.
2. C L Arora and Dr. P S Hemne, Physics for degree students- 1st, 2nd and 3rd year, (Reprint), S Chand and Company Ltd.
3. B. D. Cullity, C. D. Graham, Introduction to Magnetic Materials, second edition, Published by John Wiley & Sons, Inc., Hoboken, New Jersey, 2009.
4. Micheal A Nielsen and Isaac L Chuang, Quantum computation and Quantum Information, Reprint 2022, Cambridge University Press.

REFERENCE BOOKS:

1. Chris Bernhard, Quantum computing for Everyone, Reprint 2020, MIT Press.
2. Michele Bousque, "Physics for Animators", first edition 2015, CRC Press.
3. Quantum Mechanics concepts and applications, second edition, Published by Nouredine Zettili
4. B. D. Cullity, C. D. Graham, Introduction to Magnetic Materials, second edition, Published by John Wiley & Sons, Inc., Hoboken, New Jersey, 2009

VIDEO LINKS:

https://onlinecourses.nptel.ac.in/noc25_cs95/preview

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Chalk & Talk / PPT Presentations	Clear explanation of theoretical concepts using diagrams, equations, and real-life examples.
2	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
3	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of Verilog concepts.

4	Collaborative Learning	Encourage collaborative learning for improved competency application.
5	Numerical Problem Solving	Step-by-step solving of problems related to lasers, quantum mechanics, and electrical properties.
6	Interactive Discussions	Encourage students to ask questions and participate in discussions to reinforce conceptual clarity.
7	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE) for Theory Course with 3 credits

Components		Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
Total Marks				50	20

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Self-Learning (SL): If applicable, the teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The faculty must collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE) For Theory Course with 3 credits.

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice.
3. The questions from Module 2 and 3 will not have any choice.
4. Each of the question will have a maximum of two sub questions.
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
CO1	Explain the fundamental principles of Lasers, Optical fibres, Quantum physics & Computing, Superconductivity and physics of animation.
CO2	Apply the principles of Lasers, Optical fibres, Quantum physics & computing, conduction of materials, Superconductivity and Physics of Animation in engineering purview.
CO3	Analyse the characteristics of conductors, superconductors, Magnetic materials, Optical fibres, Quantum physics & Quantum computing for device applications.

CO-PO-Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3										
CO2	3										
CO3		2									
Average of CO'S	3	2									

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 3: Quality education	"Quality education in Quantum computing it's about preparing a generation to responsibly shape the future of technology."
2	SDG 9: Industry, Innovation and Infrastructure	Promoting Innovation for Future Solutions, In the field of Quantum computation, delivering quality education is critical to prepare a future-ready workforce, promote innovation, and ensure ethical and equitable access to transformative technologies.
3	SDG 8: Decent Work and Economic Growth	Optical fibre infrastructure supports economic efficiency, global connectivity and scalable enterprise growth.

1st/2nd Semester	Professional Course (PC) PRINCIPLES OF PROGRAMMING USING C	M26BECS103/203
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic computer Skills	Understanding how to use a computer, navigate file systems, and perform basic tasks like creating, editing, and saving files.
2	Logical Thinking	Ability to think logically and analytically, which is crucial for understanding algorithms and problem-solving in programming.
3	Understanding of Algorithms	Familiarity with what algorithms are and their role in solving problems efficiently.
4	Basic Modular Arithmetic	Basic Number Theory: Understanding of integers, prime numbers, Algebra Proficiency in algebraic manipulations and understanding of congruence relations.
5	Problem-Solving Skills	Ability to break down complex problems into smaller, manageable parts and develop step-by-step solutions

2. Syllabus

PRINCIPLES OF PROGRAMMING USING C SEMESTER – I/II			
Course Code	M26BCS103/203	CIE Marks	50
Number of Lecture Hours/Week (L:T: P: S:TW:SL)	32:32:0:0:20:0=84Hrs	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives: This course will enable students to: 1. Elucidate the basic architecture and functionalities of a Computer. 2. Apply programming constructs of C language to solve real-world problems. 3. Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems. 4. Design and Develop Solutions to problems using structured programming constructs such as functions and procedures. 5. Develop a mini project applying the concepts of C programming (arrays, strings, functions, pointers, structures and file handling) to build a small, working application.			
Module -1			
Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C. Textbook: Chapter 1.1-1.7, 2.1- 2.2, 2.3.1-2.3.2. 8.1 - 8.6, 9.1-9.14			
Module -2			
Operators in C, Type conversion and typecasting. Decision control and Looping statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement. Textbook: Chapter 9.15-9.16, 10.1-10.6			
Module -3			
Functions: Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions. Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions, Two dimensional arrays, operations on two- dimensional arrays, two dimensional arrays to functions, applications of arrays. Textbook: Chapter 11.1-11.10, 12.1-12.9			

Module -4	
Strings: Introduction, string taxonomy, operations on strings, (length, uppercase, lowercase, concatenate, appending, compare, reverse) Miscellaneous string and character functions, arrays of strings. Pointers: Understanding computer's Memory, Introduction to pointers, declaring pointer variables, Pointer Expressions and Pointer arithmetic, Null Pointers, Generic pointers, passing arguments to functions using pointers. Textbook: Chapter 13.1, 13.3-13.6, 14-14.7	
Module -5	
Structure, Union, and Enumerated Data Type: Introduction, structures and functions, Unions, unions inside structures, Enumerated data type. Files: Introduction to files, using files in C, reading and writing data files. Detecting end of file. Textbook: Chapter 15.1-15.3 , 15.6- 15.10, 16.1-16.5	
Mini Project Students, in batches of 1-3, shall design and develop a small console-based C application that integrates concepts from at least three modules (e.g., functions, arrays/strings, pointers, structures/unions, file handling). The project shall be accompanied by a report covering problem statement, design, code, sample output and a viva-voce/demo	
Textbooks: 1. Computer fundamentals and programming in c, "Reema Thareja", Oxford University, 3rd edition. Reference Books: 1. E. Balaguruswamy, Programming in ANSI C, 8th Edition, Tata McGraw-Hill. 2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, , 2nd Edition ,Prentice Hall of India VIDEO LINKS: https://nptel.ac.in/courses/106104128	
Illustrative Mini Project Ideas (Students May Choose Other Relevant Topics)	
Mini projects are to be executed in teams of 1–3 students over the last 3–4 weeks of the semester, with a project report and a live demonstration for evaluation. Mini Project 1: Student Grade Management System Build a menu-driven C program that uses an array of Student structures (name, roll number, marks in 3 subjects) to add, display, and compute the total, average, and grade for each student, using functions for each operation, and stores the records in a file for persistence. Mini Project 2: Personal Contact Book (Phonebook) Manager Develop a C program that maintains a contact book as an array of structures (name, phone number, email), supporting add, search by name using string functions, update, delete, and saving/loading contacts from a file. Mini Project 3: Library Book Catalogue Design a program that maintains a catalogue of books as an array of structures (title, author, book ID, availability status), supporting search by title/author, issue/return operations, and storing the catalogue to a file so records persist between runs. Mini Project 4: Matrix Operations Toolkit Create a menu-driven C program that performs addition, subtraction, multiplication, and transpose of two-dimensional arrays (matrices), with each operation implemented as a separate user-defined function that receives the matrices through pointers. Mini Project 5: Employee Payroll Processor Build a C program that uses an array of Employee structures (ID, name, basic pay, allowances deductions) to compute net salary for each employee via functions, and reads employee data from, and writes the payroll summary to, a file.	

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of Programming concepts.

3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Higher Order Thinking (HOTS) Questions:	Pose HOTS questions to stimulate critical thinking related to each competency.
5	Problem-Based Learning (PBL)	Implement PBL to enhance analytical skills and practical application of competencies
6	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
7	Programming Assignments	Assign programming tasks to reinforce practical skills associated with competencies.
8	Mini Project	Guide students through a small team-based application project to consolidate and apply concepts learnt across modules.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course with 3 credits**

Components		Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
Total Marks				50	20

Final CIE Marks = (A) + (B)**A** = Average of best two Test marks**B** = Average of two Alternate Assessment marks**Semester End Examination (SEE) For Theory Course with 3 or 4 credits**

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BECS103/203.1	Apply the basic knowledge of computer hardware, functionalities of a computer to develop Simple C Programs.
M26BECS103/203.2	Identify the appropriate operators, Branching and Looping constructs of C language to solve the real-world problem.
M26BECS103/203.3	Utilizing the Modularity of functions to implement arrays and strings to perform data Manipulation to inscribe the Application.
M26BECS103/203.4	Apply pointers, structures, unions in C programming to develop Application that efficiently manage, manipulate the data and implement file handling operations.
M26BECS103/203.5	Design, develop and demonstrate a mini project by integrating C programming constructs (functions, arrays, strings, pointers, structures/unions and file handling) to solve a real-world problem.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
M26BECS103/203.1	3	-	-	-	-	-	-	-	-	-	-	3	-
M26BECS103/203.2	-	3	-	-	-	-	-	-	-	-	-	-	3
M26BECS103/203.3	-	-	3	3	-	-	-	-	-	-	-	3	-
M26BECS103/203.4	-	-	-	3	-	-	-	-	-	-	-	-	3

M26BECS103/203.5	-	-	3	-	-	-	-	-	-	-	-	3	3
M26BECS103/203	3	3	3	3	-	-	-	-	-	-	-	3	3

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	The course builds critical computational and analytical thinking skills, empowering students with lifelong learning tools in computer science. Promotes technical education and employability
2	SDG 8: Decent Work and Economic Growth	By equipping students with key programming and problem-solving skills, the course enhances career opportunities in IT and software sectors, contributing to economic growth.
3	SDG 9: Industry, Innovation and Infrastructure	Programming using C forms the backbone of modern technology and software infrastructure. The course fosters innovation and prepares students for building efficient, scalable digital systems, reinforced through the hands-on mini project.

1st /2nd Semester	Engineering Science Course (ESC) INTRODUCTION TO CIVIL ENGINEERING	M26BESK104A/ 204A
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Science and Mathematics	Knowledge of basic physics (mechanics, forces) and mathematics (algebra, geometry).
2	Environmental Awareness	Basic knowledge of pollution, sanitation, and sustainable issues.
3	Engineering Drawing and Visualization	Knowledge of sketches, visualization of shapes, sections and projections of buildings.
4	Logical Reasoning and Spatial Ability	Skill to understand space, balance, and visualize structures and forces.

2. Syllabus

Introduction to Civil Engineering SEMESTER – I/II			
Course Code		CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	2:2:0: 20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
1. Explore Civil Engineering scope, materials, and building components aligned with Sustainable Development Goals. 2. Apply fundamental concepts of force systems, equilibrium, and free-body diagrams in basic structural analysis. 3. Calculate and locate centroid of simple and built-up sections for structural applications. 4. Calculate moment of inertia of simple and built-up sections for structural applications.			
Module -1			
Introduction: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics and Water Resources Engineering, Transportation Engineering, Environmental Engineering. Basic Materials of Construction: Bricks, cement, steel, concrete and mortar. Building components: substructure and super-structure components. Introduction to sustainable development goals. Infrastructure: types of infrastructure Activity: Identification and classification of common building materials, structural components, and Civil Engineering disciplines through observation and group discussion.			
Module -2			
Concurrent force systems: Concept of idealization, system of forces, Resolution and composition of forces, Law of Parallelogram of forces, principle of transmissibility, Resultant of concurrent force systems, free body diagram, types of forces, Lami's theorem, equations of equilibrium. Force Board Activity: Experimental determination of the resultant and equilibrium of concurrent force systems using a force board or graphical vector method			
Module -3			
Non-concurrent force systems: Resultant of non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, types of loads and supports, equilibrium of non-concurrent coplanar force systems. Moment Balance Activity: Verification of the principle of moments and equilibrium of non-concurrent force systems using a simple balance setup			
Module - 4			
Centroid: Introduction, centre of gravity, centroid, axis of symmetry, locating the centroid of plane lamina and composite figures from first principles and Numerical examples. Paper Cut-Out Activity: Experimental determination of the centroid of plane lamina using the suspension (plumb line) method and comparison with analytical results.			

Module -5

Moment of inertia: Introduction, method of determining the second moment of area of plane sections from first principles, parallel axis and perpendicular axis theorem, radius of gyration, polar moment of inertia, moment of inertia of built-up sections and numerical examples.

Section Comparison Activity: Comparative study of the bending behaviour of different cross-sections to demonstrate the influence of moment of inertia on structural stiffness.

TEXTBOOKS

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

REFERENCE BOOKS

1. Beer F.P. and Johnston E. R., *Mechanics for Engineers, Statics and Dynamics*, 1987, McGraw Hill.
2. Irving H. Shames, *Engineering Mechanics*, 2019, Prentice-Hall.
3. Timoshenko S, Young D. H., Rao J. V., *Engineering Mechanics*, 5th Edition, 2017, Pearson Press.

VIDEO LINKS

1. <https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSwwFV98rfKXq2KBphJz95rao7q8PpwT>
2. <https://www.youtube.com/watch?v=3YBXteL-qY4>
3. https://www.youtube.com/watch?v=atoP5_DeTPE
4. <https://www.youtube.com/watch?v=ksmsp9OzAsI>
5. <https://www.youtube.com/watch?v=x1ef048b3CE>
6. https://www.youtube.com/watch?v=l_Nck-X49qc
7. https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force
8. <https://www.youtube.com/watch?v=RIbceW1DSZg>
9. <https://www.youtube.com/watch?v=R8wKV0UQtlo>
10. https://www.youtube.com/watch?v=0RZHHgL8m_A
11. <https://www.youtube.com/watch?v=Bl5KnQOWkY>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Interactive Lectures	Use multimedia presentations, models, and physical samples to explain building materials and structural components.
2	Field Visits	Organize visits to construction sites, water treatment plants, and urban infrastructure projects.
3	Group Activities	Facilitate collaborative work on smart city models and environmental impact discussions.
4	Problem Solving Sessions	Introduce conceptual and numerical problem-solving on centroid, force systems, and moment of inertia.
5	ICT Tools and Videos	Use NPTEL lectures, animations and simulations to demonstrate real-time force analysis and building science.
6	Seminars and Presentations	Assign students short presentations on infrastructure, smart cities, and sustainable practices.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course with 3 credits**

Components	Number	Weightage	Max. Marks	Min Marks
1 Internal Assessment - Tests (A)	3	60%	30	12
2 Alternate Assessment (B)	2	40%	20	8
Total Marks			50	20

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Self-Learning (SL): the teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The faculty must collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE)

1. Question paper will be containing 8 questions. Each question is set for 20 marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice.
3. The questions from Module 2 and 3 will not have any choice.
4. Each of the question will have a maximum of two sub questions.
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks.

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BESK104A.1	Apply knowledge of Civil Engineering disciplines, materials, structural elements, and infrastructure for sustainable development practices.
M26BESK104A.2	Assess the resultant and equilibrium of force systems on the rigid bodies.
M26BESK104A.3	Determine and locate the centroid of plane and built-up sections.
M26BESK104A.4	Determine the moment of inertia of plane and built-up sections.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BESK104A.1	3	-	-	-	-	2	3	-	-	-	2
M26BESK104A.2	3	3	-	2	2	-	-	-	-	-	2
M26BESK104A.3	3	3	-	2	-	-	-	-	-	-	2
M26BESK104A.4	3	3	-	2	-	-	-	-	-	-	2
M65BESK104	3	3	-	2	2	2	3	-	-	-	2

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 9: Industry, Innovation and Infrastructure	Students explore fundamental infrastructure design concepts promoting innovation and resilient development.
2	SDG 11: Sustainable Cities and Communities	Incorporates clean city, smart city, and solid waste management topics to improve urban livability.
3	SDG 13: Climate Action	Introduces environment-friendly practices in construction and energy- efficient buildings.

1st/2nd Semester	Engineering Science Course (ES) INTRODUCTION TO ELECTRICAL ENGINEERING	M26BESK104B/ 204B
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic concepts of Circuit Elements	Basic understanding of active and passive elements of a circuit. Familiarity with fundamentals of discrete elements such as resistors, capacitors and inductors.
2	Electrical Circuits	Understanding of voltage, current and their characteristic behavior in electrical circuits and relevant laws.
3	Fundamentals of electromagnetic induction	Faraday's laws of electromagnetic induction, Lenz's law and Fleming's left and right hand rule.
4	Basic knowledge of measuring instruments.	Knowledge of measuring instruments such as ammeter, voltmeter and multimeter etc.

2. Syllabus

INTRODUCTION TO ELECTRICAL ENGINEERING SEMESTER – I/II			
Course Code	M26BESK104B/204B	CIE Marks	50
Total Number of Teaching-Learning Hours/sem(L:T:P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
- To explain electric power generation, transmission and distribution - To explain the laws used in the analysis of DC and AC circuits. - To explain the behaviour of circuit elements in single-phase AC circuits. - To explain the construction and operation of Transformers, AC generators, DC motors and Induction motors. - To introduce concepts of circuit protecting devices, earthing and electricity billing			
Module -1: Electrical Energy Sources & DC circuits			
Introduction to electrical energy sources, Single line diagram approach. Brief introduction to the electrical generation using Thermal, Solar, Hydro, Wind using Block diagram approach. DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series – parallel circuits excited by independent voltage sources. Power and energy, Illustrative examples			
Module -2: Single phase and Three phase AC circuit			
A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, Derivations of average value, RMS value, form factor, peak factor. Voltage and current relationship with phasor diagrams in R, L, and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor and Numerical. Three Phase Circuits: Advantages and limitations; star and delta connection, relationship between line and phase quantities excluding derivation.			
Module -3: Transformers & Three phase synchronous generators			
Transformers: Necessity of transformer, principle of operation, Types and construction of single-phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency and numerical. Three-phase synchronous generators: Principle of operation and constructional details of salient and non-salient pole generators, synchronous speed, frequency of generated voltage, emf equation, with the concept of winding factor excluding the derivation and calculation of winding factors and numerical.			
Module -4: Motors			

Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and slip ring. Slip, its significance and numerical.

DC Motor: Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and Simple numerical.

Module -5: Domestic Wiring & Electrical Safety

Domestic Wiring: Requirements, Types of wiring: casing, capping. Two way and three way control of load.

Electricity Bill: Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of “unit” used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.

Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock

TEXTBOOKS:

1. Fundamentals of Electrical Engineering & Electronics by B L Theraja, S. Chand and Company Pvt. Ltd. Reprint edition, 2022
2. Basic Electrical Engineering D. C. Kulshreshtha McGraw-Hill Education 1st edition, 2019

REFERENCE BOOKS:

1. Electrical Technology E Hughes Pearson International Students 9th edition
2. Principles of Electrical Engineering & Electronics V K Mehta and Rohit Mehta S. Chand and Company Pvt. Ltd.

VIDEO LINKS:

1. <https://youtu.be/OC8Lbyeyh-E>
2. <https://youtu.be/5CHufqAF-p0>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of generation of electrical energy.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies
6	Laboratory Learning	Utilize the facilities available in the laboratories to understand the behavior of the materials by performing few experiments.

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE)

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment-Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Self-Learning (SL): If applicable, the teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The faculty must collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE) For Theory Course with 3 or 4 credits

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BESK104B.1	Understand the concepts of hydro, thermal, solar & wind energy sources and Electric circuits.
M26BESK104B.2	Apply Ohm's law and Kirchhoff's laws to solve DC & AC circuits
M26BESK104B.3	Illustrate the construction and working principles of DC & AC Machines
M26BESK104B.4	Describe the types of wiring, tariff and safety measures in an electrical system.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BESK104B.1	3	3	-	-	-	-	-	-	-	-	-
M26BESK104B.2	3	3	-	-	-	-	-	-	-	-	-
M26BESK104B.3	3	3	-	-	-	-	-	-	-	-	-
M26BESK104B.4	-	-	-	-	-	3	-	-	-	-	-
M26BESK104B	3	3	-	-	-	3	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 7: Affordable and Clean Energy	Electrical engineers are crucial in designing, installing, and maintaining systems for solar, wind, hydro, and geothermal power. This involves understanding circuits, power electronics, energy conversion, and grid integration.
2	SDG 9: Industry, Innovation, and Infrastructure	Applying basic electrical engineering principles leads to the development of energy-efficient industrial processes, automation, and control systems that reduce resource consumption and waste.
3	SDG 11: Sustainable Cities and Communities	Smart Cities: The development of smart cities heavily relies on electrical engineering for smart infrastructure, energy conservation, efficient waste management, and sustainable urban living. Sustainable Transportation: Electrical engineers are vital in the design and development of electric vehicles (EVs) and their charging infrastructure, reducing reliance on fossil fuels and improving air quality in urban areas.

1st / 2nd Semester	Engineering Science Course (ESC) INTRODUCTION TO ELECTRONICS AND COMMUNICATION	M26BESK104C/ 204C
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic knowledge on Physics	A fundamental understanding of physics.
2	Basic knowledge on Mathematics	A fundamental understanding of mathematics.
3	Semiconductor Fundamentals	Basic knowledge of semiconductor physics and semiconductor devices is beneficial.
4	Basic knowledge of analog and digital signals	Elementary electronic components such as resistors, capacitors, inductors, diodes, and transistors.

2. Syllabus

INTRODUCTION TO ELECTRONICS AND COMMUNICATION SEMESTER – I/II			
Course Code	M26BESK104C/204C	CIE Marks	50
Total Number of Teaching-Learning Hours/sem(L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
1. To prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering. 2. To equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems. 3. Professionalism & Learning Environment: To inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context, and life-long learning needed for a successful professional career.			
Module -1			
Power Supplies – PN Junction Diode: Forward and Reverse Bias Characteristics, DC-powersupply Block diagram, Half-wave rectifier, Full-wave rectifiers, Voltage regulators, switch mode power supplies. Amplifiers – Basics of MOSFET: Construction, Symbol, Types (Enhancement and Depletion), Types of amplifiers, Gain, Input and output resistance, Negative feedback.			
Module -2			
Oscillators –Positive feedback, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator. (Only Concepts, working, and waveforms. No mathematical derivations) Operational amplifiers –symbol and connections, Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits.			
Module -3			
Boolean Algebra and Logic Circuits: Number Base Conversion, Complements, Binary subtraction using 1's and 2's, Basic Theorems and Properties of Boolean Algebra, Canonical and Standard Forms, Digital Logic Gates . Combinational logic: Introduction, Design procedure, Adders and Subtractors.			
Module -4			
Embedded Systems – Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, purpose of embedded system, Elements of an Embedded System, Microprocessor vs Microcontroller, RISC vs CISC.			

Sensors and Interfacing – Instrumentation and control systems, Transducers, Sensors, Actuators, LED, 7-Segment LED Display.
Module -5
Communication Schemes – Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) , Concept of Radio wave propagation (Ground, space, sky) An Overview of Wireless Systems: Introduction, First- and Second-Generation Cellular Systems, Cellular Communications from 1G to 3G, Road Map for Higher Data Rate Capability in 3G, Wireless 4G Systems.
Text Books 1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications', 4th Edition, Elsevier, 2015. DOI https://doi.org/10.4324/9781315737980. eBook ISBN 9781315737980 2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-84. 3. K V Shibu, 'Introduction to Embedded Systems', 2nd Edition, McGraw Hill Education (India), Private Limited, 2016 4. S L Kakani and Priyanka Punglia, 'Communication Systems', New Age International Publisher, 2017. 5. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson Education, 2013. 6. Vijay K. Garg, Wireless Communications and Networking, Morgan Kaufmann Publishers (Elsevier), 2nd Edition.

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of basic electronics concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies

4. Assessment Details (both CIE and SEE)
Continuous Internal Evaluation (CIE)

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment-Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

$$\text{Final CIE Marks} = (A) + (B)$$

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Semester End Examination (SEE)

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.

2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BESK104C/204C.1	Describe the working principles of PN junction diodes, DC power supplies, rectifiers, voltage regulators, switch mode power supplies, amplifier fundamentals, and MOSFET basics.
M26BESK104C/204C.2	Illustrate the principles of oscillators, operational amplifiers configurations used in basic electronic circuits.
M26BESK104C/204C.3	Apply number system concepts, Boolean algebra, and logic gates to implement logic circuits such as adders and subtractors.
M26BESK104C/204C.4	Discuss the fundamentals of communication systems, modulation concepts, radio wave propagation, and the development of wireless communication technologies from 1G to 4G.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BESK104C/204C.1	3	-	-	-	2	-	-	-	2	2	-
M26BESK104C/204C.2	3	3	-	-	2	-	-	-	2	2	-
M26BESK104C/204C.3	3	3	2	-	2	-	-	-	2	-	-
M26BESK104C/204C.4	3	2	-	-	-	-	-	-	-	-	-
M26BESK104C/204C	3	-	2	-	2	-	-	-	2	2	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Learning advanced electronics builds foundational engineering skills.
2	SDG 9: Industry, Innovation and Infrastructure	Embedded systems, communication technologies, amplifiers, digital logic.
3	SDG 11: Sustainable Cities and Communities	Sensors, automation, embedded applications in smart cities

1st/2nd Semester	Engineering Science Course INTRODUCTION TO MECHANICAL ENGINEERING	M26BESK104D/ 204D
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic understanding of Engineering disciplines	Familiarity with different engineering disciplines and their role in society, industry, and technological development.
2	Basic knowledge of Mathematics and Physics	Understanding of fundamental concepts such as force, motion, energy, power, heat, and simple calculations related to engineering systems.
3	Analytical Thinking Skills	Ability to observe, analyze, and solve simple engineering problems using logical reasoning.
4	Visualization Skills	Ability to interpret basic engineering diagrams, machine components, schematic representations, and manufacturing processes.
5	Interest in Engineering Systems and Emerging Technologies	Curiosity to understand the working principles of machines, manufacturing processes, automation, robotics, and future mobility technologies.

2. Syllabus

Introduction to Mechanical Engineering SEMESTER – I/II			
Course Code	M26BESK104D/204D	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
- To develop basic knowledge of Mechanical Engineering, its role in industries, emerging technologies, and conventional and renewable energy sources. - To understand the concepts of different machine tool operations, industrial automation, and advanced manufacturing systems such as CNC machines and Additive Manufacturing (3D Printing). - To understand the working principles and applications of Internal Combustion (IC) engines and future mobility technologies including Electric, Hybrid, and Autonomous Vehicles. - To provide exposure to engineering materials, joining processes and their applications in manufacturing industries. - To acquire a basic understanding of mechatronics, robotics, and their role in industrial automation and modern manufacturing.			
Module -1			
Introduction: Role of Mechanical Engineering in Industries and Society. Emerging trends and technologies in Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. Energy: Introduction and applications of conventional and renewable energy sources including Thermal, Hydel, Nuclear, Solar Photovoltaic (PV), and Wind Energy. Environmental issues such as Global Warming and Carbon Neutrality.			
Module -2			
Machine Tool Operations: Working principle of Lathe and operations such as Turning, Facing and Knurling. Working principle of Drilling Machine and operations including Drilling, Boring and Reaming. Working principle of Milling Machine and operations such as Plain Milling, End Milling and Slot Milling. (No sketches of machine tools; sketches to be used only for explaining the operations). Automation in Industry: Definition, types – Fixed, Programmable and Flexible Automation, basic elements with block diagrams, advantages and industrial applications.			
Module -3			

Introduction to IC Engines: Components and working principles, four-stroke Petrol and Diesel engines, applications of IC engines, and basic performance parameters of IC engines (**Simple numerical problems**).

Future Mobility: Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), components of electric and hybrid vehicles, advantages and limitations of EVs and Hybrid Vehicles, and an introduction to Autonomous Vehicles.

Module -4

Engineering Materials: Types, properties and applications of Ferrous and Non-Ferrous Metals, Ceramics, Glass, Polymers, Graphite, Diamond and Shape Memory Alloys.

Joining Processes: Soldering, Brazing and Welding, definitions, classification of welding processes, Arc Welding, Gas Welding and TIG Welding.

Module -5

Introduction to Mechatronics and Robotics: Open-loop and Closed-loop Mechatronic Systems. Robot Anatomy, Robot Configurations (Cartesian, Cylindrical, Polar and Articulated), applications, advantages and limitations of Industrial Robots.

Introduction to Advanced Manufacturing Systems: Introduction to CNC machines, components of CNC, advantages and applications of CNC, Introduction to Additive Manufacturing (3D Printing), and Introduction to Industry 4.0.

TEXTBOOKS:

3. K. R. Gopala Krishna, Elements of Mechanical Engineering, Subhash Publications, 35th Edition.
4. **R. K. Rajput**, *a Textbook of Elements of Mechanical Engineering*, **Laxmi Publications**, Fourth Edition.

REFERENCE BOOKS:

5. **Jonathan Wickert and Kemper Lewis**, *an Introduction to Mechanical Engineering*, **Cengage Learning**, Fourth Edition.
6. **P. N. Rao**, *Manufacturing Technology: Foundry, Forming and Welding*, **McGraw Hill Education**, Fifth Edition.

VIDEO LINKS:

1. https://www.nptel.ac.in/courses/112104526?utm_source=chatgpt.com
2. <https://mitlibraryblog.wordpress.com/mitm-videos/>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lectures & Presentations	Deliver core concepts and foundational knowledge. - Utilize multimedia (images, diagrams, and animations, videos) to enhance understanding.
2	Interactive Discussions & Q&A	Encourage active participation and clarification of doubts. Facilitate critical thinking and analysis of concepts through student-led discussions
3	Hands-on Activities	Provide laboratory or simulation-based activities to demonstrate real-world applications of mechanics or machine tools.
4	Case Studies	Present real-world engineering challenges and have students analyze potential solutions.
5	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies
6	Project-Based Learning	Encourage research and design thinking through project-based learning activities

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE) for Theory Course with 3 credits

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Self-Learning (SL): If applicable, the teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The faculty must collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE) For Theory Course with 3 or 4 credits

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BESK104D/204D.1	Interpret the working principles and applications of conventional and renewable energy sources, with environmental issues such as global warming and carbon neutrality.
M26BESK104D/204D.2	Analyse the working principles and functionalities of various machine tools, industrial automation systems, their control strategies, and industrial applications.
M26BESK104D/204D.3	Evaluate the construction and working principles of Internal Combustion (IC) engines, and the basic concepts, components, and applications of Electric, Hybrid, and Autonomous Vehicles.
M26BESK104D/204D.4	Interpret the properties of engineering materials for selection in engineering applications, and the working principles and applications of welding, brazing, and soldering.
M26BESK104D/204D.5	Analyse the basic concepts of mechatronic systems, robotic systems, CNC machines, Additive Manufacturing (3D Printing), and Industry 4.0 in modern manufacturing.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BESK104D/204D.1	3	-	-	-	-	-	-	-	-	-	-
M26BESK104D/204D.2	3	-	-	-	-	-	-	-	-	-	-
M26BESK104D/204D.3	-	3	-	-	-	-	-	-	-	-	-
M26BESK104D/204D.4	3	-	-	-	-	-	-	-	-	-	-
M26BESK104D/204D.5	3	-	-	-	-	-	-	-	-	-	-
M26BESK104D/204D	3	3	-	-	-	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 7: Affordable and Clean Energy	The course introduces conventional and renewable energy sources, environmental sustainability, and future mobility technologies such as Electric and Hybrid Vehicles, promoting awareness of clean energy solutions, energy efficiency, and sustainable transportation, thereby supporting SDG 7.
2	SDG 9: Industry, Innovation and Infrastructure	Topics such as machine tools, industrial automation, CNC machines, Additive Manufacturing (3D Printing), robotics, and Industry 4.0 foster innovation, enhance manufacturing productivity, and strengthen sustainable industrial infrastructure, contributing to SDG 9.
3	SDG 12: Responsible Consumption and Production	The study of engineering materials, joining processes, advanced manufacturing systems, and automation promotes efficient utilization of resources, sustainable manufacturing practices, waste reduction, and responsible production, aligning with SDG 12.

1st / 2nd Semester	Engineering Science Course (ES) INTRODUCTION TO C PROGRAMMING	M26BESK104E / 204E
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic computer Skills	Understanding how to use a computer, Functionality of Computer and perform basic Programming.
2	Logical Thinking	Ability to think logically and analytically, which is crucial for understanding algorithms and problem-solving in programming.
3	Understanding of Algorithms	Understanding the logic behind different algorithms (e.g., sorting, searching) can improve the efficiency of the code and its role in solving problems efficiently.
4	Basic Modular Arithmetic	Basic Number Theory: Understanding of integers, Datatypes. Algebra: Proficiency in algebraic manipulations and understanding of congruence relations.
5	Problem-Solving Skills	Ability to break down complex problems into smaller, manageable parts and develop step-by-step solutions

2. Syllabus

INTRODUCTION TO C PROGRAMMING SEMESTER – I/II			
Course Code	M26BESK104E/204E	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
Credits	03	Total Marks	100
		Exam Hours	03
Course Objectives:			
1. To introduce the fundamentals of computers, algorithmic thinking, and structured problem solving. 2. To build strong foundations in C syntax, control structures, and modular programming. 3. To develop the ability to design solutions using arrays, pointers, structures, and files. 4. To cultivate debugging discipline and good programming practices from the very first semester.			
Module -1			
Introduction to computers: Definition, Characteristics of Computer, Stored Program Concept, Applications of Computers, Basic Organization of Computer. Computer memory and Processors: Memory Organization, memory Hierarchy, Sequential and random Access, cache memory, Primary Memory. Design efficient programs: Program design Tools: Algorithms, Flowcharts, Pseudo codes. Programming in C: Introduction to C, Structure of C Program, writing the First C Program,. Introduction to C, Files used in a C program, C tokens, Character set in C, keywords, Identifiers, Basic Datatypes in C, variables, constants, Input/output statements in C. Textbook 1: Chapter 1.1,1.2, 1.3, 1.6,1.7 , 3.1-3.7 8.4, 9.1-9.4, 9.7-9.14			
Module -2			
Programming in C: Operators in C, Type conversion and typecasting. Decision control and Looping statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements. Textbook 1: Chapter 9.15-9.16, 10.1-10.5			
Module -3			
Functions: Introduction, Using Functions, Function declaration, Function definition, Function call, return statement, passing parameters to functions, scope of variables, recursive functions. Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays (Traverse, Searching, Sorting). Textbook 1: Chapter 11.1-11.8, 11.10. Chapter 12.1-12.5			
Module -4			
Arrays: Two dimensional arrays, operations on two-dimensional arrays Strings: Introduction, string taxonomy, operations on strings, (length, uppercase, lowercase, concatenate, compare, reverse) Miscellaneous string and character functions. Textbook 1: Chapter 12.7-12.8 Chapter 13.1, 13.3-13.6,			

Module -5	
Pointers: Concepts, pointer Variable, Accessing Variables through pointers, pointer Declaration and Definition, Initialization Pointer Variables, Pointer and Functions, pointers to pointers, Compatibility. Structures and Unions: Introduction, defining a structure, declaring structure Variables, accessing structure members, structure initialization, copying and comparing structure variables, operation on individuals' members. Textbook 2: Chapter 11, Chapter 13	
Illustrative Mini Project Ideas (Students May Choose Other Relevant Topics)	
<i>Mini projects are to be executed in teams of 2-3 students over the last 3-4 weeks of the semester, with a project report and a live demonstration for evaluation.</i> Mini Project 1: Digital Voltmeter Simulator Simulate a set of voltage readings, classify them into safe/unsafe ranges using functions, and log the readings to a file. Mini Project 2: Ohm's Law Based Circuit Calculator Given any two of voltage, current, and resistance, compute the third for a series of readings stored in an array, and save results to a file. Mini Project 3 Smart Site Alert Simulator Simulate a set of sensor-style readings (e.g., vibration or crack width) in an array, flag any reading beyond a safe limit, and log alerts to a file. Mini Project 4 Concrete Mix Quantity Calculator Given the volume of concrete and mix ratio, use functions to compute the required quantities of cement, sand, and aggregate, and save the report to a file. Mini Project 5: Frequency Unit Converter Utility Build a utility that converts frequency values between Hz, kHz, and MHz using functions and macros, with results logged to a file.	
Textbooks:	
1. Reema Thareja, Computer fundamentals and programming in c, Oxford University, Third edition, 2023 2. Behrouz Forozon, Richard Gilberg, A structured Programming Approach using C, 2nd edition Thomson Learning, 2003.	
Reference Books:	
1. E. Balaguruswamy, Programming in ANSI C, 8th Edition, Tata McGraw-Hill. 2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Pearson Publishers 2015. 3. Behrouz Forozon, Richard Gilberg, A structured Programming Approach using C, 2nd edition Thomson Learning, 2003.	
VIDEO LINKS:	
https://onlinecourses.nptel.ac.in/noc22_ce54/preview https://mitlibraryblog.wordpress.com/mitm-videos/ https://www.tutorialspoint.com/what-is-an-algorithm-and-flowchart-in-c-language https://www.tutorialspoint.com/cprogramming/c_data_types.htm https://www.tutorialspoint.com/cprogramming/c_operators.htm https://www.ccbp.in/blog/articles/decision-making-statements-in-c https://www.tutorialspoint.com/cprogramming/c_arrays.htm https://www.geeksforgeeks.org/variables-in-c/ https://www.w3schools.com/c/c_arrays.php https://www.programiz.com/c-programming/c-strings https://www.programiz.com/c-programming/c-pointers https://www.scaler.com/topics/c/structures-c/	

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of programming concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.

4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Programming Assignments	Assign programming tasks to reinforce practical skills associated with competencies.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course with 3 credits**

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

Final CIE Marks = (A) + (B)**A** = Average of best two Test marks**B** = Average of two Alternate Assessment marks**Semester End Examination (SEE) For Theory Course with 3 or 4 credits**

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BESK104E/204E.1	Apply the basic knowledge of computer hardware, functionalities of a computer to develop Simple C Programs.
M26BESK104/204E.2	Identify the appropriate operators, Branching and Looping constructs of C language to solve the real-world problem.
M26BESK104E/204E.3	Utilizing the Modularity of functions to implement arrays and strings to perform data Manipulation to inscribe the Application.
M26BESK104E/204E.4	Apply pointers, structures, unions in C programming to develop Application that efficiently manage, manipulate the data.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BESK104E/204E.1	3	-	-	-	-	-	-	-	-	-	-
M26BESK104E/204E.2	-	3	-	-	-	-	-	-	-	-	-
M26BESK104E/204E.3	-	3	3	-	-	-	-	-	-	-	-
M26BESK104E/204E.4	-	3	3	-	-	-	-	-	-	-	-
M26BESK104E/204E	3	3	3	-	-	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	The course builds critical computational and analytical thinking skills, empowering students with lifelong learning tools in computer science. Promotes technical education and employability
2	SDG 8: Decent Work and Economic Growth	By equipping students with key programming and problem-solving skills, the course enhances career opportunities in IT and software sectors, contributing to economic growth.
3	SDG 9: Industry, Innovation and Infrastructure	Programming using C form the backbone of modern technology and software infrastructure. The course fosters innovation and prepares students for building efficient, scalable digital systems

1st/2nd Semester	Emerging Technology Course (ET) INTRODUCTION TO BIOMEDICAL INSTRUMENTATION	M26BETK105A/ 205A
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Mathematics	Understanding of basic arithmetic operations.
2	Basic Electronics	Understanding of semiconductor components and their applications.
3	Basic Electrical	Understanding of Alternating Current, Direct current and their appliances.
4	Computer Knowledge	Basic knowledge of computers, peripherals and its operating system

2. Syllabus

INTRODUCTION TO BIOMEDICAL INSTRUMENTATION SEMESTER – I/II			
Course Code	M26BETK105A/205A	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
1. To understand the fundamental principles of biomedical instrumentation and physiological signal generation. 2. To study the operation and application of biomedical sensors and transducers. 3. To analyze the functioning of diagnostic and monitoring instruments such as ECG, EEG, EMG, and BP monitors. 4. To apply basic signal conditioning methods to biomedical signals. 5. To evaluate safety standards, ethical practices, and regulations in biomedical instrumentation.			
Module -1			
Physiology, Sensory organs and transducers: Cell and its structure, Nervous system: Structure of nervous system, neurons, Cardiovascular system, respiratory system, Kidney, Basic components of a biomedical system Sensory organs: Structure and function of Eye, Ear mechanism of hearing Transducers: Transducer, types of transducers, Piezo-electric, Ultrasonic transducer.			
Module -2			
Electro-physiological Measuring devices: Electrodes, ECG, EEG, EMG, ERG (Block diagram approach and its typical waveforms), Dialysis of Kidney.			
Module -3			
Non-electrical Measuring devices: Measurement of blood pressure, Heart rate, Spirometer, pH of blood, finger-tip oximeter, PPG, ESR, GSR (Block diagram approach, typical waveforms and its measurements).			
Module -4			
Medical Imaging: Introduction to Radiographic and fluoroscopic techniques, X-rays, Computer Tomography, MRI, Ultrasonography, Endoscopy, Thermography, PET (working principle with merits and demerits).			
Module -5			
Assistive/therapeutic Equipment and Electrical safety: Pacemakers, Ventilators, Hearing Aids, Audio meters. Electrical safety: Electrical danger, physiological effect of current.			
TEXTBOOKS:			
1. 'Medical Instrumentation: Application and Design', John G. Webster, Amit J. Nimunkar · 2020 2. R.S. Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing CoLtd., 2003. 3. Leslie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI. https://kahedu.edu.in/naac/C-3/Additional%20documents/E-content/2651.pdf			
REFERENCE BOOKS:			

1. J. Webster, 'Medical Instrumentation', John Wiley & Sons, 2009.
2. L.A. Geddes and L.E. Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.

VIDEO LINKS:

1. https://onlinecourses.nptel.ac.in/noc25_bt49/preview
2. <https://www.coursera.org/learn/medical-image-processing>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Conceptual Lectures with Visual Aids	Deliver fundamental concepts using presentations, diagrams, animations, and videos for better understanding of physiological systems and instruments.
2	Case Studies and Clinical Application Examples	Analyze real-life medical instrumentation cases from hospitals or published studies.
3	Demonstrations of Medical Devices	Live demos or videos of devices like ECG, pulse oximeters, BP monitors to connect theory with practice.
4	Guest Lectures / Industry Interaction	Invite professionals from hospitals or biomedical industries for expert talks.
5	Quizzes, Group Discussions & Peer Teaching	Encourage active learning through formative assessments and collaborative discussion.
6	Conceptual Lectures with Visual Aids	Deliver fundamental concepts using presentations, diagrams, animations, and videos for better understanding of physiological systems and instruments.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE)**

Components		Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment-Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
Total Marks				50	20

$$\text{Final CIE Marks} = (A) + (B)$$

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Semester End Examination (SEE)

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BETK105A/205A.1	Describe the basic structure and function of physiological systems relevant to biomedical instrumentation.

M26BETK105A/205A.2	Apply the principles and characteristics of sensors and transducers in biomedical instrumentation.
M26BETK105A/205A.3	Apply signal conditioning techniques for acquisition and processing of biomedical signals.
M26BETK105A/205A.4	Analyze the working of diagnostic and therapeutic devices such as ECG, EEG, EMG, and BP monitors.
M26BETK105A/205A.5	Evaluate safety standards, ethical practices, and emerging trends in biomedical instrumentation and healthcare technology.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BETK105A/205A.1	3	-	-	-	-	-	-	-	-	-	-
M26BETK105A/205A.2	-	3	-	-	-	-	-	-	-	-	-
M26BETK105A/205A.3	-	-	3	3	-	-	-	-	-	-	-
M26BETK105A/205A.4	-	-	-	3	-	-	-	-	-	-	-
M26BETK105A/205A.5	-	-	3	-	-	-	-	-	-	-	-
M26BET105A/205A	3	3	3	3	-	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 3: Good Health and Well-Being	Failure theories ensure mechanical safety , preventing accidents (SDG 3).
2	SDG 7: Affordable and Clean Energy	Understanding torsion and stability of columns is essential for energy transmission systems (e.g., turbine shafts in clean energy) and for the structural integrity of buildings and machinery, aligning with SDG 7
3	SDG 9: Industry, Innovation and Infrastructure,	Stress analysis ensures that buildings and components can handle real-world loads and environmental effects, which is crucial for developing resilient infrastructure (SDG 9)

1st / 2nd Semester	Emerging Technology Course (ET) INTRODUCTION TO EMBEDDED SYSTEMS	M26BETK105B/ 205B
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Physics Fundamentals	Apply fundamental concepts of physics related to electronic devices, semiconductor components, sensors, actuators, and physical principles involved in embedded system applications.
2	Digital Concepts	Demonstrate knowledge of digital electronics concepts including logic gates, digital circuits, memory organization, microcontrollers, and input/output interfaces used in embedded systems.
3	Mathematics	Apply mathematical concepts such as number systems, logical operations, calculations, and analytical methods required for understanding embedded system design, programming, and performance evaluation.
4	Computer Knowledge	Apply basic computer architecture, programming concepts, computer languages, and computational principles to understand microprocessors, microcontrollers, embedded software, and embedded system applications.

2. Syllabus

INTRODUCTION TO EMBEDDED SYSTEMS SEMESTER – I/II			
Course Code	M26BETK105B/205B	CIE Marks	50
Total Number of Teaching-Learning Hours/Sem(L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
1. To understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.			
2. To develop the hardware-software co-design and firmware design approaches.			
3. To provide an overview of various applications and domains of embedded systems			
Module -1			
Basics: Basics of Computer Architecture, Computer Languages, RISC and CISC Architectures. Introduction to Embedded Systems: Introduction, Application Domain of Embedded Systems, Desirable Features and General Characteristics, Model of an Embedded System, Microprocessor vs Microcontroller, Example of a Simple Embedded System, Figures of Merit for an Embedded System.			
Module -2			
Embedded systems - The hardware point of view: Microcontroller unit (MCU), a popular 8-bit MCU: General Purpose I/O (GPIO), Clock, Power on Reset, Brown Out Reset, Watchdog Timer, Real-time Clock (RTC), Memory.			
Module -3			
Embedded System Components: Sensors, Actuators, I/O subsystems: LED, 7-segment LED, Optocoupler, Stepper motor, Relay, Push Button Switch, Keyboard. Communication interfaces: onboard interface -I2C, SPI, UART, External interface- USB, Bluetooth, Wi-Fi, ZigBee, GPRS.			
Module -4			
Examples of Embedded Systems: Mobile Phone, Automotive Electronics, Radio Frequency Identification (RFID), Wireless Sensor Networks (WISNET).			
Module -5			
Examples of Embedded Systems: Robotics, Biomedical applications. Embedded System Design Concepts: Hardware Software Co- Design, Computational models in embedded systems.			
TEXT BOOKS:			
1. Das, Lyla B, “Embedded systems: An integrated approach” Pearson Education India, 2012			

- Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited, 2nd Edition.

REFERENCE BOOKS:

- Raj Kamal, "Embedded system-architecture, design and programming" 2nd edition.

VIDEO LINKS:

- <https://nptel.ac.in/courses/108102045>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of embedded system working or protocols or buses.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Higher Order Thinking (HOTS) Questions:	Pose HOTS questions to stimulate critical thinking related to each competency.
5	Problem-Based Learning (PBL)	Implement PBL to enhance analytical skills and practical application of competencies
6	Multiple Representations	Introduce topics in various representations to reinforce competencies
7	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
8	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate a deeper understanding of competencies
9	Student Role-Play Assignments	Assign any embedded components to give seminars associated with competencies.

**4. Assessment Details (both CIE and SEE)
Continuous Internal Evaluation (CIE)**

Components		Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment-Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
Total Marks				50	20

$$\text{Final CIE Marks} = (A) + (B)$$

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Self-Learning (SL): If applicable, the teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The faculty must collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE)

- Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
- The questions from Module 1, 4 and 5 will have 100% choice
- The questions from Module 2 and 3 will not have any choice
- Each of the question will have a maximum of two sub questions

5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BETK105B/205B.1	Describe the basic concepts and design attributes of embedded systems
M26BETK105B/205B.2	Describe the elements of an embedded system like core, sensors, actuators, memory and communication buses and protocols.
M26BETK105B/205B.3	Apply the modelling techniques for designing embedded system firmware.
M26BETK105B/205B.4	Analyze the applications of embedded systems in various domains.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BETK105B/205B.1	3	-	-	-	-	-	-	-	-	-	2
M26BETK105B/205B.2	3	-	-	-	-	-	-	-	-	-	2
M26BETK105B/205B.3	3	3	-	-	-	-	-	-	-	-	2
M26BETK105B/205B.4	3	-	2	-	-	-	-	-	-	-	2
M26BETK105B/205B	3	3	2	-	-	-	-	-	-	-	2

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality education	Focuses on design embedded systems and use of OS.
2	SDG 9: (Industry, Innovation, and Infrastructure)	Embedded systems form the backbone of modern industrial automation, IoT, and smart infrastructure. By learning system design, students contribute to advancements in robotics, automation, and efficient computing solutions.
3	SDG 11: (Sustainable Cities and Communities)	Students are exposed to embedded applications in smart cities, including sensor networks, real-time communication, and automation. These help in the development of smart transportation, environmental monitoring, and public safety systems.

1st/ 2nd Semester	Emerging Technology Course (ET) RENEWABLE SOURCES OF ENERGY	M26BETK105C/ 205C
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1. Prerequisites

S/L	Proficiency	Prerequisites
1.	Basic Physics	- Understanding of energy, power, and force. - Knowledge of thermodynamics, particularly the laws of energy conservation and conversion.
2.	Basic Chemistry	- Understanding of chemical reactions and processes. - Understanding the materials and reactions involved in energy storage, bioenergy, and fuel cells.
3.	Basic Biology	Basics of plant biology and ecology for bioenergy.
4.	Environmental Science	Basic understanding of Ecology, Pollution & Environmental Impact and Sustainability.
5.	Conventional Sources	Basic knowledge of fossil fuels, coal, hydro & nuclear.

2. Syllabus

RENEWABLE SOURCES OF ENERGY SEMESTER – I/II			
Course Code	M26BETK105C/205C	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course objectives: - To understand energy scenario, energy sources and their utilization. - To explore society's present needs and future energy demands. - To Study the principles of renewable energy conversion systems. - To exposed to energy conservation methods.			
Module -1			
Introduction: Energy source and its classification, India's production and reserves of commercial energy sources, India's Energy Needs, Energy Pricing in India, Energy Distribution between Developed and Developing Countries, worldwide renewable energy availability, renewable energy availability in India, Advantages & disadvantages of renewable energy, Introduction to Internet of energy (IOE) and its applications.			
Module -2			
Solar Energy: Fundamentals of Solar Radiation; Solar radiation Measurements- Pyrheliometer, Pyrometer, Sunshine Recorder. Solar Thermal Collectors: Flat Plate Collector and Concentrating Collectors, Solar distillation; Solar pond electric power plant. Solar electric power generation- Principle of Solar cell, Photovoltaic system for electric power generation, advantages, Disadvantages and applications of solar photovoltaic system. Case Study.			
Module -3			
Wind Energy: History and evolution of wind energy, availability of wind energy in India, wind velocity and power from wind; limitations of wind energy, energy available in the wind, Basic components of wind energy conversion system (WECS); lift and drag, Classification of WECS. Vertical axis- Savonius and Darrieus types. Case study. Biomass Energy: Introduction; Photosynthesis Process; Biomass Resources; Biomass conversion technologies, Anaerobic Digestion, Bio digester -fixed dome & Floating type; Urban waste to energy conversion. Case study			
Module -4			

Ocean Water Energy: Tides and waves as energy suppliers and their mechanics, Single & double basin system, OTEC - Open & Close cycle, Challenges and future directions in ocean energy, Case Study.

Geo Thermal Energy: Introduction, Types of Hydrothermal resources, Applications.

Module -5

AI based Renewable Energy Systems: Role of AI in achieving energy efficiency, Machine learning, deep learning, reinforcement learning, AI techniques and models in renewable energy, AI applications in renewable energy systems, Challenges and limitations of AI in renewable energy. **Role of AI in renewable energy systems,** Sector-wise use of AI: Solar, wind, and grid management, Challenges, opportunities, and future directions. Standards for AI in renewable energy.

Text Books:

1. Nonconventional Energy sources, G D Rai, Khanna Publication, Fourth Edition,
2. Energy Technology, S.Rao and Dr. B.B. Parulekar, Khanna Publication.
3. Solar energy, Subhas PSukhatme, TataMcGrawHill, 2ndEdition,1996.
4. Artificial Intelligence-based Renewable Energy Systems, Kashif Naseer Qureshi,

Reference Books:

- 1.Principles of Energy conversion, A. W. Culp Jr., McGraw Hill, 1996
- 2.Non-Convention EnergyResources, Shobh Nath Singh, Pearson, 2018

Links

1. <https://www.youtube.com/@mitmysore-mechanicalengine8107>
2. https://www.youtube.com/watch?v=mh51mAUexK4&list=PLwdnzlV3ogoXUifhvYB65ILJCZ74o_fAk

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of RES concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies.

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE) for Theory Course with 3 credits

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

$$\text{Final CIE Marks} = (A) + (B)$$

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Semester End Examination (SEE) For Theory Course with 3 or 4 credits

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the

question paper shall be English unless otherwise it is mentioned.

2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.

Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BETK205C.1	Make use of the basic physics of energy conversion to identify the environmental aspects of renewable energy resources in comparison with various conventional energy systems, their prospects and limitations.
M26BETK205C.2	Interpret the principles of solar radiation and performance of solar thermal and photovoltaic systems for sustainable energy applications.
M26BETK205C.3	Illustrate the methods of energy conversion using the concept of wind energy and bio mass energy concepts.
M26BETK205C.4	Interpret the different energy generation technologies by identifying the key operating principles of ocean energy and geothermal energy.
M26BETK205C.5	Make use of AI techniques to improve the operation, monitoring, and management of renewable energy systems through suitable case studies.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BETK205C.1	3	-	-	-	-	-	-	-	-	-	-
M26BETK205C.2	3	-	-	-	-	-	-	-	-	-	-
M26BETK205C.3	3	-	-	-	-	-	-	-	-	-	-
M26BETK205C.4	3	-	-	-	-	-	-	-	-	-	-
M26BETK205C.5	3	-	-	-	-	-	-	-	-	-	-
M26BETK205C	3	-	-	-	-	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 7 - Affordable and Clean Energy	Primary SDG. Covers renewable energy technologies, energy efficiency, solar, wind, biomass, geothermal, and sustainable energy access.
2	SDG 11 - Sustainable Cities and Communities	Encourages the use of renewable energy in buildings, transportation, and urban energy systems.
3	SDG 12 - Responsible Consumption and Production	Focuses on efficient utilization of energy resources, conservation, and sustainable energy practices.

1st / 2nd Semester	Emerging Technology Course (ET) FUNDAMENTALS OF NANO SCIENCE AND NANOTECHNOLOGY	M26BETK105D/ 205D
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1. Prerequisites

S/L	Proficiency	Prerequisites
1	Engineering principles	Basic understanding of engineering concepts like design, fabrication, and characterization can be helpful.
2	Basic Chemistry	Atomic Structure: Understanding atoms, molecules, and chemical bonds. Chemical Reactions: Knowledge of how substances interact and change. Organic Chemistry: Familiarity with carbon-based molecules, which are often used in nanotechnology.
3	Basic Physics	Classical Mechanics: Basics of motion, forces, and energy. Electromagnetism: Understanding electric and magnetic fields and their interactions with matter. Quantum Mechanics: Basic principles, as nanotechnology often deals with phenomena at the atomic and molecular levels.
4	Fundamentals of Material Science and Engineering	Solid State Physics: Crystal structures, defects in solids, and electronic properties of materials. Thermodynamics: Basic principles including energy, entropy, and the laws of thermodynamics. Material Properties: Mechanical, electrical, optical, and thermal properties of materials.

2. Syllabus

Fundamentals of Nano science and Nanotechnology SEMESTER – I/II			
Course Code	M26BETK105D/205D	CIE Marks	50
Number of Lecture Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Total Marks	100
Credits	3	Exam Hours	03
Course objectives			
- To provide a comprehensive overview of synthesis and characterization of nanoparticles, nanocomposites and hierarchical materials with nanoscale features. - To provide the engineering students with necessary background for understanding various nanomaterials characterization techniques. - To develop an understanding of the basis of the choice of material for device applications. - To give an insight into complete systems where nanotechnology can be used to improve our everyday life. - To describe the historical development and the future potential of nanotechnology.			
Module -1			
Fundamentals of Nanomaterials and Synthesis			
Introduction to Nanotechnology: Introduction to Nanoscience and Nanotechnology, Historical development and future prospects of nanotechnology, Nanoscale dimensions and classification of nanomaterials, Size-dependent physical, chemical, optical and magnetic properties, Quantum confinement in 0D, 1D, 2D and 3D nanostructures, Surface energy and Surface-to-Volume ratio, Types of nanomaterials.			
Synthesis of Nanomaterials			
Bottom-Up Approaches: Sol-Gel Method, Hydrothermal and Solvothermal Synthesis, Chemical Vapor Deposition (CVD), Chemical Bath Deposition (CBD), SILAR Technique.			

Top-Down Approaches: High Energy Ball Milling, Physical Vapor Deposition (PVD), Magnetron Sputtering, Laser Ablation.

Module -2

Characterization Techniques for Nanomaterials

Microscopy Techniques: Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Atomic Force Microscope (AFM), Scanning Tunneling Microscope (STM), Basic introduction to Field Emission SEM (FESEM).

Structural and Optical Characterization: X-Ray Diffraction (XRD), Bragg's Law, Debye-Scherrer Equation and Numerical Problems, UV-Visible Spectroscopy and Optical Band Gap, Fourier Transform Infrared Spectroscopy (FTIR), Introduction to Raman Spectroscopy

Module -3

Carbon and Two-Dimensional Nanomaterials

Carbon Nanomaterials: Graphene, Single-Walled Carbon Nanotubes (SWCNT), Multi-Walled Carbon Nanotubes (MWCNT), Fullerenes.

Emerging Two-Dimensional Materials: Graphene Oxide (GO), Reduced Graphene Oxide (rGO), Transition Metal Dichalcogenides (MoS₂ – Introduction).

Properties and Applications: Electrical, Mechanical, Thermal, Optical Properties. **Applications:** Energy Storage, Flexible Electronics, Sensors, Biomedical Applications.

Module -4

Nanotechnology for Sustainable Energy

Solar Energy: First, Second and Third Generation Solar Cells, Dye Sensitized Solar Cells (DSSC), Quantum Dot Sensitized Solar Cells (QDSSC), Introduction to Perovskite Solar Cells.

Energy Storage: Lithium-ion Batteries, Sodium-ion Batteries (Introduction), Nanomaterials for Cathodes and Anodes, Solid Electrolytes and Battery Separators, Supercapacitors (Introduction).

Fuel Cells: Types of Fuel Cells, Proton Exchange Membrane Fuel Cell (PEMFC), Hydrogen Storage Materials, Nanocatalysts for Fuel Cells.

Module -5

Applications of Nanotechnology and Recent Trends

Applications of Nanotechnology: Nanomedicine and Drug Delivery, Nano Biotechnology and Biosensors, Nanoelectronics, Nanophotonics, Nano-enabled Agriculture, Water Purification using Nanomaterials, Environmental Remediation,

Emerging Trends: Smart Nanomaterials, Nanorobotics (Introduction), Artificial Intelligence in Nanomaterial Design, Safety, Toxicity and Ethical Issues of Nanotechnology, Recent Advances and Industrial Applications of Nanotechnology.

Suggested Learning Resources:

Books

1. Nano Materials – A.K. Bandyopadhyay/ New Age Publishers
2. Nanocrystals: Synthesis, Properties and Applications – C.N.R. Rao, P. John Thomas and G. U. Kulkarni, Springer Series in Materials Science
3. Nano Essentials- T. Pradeep/TMH
4. Peter J. F. Harris, Carbon nanotube science: synthesis, properties, and applications. Cambridge University Press, 2011
5. M.A. Shah, K.A. Shah, “Nanotechnology: The Science of Small”, Wiley India, ISBN 13: 9788126538683.

Reference Books

1. Introduction to Nanotechnology, C. P. Poole and F. J. Owens, Wiley, 2003
2. Understanding Nanotechnology, Scientific American, 2002
3. Nanotechnology, M. Ratner and D. Ratner, Prentice Hall, 2003
4. Nanotechnology, M. Wildon, K. Kannagara, G. Smith, M. Simmons and B. Raguse, CRC Press Boca Raton, 2002.

3. Teaching-Learning Process Strategies

S/L	TLP Strategies:	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of nano materials concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Higher Order Thinking (HOTS) Questions:	Pose HOTS questions to stimulate critical thinking related to each competency.
5	Multiple Representations	Introduce topics in various representations to reinforce competencies
6	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course with 3 credits**

Components		Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
Total Marks				50	20

Final CIE Marks = (A) + (B)**A** = Average of best two Test marks**B** = Average of two Alternate Assessment marks**Semester End Examination (SEE) For Theory Course with 3 or 4 credits**

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BETK205D.1	Make use of the fundamental concepts of nanotechnology to synthesize the nanoparticles by various techniques.
M26BETK205D.2	Illustrate the working of basic instruments used in characterization of nanoparticles.
M26BETK205D.3	Apply the concepts of nanotechnology in various engineering discipline.
M26BETK205D.4	Interpret the unique properties of carbon and its various allotropes like diamond, graphite and graphene.
M26BETK205D.5	Analyze the relationship between material properties at the nanoscale and their energy storage and conversion capabilities.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BETK205D.1	3	-	-	-	-	-	-	-	-	-	-
M26BETK205D.2	3	-	-	-	-	-	-	-	-	-	-
M26BETK205D.3	3	-	-	-	-	-	-	-	-	-	-
M26BETK205D.4	3	-	-	-	-	-	-	-	-	-	-

M26BETK205D.5	-	3	-	-	-	-	-	-	-	-	-
M26BETK205D	3	3	-	-	-	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 7: Affordable and Clean Energy	The course extensively covers nanotechnology applications in sustainable energy, including first, second, and third generation solar cells, dye-sensitized and quantum dot solar cells, perovskite solar cells, lithium-ion and sodium-ion batteries, supercapacitors, hydrogen storage materials, and fuel cell nanocatalysts. These topics directly contribute to improving clean energy generation, storage, and energy efficiency.
2	SDG 9: Industry, Innovation and Infrastructure	The course provides a strong foundation in the synthesis, characterization, and application of advanced nanomaterials using state-of-the-art techniques such as CVD, PVD, sputtering, SEM, TEM, XRD, and AFM. It promotes technological innovation in nanoelectronics, sensors, smart materials, nanophotonics, AI-assisted material design, and industrial nanotechnology, supporting sustainable industrialization and research-driven innovation.
3	SDG 6: Clean Water and Sanitation	The course includes nanomaterial-based water purification and environmental remediation technologies. Advanced nanomaterials such as graphene-based materials and nanocomposites are widely used for removing heavy metals, dyes, pathogens, and organic pollutants from water, contributing to improved access to clean and safe water.

1st / 2nd Semester	Emerging Technology Course (ET) GREEN BUILDINGS	M26BETK105E/ 205E
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Mathematics.	Fundamentals of arithmetic and algebra calculations.
2	Physics.	Fundamentals of heat, light, and building physics.
3	Material Science.	Understanding how materials respond to external loads.
4	Construction Methods and Materials.	Knowledge of construction materials observed in day-to-day life.

2. Syllabus

GREEN BUILDINGS SEMESTER – I/II			
Course Code	M26BET105E/205E	CIE Marks	50
Total Number of Teaching-Learning Hours/Sem (L: T: P:TW:SL)	2:2:0: 20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
- Understand the Definition, Concept & Objectives of the terms cost effective construction and green building. - Apply cost effective Technologies and Methods in Construction. - Understand the Problems due to Global Warming. - Understand green building ratings and sustainable design. - Understand the concept of utilization of solar energy and green composites.			
Module -1			
Introduction to the concept of cost-effective construction			
- Different types of materials, their availability, requirements/properties and application – Stones, Laterite Blocks, Burnt Bricks, Concrete Blocks, Stabilized Mud Blocks, Lime Pozzolana Cement, Fiber Reinforced Cement Components, Fiber Reinforced Polymer Composite, Bamboo. - Recycling of building materials – Bricks, Concrete, Steel, Plastics. - Environmental issues related to quarrying of building materials.			
Module -2			
Environment friendly and cost-effective Building Technologies			
- Alternates for wall construction - Flemish Bond, Rat Trap Bond, Cavity Wall. - Ferro Cement and Ferro Concrete constructions. - Different pre cast members - Wall and Roof Panels, Door and Window frames, Water tanks, Septic Tanks. - Alternate roofing systems - Filler Slab, Composite Beam and Panel Roof. - Pre-engineered and ready to use building elements. - Contributions of agencies - Cost ford, Nirmithi Kendra, Habitat			
Module -3			
Global Warming			
- Definition, Causes and Effect, Contribution of Buildings towards Global Warming, - Carbon Footprint – Global Efforts to reduce carbon Emissions. - Green Buildings – Definition, Features, Necessity, Environmental benefit, Economical benefits, Health and Social benefits, Major Energy efficient areas for buildings. - Embodied Energy in Materials. - Comparison of cost of Green V/s Conventional Building. - Life cycle Assessment of Buildings.			
Module -4			

Green Building rating Systems – BREEAM, LEED, GREEN STAR, GRIHA (Green Rating for Integrated Habitat Assessment) and IGBC for new buildings – Purpose - Key highlights - Point System with Differential weight age.

Green Design – Definition, Principles of sustainable development in building design, Characteristics of Sustainable Buildings, sustainably managed Materials.

Module -5

Utility of Solar Energy in Buildings

Utility of Solar energy in buildings concepts - Passive Cooling and Heating of Buildings, Low Energy Cooling, Case studies of Solar Passive Cooled and Heated Buildings.

Green Composites for Buildings - Concepts of Green Composites,

Water Utilization in Buildings - Low Energy Approaches to Water Management, Management of Solid Wastes, Management of Sullage Water and Sewage.

Green Cover and Built Environment.

TEXTBOOKS

1. Harharalyer G, Green Building Fundamentals, Notion Press
2. Dr. Adv. Harshul Savla, Green Building: Principles & Practices. Notion press.

REFERENCE BOOKS

1. Jimmy C.M. Kao, Wen-Pei Sung, Ran Chen, Green Building, Materials and Civil Engineering, 1st edition, CRC Press.
2. Ross Spiegel, Dru Meadows, Green Building Materials: A Guide to Product Selection and Specification,
3. Sam Kubba, Handbook on green building design and construction, BH publications.

VIDEO LINKS:

1. <https://nptel.ac.in/courses/124106455>
2. <https://nptel.ac.in/courses/105102195>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of Verilog concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies.
6	Site Visits	Visting the sites to understand the concept of green building materials and technologies.

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE)

Components	Number	Weightage	Max. Marks	Min Marks
1 Internal Assessment - Tests (A)	3	60%	30	12
2 Alternate Assessment (B)	2	40%	20	---
Total Marks			50	20

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Self-Learning (SL): The teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The faculty must

collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE)

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs

Course Outcomes (COs)

COs	Description
M26BETK205E.1	Apply the knowledge of science to study environmental issues in building materials and environmentally friendly/alternative building materials and technologies for cost effective and energy efficient construction.
M26BETK205E.2	Illustrate the concept of global warming due to different materials and buildings in construction.
M26BETK205E.3	Exemplify the concept of green building rating systems used in buildings.
M26BETK205E.4	Illustrate the alternate source of energy and effective water & solid waste management used in buildings to meet sustainable environment.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BETK205E.1	3	-	-	-	-	2	-	-	-	-	-
M26BETK205E.2	3	-	-	-	-	2	-	-	-	-	-
M26BETK205E.3	3	2	-	-	-	2	-	-	-	-	-
M26BETK205E.4	3	-	-	-	-	2	-	-	-	-	2
M26BETK205E	3	2	-	-	-	2	-	-	-	-	2

6. Mapping to Sustainable Development Goals (SDG)

Sl. No.	SDG	Justification
1	SDG 3: Good Health and Well-being	Improves indoor air quality, reduces exposure to harmful materials, and promotes healthier living and working environments
2	SDG 6: Clean Water and Sanitation	They will learn about rainwater harvesting, greywater reuse, and better sanitation systems.
3	SDG 7: Affordable and Clean Energy	Focuses on energy efficiency and renewable integration (solar systems)
4	SDG 9: Industry, Innovation and Infrastructure,	By adapting these green technologies can ensure buildings and components can handle real-world loads and environmental effects, which is crucial for developing resilient infrastructure.
5	SDG 11: Sustainable Cities and Communities,	Supports urban resilience, resource-efficient neighbourhoods, and inclusive city planning.
6	SDG 12: Responsible Consumption and Production	The efficient use of materials and adoption of construction practices that minimize waste and environmental impact.
7	SDG 13: Climate Action	Promotes deep decarbonization, greenhouse gas reduction, and climate adaptation resilience
8	SDG 15: Life on Land	Supports biodiversity, ecosystem preservation, sustainable forestry, and green landscapes

1st / 2nd Semester	Emerging Technology Course (ET) SMART BUILDING SERVICES AND SUSTAINABLE SYSTEMS	M26BETK105F/ 205F
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1. Prerequisites.

S/L	Proficiency	Prerequisites
1	Basic knowledge of science and mathematics	Studied in 10+2 level and implementation of the concepts through fundamentals
2	Familiarity with basic engineering drawing	The subject imparts ability to visualize spatial arrangements.
3	General awareness of buildings and infrastructure	Understanding of common utilities in homes/buildings.
4	Basic communication skills	Understand and interpret instructions, manuals, and maintenance records

2. Syllabus

SMART BUILDING SERVICES AND SUSTAINABLE SYSTEMS SEMESTER – I/II			
Course Code	M26BETK105F/205F	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L: T: P:TW:SL)	2:2:0: 20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
1. Learn the importance of sanitation, domestic water supply, and fire services.			
2. Understand the concepts of heat, ventilation and air conditioning.			
3. Develop technical and practical knowledge in Building Services.			
Module -1			
Water Supply Services for building:			
Basics of water supply for different building types, Simple water purification techniques, Water-saving methods and practices, Service connections: mains, sump, storage tanks, Simple layout plans for water supply systems in building.			
Plumbing services for building:			
Introduction to plumbing services, Basic plumbing, Types/sizes of pipes and pipe fittings and special setups for multi-storeyed buildings, Common materials, bathroom fixtures, and modern fittings (e.g., taps, mixers, showers)			
Module -2			
Heat Ventilation and Air Conditioning (HVAC):			
Basics of heat transfer and thermal insulating materials, Common methods of thermal insulation for roofs and walls.			
Ventilation: importance, types, and basic systems, Fundamentals of air conditioning and air cooling systems, Principles of Air conditioning, Types of ducting and air distribution methods, Essentials of air-conditioning system.			
Module -3			
Electrical Services for building:			
Basics of electricity and electrical supply (Single & Three-phase), Protective devices in buildings (fuse, MCB, RCCB, etc.), Electrical safety and types of earthing (pipe, plate, chemical), ISI standards and safety norms, Types of electrical wiring and cables used in buildings, Electrical layout planning for residential buildings, Components: Main board, distribution board, Basic principles of lighting and illumination.			
Fire Fighting services for building:			
Classification of buildings based on fire risk and occupancy, Common causes and spread of fire in buildings			
Fire protection systems: active and passive, Fire detection equipment: smoke detectors, heat sensors, alarms			
Fire suppression systems: sprinklers, extinguishers, hydrants, wet & dry risers, Escape route planning: fire stairs, doors, signage, fire safety provisions.			
Module -4			

Solar Energy Systems in Buildings:

Introduction to Solar Energy: Basics of solar radiation and photovoltaic (PV) principle, Solar potential in India, Solar Power Systems: Components of a rooftop solar system, Applications in Buildings: Rooftop solar electricity generation, Solar water heating systems, Solar streetlights and garden lighting, Solar-powered fans and pumps.

Rainwater Harvesting: Introduction to Rainwater Harvesting, Need and Importance of RWH in Modern Context, Basic Components of Rainwater Harvesting System, Types of Rainwater Harvesting Systems, Benefits of Rainwater Harvesting, Limitations and Challenges in Implementation.

Module -5**Engineering Services in Buildings:**

Introduction of Engineering Services, Vertical Transportation Systems: Lifts and escalators – types, safety norms, Cold and hot water supply systems, Electrical Systems: Overview of building wiring, power distribution, Heating Systems: Hot water boilers – types and usage.

Building Maintenance:

Introduction to Building Maintenance: Importance and scope, Types of Maintenance: Preventive: Regular inspections, servicing, Protective: Weatherproofing, anti-corrosion measures, Scheduled: Periodic maintenance routines, Contingency: Emergency repairs and breakdown response, Maintenance Planning: Planning tools and scheduling, Maintenance Information System (MIS), Maintenance Standards and Practices.

Text Books

1. Charangith shah, Water supply and sanitary engineering, Galgotia publishers.
2. E. G. Butcher, Smoke control in Fire-safety Design.
3. Energy Conservation Building Code – 2017 (with amendments up to 2020), Bureau of Energy Efficiency.

Reference Books:

1. National Building Code.
2. O. H. Koenigsberger, “Manual of Tropical Housing and Building”, Longman Group United Kingdom.

3. Teaching-Learning Process Strategies

S/L	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Multiple Representations	Introduce topics in various representations to reinforce competencies
5	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
6	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE)**

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Self-Learning (SL): If applicable, the teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The

faculty must collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE)

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

Cos	Description
M26BETK205F.1	Demonstrate the understanding of basic engineering services in buildings including water supply, HVAC, electrical, and solar systems.
M26BETK205F.2	Apply sustainable solutions in buildings through the use of rainwater harvesting, solid waste management, and energy-saving methods.
M26BETK205F.3	Identify and interpret safety systems and maintenance strategies including firefighting systems, accessibility features, and building upkeep procedures.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BETK205F.1	3						2				2
M26BETK205F.2	3					2					
M26BETK205F.3		3									
M26BETK205F	3	3				2	2				2

6. Mapping to Sustainable Development Goals (SDG)

Sl. No.	SDG	Justification
1	SDG 3: Good Health and Well-being	HVAC, Fire safety, Ventilation, Building maintenance
2	SDG 6: Clean Water and Sanitation	Water supply, Rainwater harvesting, Wastewater systems
3	SDG 7: Affordable and Clean Energy	Solar energy systems, Energy-efficient electrical layout
4	SDG 9: Industry, Innovation and Infrastructure	Engineering services in buildings, Lift systems, Automation in waste management
5	SDG 11: Sustainable Cities and Communities	Solid waste management, Fire safety, Accessibility, HVAC
6	SDG 12: Responsible Consumption and Production	Waste segregation, Composting, Energy-efficient lighting
7	SDG 13: Climate Action	Rainwater harvesting, Solar PV systems, Sustainable HVAC systems

I/ II Semester	Emerging Technology Course (ET) INTRODUCTION TO MACHINE LEARNING	M26BETK105G/ 205G
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Mathematics	Ability to understand simple arithmetic, percentages, averages, graphs, tables and basic equations used in introductory data analysis.
2	Computer Operations	Ability to operate a computer, manage files and folders, use spreadsheets, browse online resources and install or open basic software tools.
3	Programming Awareness	Familiarity with variables, simple logic, step-by-step problem solving and the role of programming in solving computational tasks.
4	Data Interpretation	Ability to read tabular data, identify rows and columns, compare values, observe simple patterns and interpret basic charts or scatterplots.

2. Syllabus

INTRODUCTION TO MACHINE LEARNING SEMESTER – I/ II			
Course Code	M26BETK105G/ 205G	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
Credits	03	Total Marks	100
		Exam Hours	03
Course Objectives:			
1. Introduce the fundamental idea of machine learning and its relationship with data science, artificial intelligence and traditional programming. 2. Enable students to distinguish supervised, unsupervised, semi-supervised and reinforcement learning using simple real-world examples. 3. Develop basic understanding of datasets, features, variables, training data, test data, data preparation and visualization in a machine learning workflow. 4. Introduce beginner-level machine learning algorithms such as regression, clustering, support vector machines, neural networks, decision trees and ensemble models. 5. Develop the ability to interpret basic model behaviour, bias, variance, model optimization and a simple Python-based model-building workflow.			
Module -1			
Foundations and Categories of Machine Learning: Meaning and need of machine learning, machine learning as learning from data, input command versus input data, self-learning, training data and test data, relationship among computer science, data science, artificial intelligence and machine learning, machine learning and data mining, supervised, unsupervised, semi-supervised and reinforcement learning with beginner-level examples. Textbook: Chapters 2 and 3, pp. 7-23.			
Module -2			
Data and the Machine Learning Toolbox: Data as the main input for machine learning, structured and unstructured data, tabular datasets, rows, columns, features, variables, vectors and matrices, basic scatterplots and visualization, beginner machine learning infrastructure, Python, Jupyter Notebook, NumPy, Pandas and Scikit-learn, role of algorithms and visualization in communicating results. Textbook: Chapter 4, pp. 24-33.			
Module -3			
Data Preparation and Regression Analysis: Data scrubbing, incomplete, incorrectly formatted, irrelevant and duplicate data, feature selection, row compression, setting up data for modelling, dependent and independent variables, regression analysis, linear regression and prediction, interpreting simple regression-based prediction problems. Textbook: Chapters 5, 6 and 7, pp. 34-63.			
Module -4			

Unsupervised Learning, Generalization and Classification Models: Clustering and k-means clustering, grouping similar data points, bias and variance, underfitting and overfitting, importance of model generalization, support vector machines as a beginner classification approach, margin, separation and simple classification intuition.
Textbook: Chapters 8, 9 and 10, pp. 64-84.

Module -5

Machine Learning Models and Beginner Implementation: Artificial neural networks overview, decision trees, ensemble modelling, development environment, building a model in Python, model optimization, interpreting model results, beginner-level pathway for continuing machine learning study using Python.
Textbook: Chapters 11 to 16 and Appendix, pp. 85-137 and 145-160.

TEXTBOOKS:

1. Oliver Theobald, Machine Learning for Absolute Beginners: A Plain English Introduction, Second Edition, Scatterplot Press, 2017. ISBN: 9781549617218.

REFERENCE BOOKS:

1. Andreas Lindholm, Niklas Wahlström, Fredrik Lindsten and Thomas B. Schön, Machine Learning: A First Course for Engineers and Scientists, Cambridge University Press, 2022.
2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani and Jonathan Taylor, An Introduction to Statistical Learning with Applications in Python, Springer, 2023.

VIDEO LINKS:

1. Google Developers, Machine Learning Crash Course: <https://developers.google.com/machine-learning/crash-course>
2. Kaggle Learn, Intro to Machine Learning: <https://www.kaggle.com/learn/intro-to-machine-learning>
3. Scikit-learn Getting Started Guide: https://scikit-learn.org/stable/getting_started.html

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture with Examples	Explain machine learning concepts using simple examples such as spam detection, price prediction, customer grouping and recommendations.
2	Tutorial Practice	Use tutorial hours for interpreting small datasets, identifying input/output variables and selecting suitable beginner-level algorithms.
3	Visual Learning	Use tables, scatterplots, flow diagrams and model workflow diagrams to understand data, features, prediction and model behaviour.
4	Case-Based Learning	Discuss short caselets on regression, clustering, classification, overfitting and model improvement.
5	Tool Demonstration	Demonstrate beginner-level use of Python/Jupyter Notebook, Pandas and Scikit-learn for building simple ML models.
6	Collaborative Presentation	Encourage small groups to explain one algorithm, compare learning categories or present a simple data-driven use case.

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE) for Theory Course with 3 credits

Components		Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
				50	20

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Self-Learning (SL): The teaching faculty shall motivate students to take up relevant online courses from recognized platforms. There shall not be any assessment of the Self-Learning component. The

faculty must collect certificates from students who successfully complete self-learning activities relevant to the course.

Semester End Examination (SEE)

1. Question paper will contain 8 questions. Each question is set for 20 marks. The medium of the question paper shall be English unless otherwise mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice.
3. The questions from Module 2 and 3 will not have any choice.
4. Each question will have a maximum of two sub-questions.
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks.

5. Course Outcomes (COs) and Mapping with POs/PSOs

Course Outcomes (COs)

COs	Description
M26BETK205G.1	Explain the fundamentals of machine learning, its relationship with data science and artificial intelligence, and the role of data-driven learning.
M26BETK205G.2	Distinguish supervised, unsupervised, semi-supervised and reinforcement learning using appropriate examples and problem contexts.
M26BETK205G.3	Interpret datasets in terms of features, variables, training data, test data and basic data preparation requirements for machine learning.
M26BETK205G.4	Analyze the purpose and working intuition of beginner-level machine learning models such as regression, clustering, support vector machines, neural networks, decision trees and ensemble models.
M26BETK205G.5	Apply a beginner machine learning workflow to outline model building, evaluation, optimization and communication of results using suitable tools.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BETK205G.1	2	-	-	-	1	-	-	-	-	-	-
M26BETK205G.2	2	2	-	-	1	-	-	-	-	-	-
M26BETK205G.3	2	2	-	-	2	-	-	-	-	-	-
M26BETK205G.4	2	2	1	-	2	-	-	-	-	-	-
M26BETK205G.5	-	2	2	-	3	-	-	-	1	1	1
M26BETK205G	2	2	2	-	3	-	-	-	1	1	1

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Introduces first-year students to foundational machine learning concepts, data literacy, analytical thinking and technology-enabled learning.
2	SDG 8: Decent Work and Economic Growth	Builds early awareness of emerging technology skills that support employability, digital transformation and future-ready technical careers.
3	SDG 9: Industry, Innovation and Infrastructure	Develops understanding of data-driven innovation, intelligent systems and modern computational tools used in industry and research.

1st /2nd Semester	Emerging Technology Course (ET) INTRODUCTION TO AI	M26BETK105H /205H
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1. Prerequisites

S/L	Proficiency	Prerequisites
1.	Basic Computer Literacy	Ability to use computers, operating systems, and common software applications.
2.	Fundamentals of Programming	Basic understanding of programming concepts such as variables, data types, input/output, and logical thinking (any programming language).
3.	Mathematical Foundations	Basic knowledge of algebra, logic, probability, and elementary statistics.
4.	Communication Skills	Ability to read, understand, and communicate technical information in English

2. Syllabus

INTRODUCTION TO AI SEMESTER – I/II			
Course Code	M26BETK105H/205H	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
Credits	03	Total Marks	100
		Exam Hours	03
Course Objectives:			
1. To introduce the fundamentals, history, and core concepts of Artificial Intelligence. 2. To familiarize students with the architecture and working principles of Large Language Models. 3. To develop the ability to create effective prompts for interacting with generative AI applications. 4. To expose students to AI ethics, emerging AI trends, and Power BI for data visualization and analysis. 5. To enable students to utilize AI-powered tools for solving academic and real-world problems.			
Module -1			
Overview of Artificial Intelligence: Introduction, Definitions of AI, Is Automating Intelligence is Possible, Man Vs. Computers, Simulation of Sophisticated and Intelligent Behaviour, Brief History: Brief History of AI, Branches of AI, Natural Language, Automated Reasoning, Visual Perception, Intelligent Agents, Major Components of Intelligent System. (Textbook 1:Chapter 1: 1.1 -1.13)			
			8 hours
Module -2			
Large Language Models : Introduction, Definition, Training, Token in the Language Model, Estimate the Cost of Running SaaS-based and Open Source LLM Models, Open Source LLM Models. Transformer and Transformer Block, Self Attention. The Future of LLM Communication (Textbook2:Chapter1) LearningMaterial: https://drive.google.com/drive/folders/1M8mDMeJiO0NTRJhDE2xnLD9-wB2ioY_G?usp=drive_link			
			8 hours
Module -3			
Prompt Engineering: Introduction to Prompt Engineering, Evolution of Prompt Engineering, Types of Prompts, Working of Prompt Engineering, Comprehending Prompt Engineering's Function in Communication, Advantages of Prompt Engineering,. (Textbook2:Chapter1)			
			8 hours
Module -4			
Trends in AI: AI and Ethical Concerns, Introduction to Power BI, Get Started with Power BI, Power BI concepts, Sign up for Power BI, Power BI data sources, Connect to a SaaS solution to Upload a local CSV file, Connect to Excel data that can be refreshed, Connect to a sample, Create a Report with Visualizations, Explore the Power BI portal. Practical component: Student Performance Analysis Using Power BI. LearningMaterial: https://drive.google.com/drive/folders/1M8mDMeJiO0NTRJhDE2xnLD9-wB2ioY_G?usp=drive_link			
			8 hours
Module -5			
Industrial Applications of AI: Introduction to Claude. Practical Component: Creating a Personalized Study Planner Using Claude AI, introduction to Perplexity. Practical Component To familiarize with			

Perplexity AI and to use it effectively for searching, learning, summarizing, and verifying academic information. introduction to NotebookLM, Use of NotebookLM to Organize, Summarize, and Learn from Study Materials

Learning Material: https://drive.google.com/drive/folders/1M8mDMeJiO0NTRJhDE2xnLD9-wB2ioY_G?usp=drive_link

8 hours

Text Books:

1. Munesh Chandra Trivedi, A Classical Approach to Artificial Intelligence, Second edition.
2. Ajantha Devi Vairamani and AnandNayyar, Prompt Engineering: Empowering Communication, 1st Edition, CRC Press, Taylor & Francis Group, 2024. (DOI:<https://doi.org/10.1201/9781032692319>).

Reference Books:

1. ReemaThareja, Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023.

VIDEO LINKS:

1. <https://nptel.ac.in/courses/106106226>
2. <https://www.youtube.com/watch?v=xXCszgfPN6Y>
3. <https://nptel.ac.in/courses/106101007>

3. Teaching-Learning Process Strategies

S/L	TLP Strategies:	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Problem-Based Learning (PBL)	Implement PBL to enhance analytical skills and practical application of competencies
5	Multiple Representations	Introduce topics in various representations to reinforce competencies
6	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
7	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation:

CIE Split up for Emerging Technology Course (ET)

	Components	Number	Weightage	Max. Marks
1	Internal Assessment - Tests (A)	3	50%	25
2	Term Work - TW (B)	2	50%	25
	Total Marks			50

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Term Work marks

Semester End Examination (SEE) For Theory Course with 3 credits

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.

Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BETK205H.1	Understand the fundamentals, history, branches, and intelligent systems of Artificial Intelligence.
M26BETK205H.2	Apply the concepts and working of Large Language Models, transformers, tokenization, and self-attention mechanisms.
M26BETK205H.3	Analyze prompt engineering techniques to effectively use generative AI tools for various applications.
M26BETK205H.4	Analyze AI ethics, recent AI trends, and develop interactive reports using Power BI for data visualization.
M26BETK205H.5	Design AI-based solutions using AI tools to support learning, research, and academic tasks.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BETK205H.1	3	2	-	-	-	-	-	2	-	-	2
M26BETK205H.2	3	2	-	1	2	-	-	-	-	-	2
M26BETK205H.3	2	3	2	-	3	-	-	2	1	2	3
M26BETK205H.4	2	3	3	2	3	-	-	3	2	2	2
M26BETK205H.5	2	2	2	1	3	2	-	3	2	2	3
M26BETK205H	2.4	2.4	2.3	1.3	2.8	2	-	2.5	1.6	2	2.4

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Promotes AI-assisted learning using Claude, Perplexity, NotebookLM, and Power BI to enhance personalized, inclusive, and lifelong learning.
2	SDG 8: Decent Work and Economic Growth	Develops AI, data analytics, and prompt engineering skills that improve employability and prepare students for AI-driven industries.
3	SDG 9: Industry, Innovation and Infrastructure	Introduces modern AI technologies, Large Language Models, and data visualization tools that support innovation and digital transformation.

1st /2nd Semester	Basic Science Course (BS) APPLIED PHYSICS LAB FOR CSE STREAM	M26BPHYLS106/ 206
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1. Prerequisites

S/L	Proficiency	Prerequisites
1.	Modern Physics and Optics	Involves understanding of wave optics, interference, diffraction, photoelectric effect, and quantum energy relations.
2.	Electronics and Semiconductor Physics	Requires knowledge of semiconductor behavior, electronic components, device characteristics, and circuit analysis.
3.	Electromagnetism and Electrical Circuits	Focuses on magnetic fields, electromagnetic induction, AC/DC circuit behavior, resonance, and impedance.
4.	Material Science and Dielectric Behavior	Emphasizes material properties like resistivity, dielectric constant, and band structure in solids.
5.	Computational and Analytical Skills	Enhances interpretation through simulations, data visualization, motion analysis, and statistical processing using digital tools.

2. Syllabus

Applied Physics lab for CSE stream			
Course Code	M26BPHYLS106/206	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L: T: P:TW:SL)	0:0:32: 0:00 = 32 Hours	SEE Marks	50
		Total Marks	100
		Exam Hours	03
Credits	01		

List of Experiments

1.	LASER – Wavelength Using Diffraction Grating: Scenario: High-Speed Internet Data Transmission: Modern cloud services, video streaming and online applications depend on high-speed data transmission through optical fiber networks. Semiconductor diode LASERs are used as light sources to carry digital information through these fibers, and their operating wavelength is an important parameter of the optical link. Determine the wavelength of the given semiconductor diode LASER using a diffraction grating of known grating element.
2.	Optical Fiber – Acceptance Angle and Numerical Aperture: Scenario: Data Transfer Between Data Centers: Large data centers exchange huge volumes of digital information through optical fibre networks. Efficient transmission requires the optical fibre to accept sufficient light from the source and guide it through the fibre. Determine the acceptance angle and numerical aperture of the given optical fibre to evaluate its light-coupling capability.
3.	Magnetic Flux Density of a Circular Coil: Scenario: Magnetic Position Sensing in Computer-Controlled Systems: Computer-controlled systems can use magnetic sensors to detect the position or movement of components. A current-carrying coil produces a magnetic field that can be detected by such sensors, and the field strength varies with position. Determine the magnetic flux density at different points along the axis of the given circular coil and study its variation with distance.
4.	Resistivity of a Semiconductor – Four-Probe Method: Scenario: Semiconductor Chips Used in Computing Devices: Processors, memory devices and other computing hardware are fabricated using semiconductor materials. The electrical properties of these materials directly influence the performance of electronic components used in computers and digital systems. Determine the resistivity of the given semiconductor using the four-probe method and evaluate its electrical conducting property.
5.	I–V Characteristics of a Bipolar Junction Transistor: Scenario: Transistor-Based Switching in Digital Hardware: Digital computing hardware uses semiconductor switching devices to represent and process binary information. A transistor can operate as an electronic switch when appropriately biased, with its behaviour depending on the applied voltages and currents. Determine the input and output I–V characteristics of the given bipolar junction transistor and identify its operating regions.
6.	Dielectric Constant by Charging and Discharging:

Scenario: Capacitors in Computer Power Supplies: Computers and servers require stable power supplies to operate reliably. Capacitors are used in these systems for energy storage, filtering and smoothing of electrical signals. The material between the capacitor plates influences its charge-storage capability. Determine the dielectric constant of the given material by studying the charging and discharging behavior of the capacitor.
7. Photodiode – Power Responsivity: Scenario: Optical Data Reception: Digital information transmitted through an optical fiber must be converted back into electrical signals at the receiving end. A photodiode can detect the incoming light and produce an electrical response corresponding to the received optical power. Study the characteristics of the given photodiode and determine its power responsivity to evaluate its effectiveness as an optical detector.
8. Frequency Response of Series and Parallel LCR Circuits: Scenario: Signal Filtering in Computer Systems: Computing systems often process signals containing components of different frequencies. Filtering is required to suppress unwanted frequency components and retain the required signal. LCR circuits can exhibit frequency-selective behavior that is useful for understanding the basic principles of filtering. Determine the frequency response of the given series and parallel LCR circuits and identify their resonance frequencies.
9. Planck's Constant Using LEDs: Scenario: LED Indicators in Computer Hardware: LEDs are commonly used as status indicators in computers, routers, keyboards and other digital devices. LEDs of different colors emit light with different wavelengths because the energy associated with the emitted photons is different. Using LEDs of different wavelengths, determine Planck's constant from the relationship between their threshold voltage and emitted wavelength, and compare the experimental value with the accepted value.
10. Fermi Energy of Copper: Scenario: Copper Interconnects in Computer Hardware: Copper is widely used in computer hardware for electrical connections, printed circuit board tracks and interconnects because of its high electrical conductivity. This conductivity is associated with the behaviour of electrons within the material. Using the given experimental data, determine the Fermi energy of copper and relate it to the behavior of conduction electrons.
11. Identification of Circuit Elements in a Black Box: Scenario: Diagnosing an Unknown Computer Hardware Module: During computer hardware testing or repair, a circuit module may be available without a circuit diagram or component labels. Identifying the components and their values is necessary before determining how the module functions within the system. Identify the circuit elements present inside the given black box and determine the values of the unknown components using suitable electrical measurements.
12. Energy Gap of a Semiconductor: Scenario: Semiconductor Devices Used in Computing Hardware: Computing devices contain semiconductor components whose electrical behavior depends on temperature and material properties. The energy gap is an important property that influences the behavior of semiconductor materials used in electronic hardware. Determine the energy gap of the given semiconductor experimentally by studying its electrical behavior at different temperatures.
13. Interactive Physical Simulations: Scenario: Simulating a System Before Implementing It. Computer-based simulation is widely used to study the behavior of systems before developing a physical prototype. By changing parameters in a simulation, different operating conditions can be tested quickly and safely. Using an interactive physics simulation, investigate the given physical phenomenon, vary the relevant parameters, observe their effects and interpret the resulting behavior.
14. Single-Qubit and Multiple-Qubit Quantum Gate Simulation: Scenario: Quantum Computing for Future Information Processing: Quantum computers process information using quantum bits instead of conventional binary bits. Quantum gates manipulate qubit states and form the basic operations used in quantum algorithms. Using a quantum simulation platform, implement single-qubit and multiple-qubit quantum gates, observe the resulting qubit states and interpret their operations.
15. Eigen Wave Function and Probability Density Using Spreadsheet: Scenario: Electron Behavior in Nanoscale Computer Hardware: As computer processors become smaller, nanoscale effects become increasingly important. At very small dimensions, the behavior of electrons is governed by quantum mechanics, and their position is described in terms of probability. Using a spreadsheet, determine the eigen wave function and corresponding probability density of the electron and interpret the allowed quantum states of the given system.

3. Teaching-Learning Process Strategies

1.	Laboratory Learning	Utilize the facilities available in the laboratories to understand the behavior of the materials by performing experiments.
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4. Assessment Details (both CIE and SEE)**CIE for Practical Course.**

- CIE marks for a practical shall be 50 marks.
- The split up of CIE marks for conduction/record/journal and test is to be split in the ratio 60:40.
- Conduction of each experiment shall be evaluated for 20 marks.
- The record write-up for the individual experiment shall be evaluated for 10 marks.
- Total marks scored for record writing and conducting the experiment shall be summed up to 30 marks (60% of the maximum marks).
- Two tests, each for 100 marks, shall be conducted, and the final test marks shall be scaled down to 10 marks (20% of the maximum marks).

Test Marks distribution for the Practical Course.

Sl. No.	Description	% Marks	In Marks
1	Write-up, Conduction, Result	60%	60
2	Viva-Voce	40%	40
Total		100%	100

Continuous Internal Evaluation (CIE) for Practical Lab Course with 1 Credits

Sl. No.	Components	Number	Weightage	Max. Marks	Min Marks
1	Conduction & Record (A)	1	60%	30	12
2	Lab IA test (B)	1	20%	10	---
3	Project Work (C)	1	20%	10	---
Total Marks				50	20

$$\text{Final CIE Marks} = A + B + C$$

A = Average of marks for all the experiments

B = Lab Internal Assessment marks

C = Project work marks

SEE for the Practical Course:

- SEE marks for a practical course shall be 50 marks.
- The practical course is evaluated for 100 marks, and the scored marks shall be scaled down to 50 marks.
- A change of experiment/program is allowed only once, and 20% of the marks allotted to the procedure/write-up part will be zero.
- The duration of SEE shall be 3 hours.

Marks distribution for the Practical Course

SL. No.	Description	% Marks	Marks
1	Write-up	20%	20
2	Conduction and Result	60%	60
3	Viva-Voce	20%	20
Total		100%	100

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
CO1	Explain the relation between the working principles and practical measurements in electromagnetism, electronics and Optics.
CO2	Apply the working principles of the given experiments and perform the experiments using required apparatus in Optics, electromagnetism and electronics.
CO3	Analyse the experimental results through interpretation of graphical/ theoretical data demonstrate and document the same.
CO4	Design and implement a physics-based mini project for an engineering application and write the report.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3										
CO2	3										
CO3								2			
CO4			3								
Average of CO'S	3		3					2			

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Hands-on experiments, virtual labs, Quantum tools, and spreadsheet modelling drive active learning, equal educational access, and practical problem-solving.
2	SDG 7: Affordable and Clean Energy	Exploring bandgaps, Fermi energy, photodiodes, dielectrics, and LEDs provides the core principles for solar photovoltaics, energy storage, and low-loss electronics.
3	SDG 9: Industry, Innovation, and Infrastructure	Practical training in Fibre optics, Laser diffraction, Transistors, LCR resonance, and Quantum gates builds key skills in photonics, communications, smart grids, and Quantum technology.
4	SDG 12: Responsible Consumption and Production	Four-probe testing, dielectric analysis, and component diagnosis develop expertise in quality control, troubleshooting, and extending electronic product lifespans.
5	SDG 13: Climate Action	Characterizing energy-efficient LEDs and Photodiodes directly advances technologies designed to reduce carbon emissions and monitor clean energy systems.
6	SDG 11: Sustainable Cities and Communities	Applying resonance circuits, power-factor correction, and fibre optics delivers the core hardware foundation for smart grids, intelligent transport, and connected cities.

1st/ 2nd Semester	Engineering Science Lab (ESL) C PROGRAMMING LAB	M26BECPL107/ 207
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Computer Skills	Understanding how to use files, folders, and applications. Familiarity with installing and using software.
2	Logical Thinking and Problem Solving	Ability to break problems into steps. Familiarity with if/then logic or flowcharts is a bonus.
3	Basic Math Skills	Comfort with simple arithmetic (addition, subtraction, multiplication, division). Basic understanding of variables and equations.
4	Typing Skills	Not required, but being comfortable with a keyboard will improve your coding speed and reduce frustration.

2. Syllabus

C PROGRAMMING LAB SEMESTER – I/II			
Course Code	M26BECPL107/207	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	(0:0:32:0:0)=32Hrs	SEE Marks	50
Credits	01	Total Marks	100
		Exam Hours	03
Course Objectives:			
- Develop an in-depth knowledge of functional and logical concepts of C Programming with basic syntax and semantics. - Enhance students' analytical and logical thinking skills, enabling them to translate real-world problems into algorithmic solutions and then into working C code. - Equip students with the foundational skills to design, write, and debug C programs, as well as foster problem-solving abilities through programming.			
Sl. No.	Scenario-Based Experiment		
1	A local stationery shop wants a simple billing helper for its counter computer. Write a C program that acts as a calculator: it should read two numbers and an operator symbol (+, -, *, /) chosen by the shopkeeper, perform the requested arithmetic operation, and print the result. The program must handle an invalid operator and division by zero gracefully instead of crashing.		
2	A civil engineering team is modelling the trajectory of water from a fountain nozzle, which follows a quadratic path $ax^2 + bx + c = 0$. Write a C program that accepts the coefficients a, b, and c from the design engineer and computes the roots of the equation, correctly identifying and reporting whether the roots are real and distinct, real and equal, or complex/imaginary, along with an appropriate message for each case.		
3	You are hired by the local electricity board to automate their monthly billing process. The board charges 80 paise/unit for the first 200 units, 90 paise/unit for the next 100 units, and Rs. 1/unit beyond 300 units, with a minimum meter charge of Rs. 100 for every consumer. If a consumer's bill exceeds Rs. 400, an additional 15% surcharge is applied on the total amount. Write a C program that reads a consumer's name and units consumed, and prints an itemized electricity bill.		
4	A textile design company wants to generate a symmetric diamond weaving pattern for a new fabric print, where each row of the pattern is represented by numbers indicating thread density. Write a C program that reads the number of rows N from the designer and prints the numeric pyramid pattern (e.g., 1 1 2 1 1 2 3 2 1 (up to the Nth row) that will guide the weaving machine.		
5	A library has digitized its book records and stored the accession numbers of all books on a shelf in sorted (ascending) order. To help the librarian quickly locate a book, write a C program that implements the Binary Search algorithm on the sorted array of accession numbers, and reports the position of the searched number or informs the librarian that the book is not available.		

6	A game development studio needs to combine two transformation matrices (used for scaling and rotating 2D game objects) into a single matrix before applying it to a sprite. Write a C program that reads two matrices from the developer, first validates whether multiplication is possible (i.e., the number of columns of the first matrix equals the number of rows of the second), and if valid, computes and displays the product matrix; otherwise it should print an appropriate error message.
7	An embedded systems company is building firmware for a low-cost microcontroller that does not have a math co-processor and hence cannot rely on the standard math library. Write a C program that computes $\sin(x)$ or $\cos(x)$ using the Taylor series approximation up to a reasonable number of terms, then compares the computed value against the built-in library function's result, and prints both values along with an inference about the accuracy of the approximation.
8	The sports committee of a college has collected the scores of N participants in an athletics event and wants them arranged in ascending order to prepare the final ranking sheet. Write a C program that reads the N scores and sorts them using the Bubble Sort technique, displaying the sorted list of scores.
9	A college's online registration portal needs to validate and process usernames entered by students: check whether two usernames are identical, merge a username with a default domain suffix, and determine the length of the username for a database field limit. Write a C program using user-defined functions (with appropriate parameter passing techniques) to compare two strings, concatenate two strings, and find the length of a string, without using built-in string library functions.
10	A class teacher wants a quick tool to analyze the internal assessment marks of her class of N students. Write a C program using structures to read each student's name and marks, compute the class average, and then list out the names of students who scored above the average and those who scored below the average.
11	An environmental monitoring station records N temperature readings (ex: as real numbers) from a sensor throughout the day and needs a quick statistical summary for its daily report. Write a C program using pointers to compute the sum, mean, and standard deviation of the N sensor readings stored in an array.
12	An office assistant frequently needs to create backup copies of important text documents before editing them. Write a C program that reads the source file name and the destination (backup) file name from the user, and copies the contents of the source text file into the destination file character by character, reporting success or an appropriate error if the source file cannot be opened.
Text Books: 1. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, 2nd Edition, Prentice Hall of India. 2. Computer Fundamentals and Programming in C, Reema Thareja, Oxford University, 3rd Edition. Reference Books: 1. E. Balaguruswamy, Programming in ANSI C, 8th Edition, Tata McGraw-Hill.	

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Interactive Demonstration	Students observe syntax, logic, and output flow in real-time to build a conceptual foundation.
2	Hands-on Practice	Students apply concepts by solving lab exercises independently on computers. Practice focuses on reinforcing learning by executing the programs.
3	Problem-Based Learning (PBL)	Students are given real-world scenario-based problems (e.g., billing systems, sensor data analysis, file handling) to solve using C, fostering critical thinking and application skills.
4	Incremental Learning Approach	Concepts are taught from simple (variables, loops), modular programming (functions), and structural programming to break down complex problems into smaller, manageable parts.
5	Lab Reports	Students prepare reports summarizing their lab experience. These typically include: (1) Program, (2) Output.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE)**

Sl. No.	Components	Number	Weightage	Max. Marks	Min Marks
1	Conduction & Record (A)	1	60%	30	12
2	Lab IA test (B)	1	20%	10	---
3	Project Work (C)	1	20%	10	---
Total Marks				50	20

Final CIE Marks = A + B + C

A = Average of marks for all the experiments

B = Lab Internal Assessment marks

C = Project work marks

SEE for the Practical Course

- SEE marks for a practical course shall be 50 marks.
- The practical course is evaluated for 100 marks, and the scored marks shall be scaled down to 50 marks.
- A change of experiment/program is allowed only once, and 20% of the marks allotted to the procedure/write-up part will be zero.
- The duration of SEE shall be 3 hours.

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BECPL107/207.1	Interpret real-world scenarios as mathematical problems and develop C programs using basic knowledge of syntax and appropriate conditional and control structures.
M26BECPL107/207.2	Apply the knowledge of modular programming to decompose scenario-based problems into functions, and use arrays to solve problems involving matrices, searching, and sorting using C programming.
M26BECPL107/207.3	Implement structural programming and file operations using pointers to develop applications for real-world scenarios and effectively document them.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
M26BECPL107/207.1	3	-	-	-	-	-	-	-	-	-	-	3	-
M26BECPL107/207.2	3	3	2	-	3	-	-	-	-	2	-	-	3
M26BECPL107/207.3	3	3	2	-	3	-	-	-	-	2	-	3	-
M26BECPL107/207	3	3	2	-	3	-	-	-	-	2	-	3	3

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	Quality Education	The course promotes computational thinking, problem-solving, and digital literacy by grounding programming exercises in real-world contexts, empowering students with technical skills crucial for a knowledge-based society.
2	Decent Work and Economic Growth	By learning to translate real-world scenarios into C programs, students become industry-ready, opening opportunities for careers in IT, data science, AI, and automation — fields that contribute to economic growth.
3	Industry, Innovation, and Infrastructure	Scenario-based C programming skills (billing systems, sensor analysis, file handling) support innovation and technological development, including areas like software engineering, automation, IoT, and AI-based infrastructure.

1st / 2nd Semester	Ability Enhancement Course (AE) INNOVATION, DESIGN THINKING AND INTERDISCIPLINARY PROJECT WORK	M26BIDTK108/ 208
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Science knowledge	Understands basic mathematics and science concepts to analyze problems, apply logical thinking, and develop practical engineering solutions
2	Problem-Solving Skills and Computer knowledge	Ability to analyze challenges logically and apply basic problem-solving frameworks. Uses computers, office software, and the internet for research, documentation, presentations, and effective project management.
3	Communication and Collaboration Skills	Communicates ideas clearly through speaking, writing, presentations, and discussions for effective teamwork and project documentation.
4	Teamwork and adaptability	Works effectively with team members, shares responsibilities, respects diverse opinions, and contributes toward achieving common project goals

2. Syllabus

INNOVATION, DESIGN THINKING AND INTERDISCIPLINARY PROJECT WORK SEMESTER I/II			
Course Code	M26BIDTK108/208	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	0:0:2	SEE Marks	50
Total Hours of Pedagogy	25	Total Marks	100
Credits	01	Exam Hours	03

Course Objectives This course will enable students to:

1. Introduce students to the fundamentals of design thinking as a human-centered, iterative approach to innovation and creative problem solving.
2. Develop an understanding of design tools, frameworks, and methodologies that facilitate effective ideation, prototyping, and user-centered design in diverse contexts.
3. Foster critical thinking, analytical reasoning, and empathy, enabling students to identify and frame real-world problems from multiple user perspectives.
4. Enhance collaboration, communication, and creativity through hands-on team-based design projects and real-world scenario applications.
5. Equip students with practical skills in prototyping, testing, and iterative design, preparing them to apply design thinking in academic, social, and entrepreneurial settings.

Course Structure and Weekly Plan

Weeks	Modules & Activities	Key Deliverables
Week 1-3	Orientation, Team Formation & Design Thinking Fundamentals - Introduction to Social Entrepreneurship, Innovation & Interdisciplinary approach. Design Thinking process: (Empathize–Define–Ideate–Prototype–Test), Group discussions: on design thinking process - Ice-breaking, team-building, and theme selection activities - Formation of Student Teams (<i>4-6 Members</i>) and Mentor Allocation	Team list, theme area, and initial idea sketch
Week 4-5	Empathy and Field Exploration - Visits to villages, industries, NGOs, public offices, etc. - Stakeholder interviews, observations, and empathy mapping - Recording interactions in the prescribed activity book	Field visit reflections and stakeholder interaction documentation
Week 6-8	Problem Definition and Framing - Categorization and group discussions on field data - Framing challenge statements using <i>How Might We</i> approach - Framing objectives & expected outcomes. - Affinity Mapping, Problem Tree analysis - How to search for prior work (journals, patents, research project, case studies). Understanding user needs	Clearly defined problem statement, user insights, and literature survey report
Week 9-11	Ideation and Concept Design - Brainstorming {mind mapping, 5W1H (what, who, when, where, why, and	Shortlisted idea, design

	how) SCAMPER}, and idea filtering, - Selection of feasible, eco-friendly, and interdisciplinary ideas - Rough sketches, block diagrams, flowcharts, resource planning - Defining team roles and work breakdown structure	document (flowcharts, sketches), resource plan
Week 12-13	Prototype Development (Stage 1) - Prototyping using ATAL Idea Lab/Makers Space/Thinker CAD/Figma - Development of subsystems/modules, integration, debugging - Peer and mentor reviews	Subsystem demonstrations, prototype development
Week 14	Testing, Validation, and Iteration - User testing and feedback collection - Refinement and iteration of prototypes - Analysis of performance, failures, limitations - Preparation of business/sustainability model	Testing report, feedback form, business model draft, Iteration Summary
Week 15-16	Final Demo, Documentation and Social Pitch - Innovation showcase and social pitch to jury - Final presentation with impact assessment, prototype demo, & sustainability plan/ solution. - Submission of final documentation and reflection journals	Final prototype model, Report, presentation, peer-team reflections
Textbooks 1. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve Apply", Springer, 2011 2. Yousef Haik and Tamer M. Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011. 3. Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).		

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Activity based learning & Experiential learning	Students learn by performing hands-on activities, experiments, and practical tasks to apply theoretical concepts in real-world engineering situations.
2	Group Learning	Students collaborate through discussions, brainstorming to analyze problems, generate ideas, and develop innovative engineering solutions
3	Case studies	Students learn through case studies for formulations of problems using field or literature survey and brainstorm to convert ideal into a prototype.
4	Project Based learning	Students work in multidisciplinary teams to design, develop, test, and present innovative solutions for real-world engineering and societal challenges.
5	Use of IDT Framework	Students apply design thinking principles and utilize Atal/Maker Spaces to prototype, test, refine, and validate innovative engineering solutions

4. Assessment Details (both CIE and SEE)

Component	Marks	Description
Continuous Internal Evaluation (CIE)	50	Based on weekly progress, fieldwork, documentation, and teamwork documented in activity book
Semester End Examination (SEE)	50	Based on prototype demonstration, presentation, and viva

Continuous Internal Evaluation (CIE) – 100 Marks

Sl. No.	CIE Parameter	Marks	Description
1	Orientation, Team formation and Communication skills	10	Participation in orientation, teamwork, and communication activities
2	Empathy & Field Exploration Documentation	15	Quality of stakeholder interviews, empathy mapping, activity book entries
3	Problem Definition, Literature Survey & Framing	15	Clarity of problem statements, user insights, prior work reference

4	Ideation, Mind Mapping & Design	20	Creativity, brainstorming participation, idea filtering, design clarity
5	Prototype Development, Testing & Iteration	25	Quality and creativity of prototype/model, testing, and iteration
6	Teamwork, Journal, and Engagement	15	Peer and mentor evaluation, teamwork, journal updates
Total		100	Minimum to Qualify for SEE: 40/100 (CIE $\geq$ 40)

Semester End Examination (SEE) – 100 Marks

SEE conducted jointly by one Internal and one Internal/External from Industry/External Examiner

S/L	Parameter	Marks	Description
1	Prototype / Solution Demonstration	30	Functionality, creativity, and use of lab tools
2	Final Presentation / Social Pitch	20	Clarity, Storytelling, problem–solution fit, visual aids
3	Business Model/Sustainability Plan	10	Feasibility, scalability, alignment with SDGs
4	Documentation Report / Portfolio	20	Structure, reflections, stakeholder inputs
5	Innovation ,Q& A	20	Individual understanding and creativity
Total		100	

Submission Requirements

1. **Team wise Activity Book (Handwritten)** – All stages documented with mentor signatures
2. **Prototype or Working Model**(Physical or Virtual Model)
3. **Team Wise Final Project Report**(handwritten, Use of MS office or equivalent AI Tools)
4. **Team wise Final Presentation**(PPT/PDF – hard and soft copy)
5. **Poster** (A3 size)

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BIDTK108.1	Empathize with community and industry problems to define meaningful challenges.
M26BIDTK108.2	Apply design thinking and interdisciplinary principles to develop user-centric, innovative solutions.
M26BIDTK108.3	Build and test digital or functional prototypes using the Atal Idea Lab/Tinkering Lab/Makers Space.
M26BIDTK108.4	Demonstrate teamwork, project management, and presentation skills through collaborative work.
M26BIDTK108.5	Pitch socially relevant, sustainable, and scalable solutions with impact analysis.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BIDTK108.1	3						2				
M26BIDTK108.2	3								3		
M26BIDTK108.3		3			3		2				
M26BIDTK108.4	3				3						
M26BIDTK108.5		3				2				3	3
M26BIDTK108	3	3			3	2	2		3	3	3

6. Mapping to Sustainable Development Goals (SDG):

Sl.No	SDG	Justification
1	SDG 4:Quality Education	Promotes experiential, project-based, and lifelong learning through innovation and design thinking.
2	SDG 9:Industry, Innovation, and Infrastructure	Develops innovative solutions, prototypes, and engineering designs for societal and industrial challenges.
3	SDG 17:Partnerships for the Goals	Fosters teamwork, interdisciplinary collaboration, and shared innovation—key to achieving all SDGs.

4	SDG 11: Sustainable Cities and Communities	Enables students to frame user-centered problems and design community-driven and sustainable solutions.
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1st / 2nd Semester	Humanities (HS) PROFESSIONAL ENGLISH -1	M26BENGK109
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic knowledge of English grammar and vocabulary	Students should have a foundational understanding of sentence structure, parts of speech, tenses, and commonly used vocabulary.
2	Familiarity with general writing formats	Prior exposure to writing simple paragraphs, letters, or essays at the school level helps ease the transition into structured and formal writing.
3	Ability to comprehend spoken English	Students should be able to follow general English conversations, classroom instructions, and audio content, which will be enhanced further in listening modules.
4	Fundamental computer and internet usage skills	Basic skills such as using a word processor, browsing the web, and using email are essential for completing blog writing, document formatting, and online communication activities.

2. Syllabus

Professional English-1 Semester I			
Course Code	M26BENGK109	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	1:0:0:0:0=16	SEE Marks	50
		Total Marks	50
Credits	01	Exam Hours	1
Course Objectives:			
To develop active listening skills by practicing various listening activities, understanding the barriers to effective listening, and applying strategies to enhance comprehension and attention. To build paragraph writing proficiency through structured practice in narrative, descriptive, cause-effect, and comparison formats, focusing on coherence, unity, and the use of transitions. To introduce students to formal and digital communication including email, blog writing, memos, circulars, and notices with emphasis on clarity, tone, and purpose. To equip students with the ability to produce technical documents such as summaries, abstracts, project documentation, reports, and technical proposals aligned with academic and professional standards.			
Module 1: SPEAKING PRACTICE (PHASE-1)			
UNIT I (a): Self-Introduction			
- Importance of professional self-introduction in academic and workplace contexts - Structuring an effective self-introduction (Personal, Academic, Skills, Goals) - Elevator pitch development (30–60 seconds format) - Highlighting strengths, achievements, and areas of interest effectively - Voice modulation, confidence, and body language during introduction - Tailoring self-introduction for academic, networking, and interview contexts			
UNIT I (b): Listening Activities:			
Advantages of active listening; Disadvantages of poor listening; Use of AV modes for awareness of different accents			
Module -2			
UNIT II (a): Just-A-Minute (JAM) Session			
- Introduction to JAM format and evaluation parameters - Idea generation techniques for impromptu speaking - Structuring short spontaneous responses (Opening–Point–Closing) - Fluency building and hesitation control techniques - Handling unfamiliar or abstract topics - Confidence, clarity, and time-management skills			
UNIT (b): Public Speaking Techniques			
A. Foundations of Public Speaking			

• Overcoming stage fear and confidence building • Audience analysis and purpose identification • Structuring a speech (Opening–Body–Closing) • Voice modulation, tone, pace, pauses, articulation • Body language, gestures, posture, and eye contact
B. Professional Speaking Formats
• Extempore speaking techniques • Presentation skills using visual aids • Storytelling for impact • Persuasive speaking methods • Handling Q&A sessions effectively
Module -3
UNIT 3: Paragraph writing: Structure, Construction of a paragraph, Narrative, Descriptive, Comparisons and Contrasts, Cause and Effect, Facts and figures; Use of transitions and connecting devices.
Module -4
UNIT 4: Email writing, Blog writing, Technical and Academic writing basics. Memo, circular, notice. Project documentation, writing of summary, abstract.
Module -5
UNIT 5 (a): Verbal Ability Essentials (Phase 1) (Note: Only placement-focused areas)
• Sentence Correction (Sub-Verb Agreement, articles, prepositions, idioms and phrases, phrasal verbs) • Tense forms, Clause Analysis • Vocabulary in Context • Cohesive Devices • Synonyms & Antonyms
(b) Reading Comprehension (Beginner & Intermediate Levels):
a) Skimming b) Scanning c) Intensive Reading d) Extensive Reading
REFERENCE BOOKS: 1. Sanjay Kumar & Pushp Lata – Communication Skills (Oxford University Press) 2. N. P. Sudharshana & C. Savitha – English for Engineers (Cambridge University Press) 3. Meenakshi Raman & Sangeeta Sharma – Technical Communication: Principles and Practice (Oxford University Press) 4. Practical English Usage by Michael Swan, Oxford University Press. 5. Technical communication by Gajendra Singh Chauhan, Cengage Learning India Recommended Digital Learning Resources: TED Talks – Public speaking, leadership, and communication models. British Council LearnEnglish – Listening, pronunciation, grammar, and vocabulary practice. Grammarly – Writing support for emails, reports, and academic writing. LinkedIn Learning – Professional communication, presentation skills, and career readiness modules. Cambridge Dictionary (Online) – Pronunciation and vocabulary support.

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Deliver key writing and communication concepts through engaging lectures using examples, concept maps, and structured presentations to establish core understanding.
2	Audio-Visual Aids	Use videos, podcasts, and recorded talks for listening skill development and to model formal/informal communication formats (e.g., email etiquette) and VTU software accessible through MITM library.
3	Collaborative Learning	Promote peer editing, group paragraph construction, and blog-writing teams to foster cooperative skills and knowledge sharing.

4	Real-World Application	Integrate real-life writing tasks like drafting emails, memos, proposals, and project summaries to connect learning with workplace needs.
5	Flipped Classroom Technique	Share writing guides, grammar resources, or sample documents before class; use class time for writing exercises and critique sessions.
6	Hands-on Writing Activities	Practice structured writing tasks in class: paragraph building, report writing, summary/abstract writing, and peer-review sessions.
7	Mini Projects and Portfolios	Assign projects like blog series creation, documentation of a mock project, or technical proposal writing; compile student work into portfolios.
8	Problem-Based Learning (PBL)	Pose real-world communication challenges (e.g., crisis memo, product summary, or report on a lab experiment) to stimulate analytical and creative writing.
9	ICT-Enabled Teaching Tools	Use Google Docs for collaborative editing, Grammarly for feedback, LMS tools for submissions/quizzes, and blogs for publishing content.

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation:

CIE Split up for Professional Course (PC)

Components		Number	Weightage	Max. Marks
1	Internal Assessment - Tests (A)	3	50%	25
2	Term Work - TW (B)	2	50%	25
Total Marks				50

Final CIE Marks=(A) + (B)

A = Average of best two Test marks

B = Average of two Term Work marks

Semester End Examination:

1. Question paper pattern will be ten questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. There shall be 2 question from each module, each of the two questions under a module (with a maximum of 3 sub questions), may have mix of topics under that module if necessary.
3. The students have to answer 5 full questions selecting one full question from each module.
4. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BENGK109.1	Develop effective communication skills through active listening, structured writing, and the use of appropriate formats for academic and professional contexts.
M26BENGK109.2	Apply principles of technical writing to prepare clear, concise, and coherent documents such as emails, reports, proposals, summaries, and project documentation.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M26BENGK109.1	3	2	-	-	-	-	-	-	2	3	2	2
M26BENGK109.2	3		2	-	2	-	-	-	2	3	2	2

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	The course promotes essential communication and technical writing skills, improving students' ability to understand, express, and document knowledge effectively.

2	SDG 8: Decent Work and Economic Growth	Effective writing and listening are critical workplace skills, enhancing employability, professionalism, and career growth.
3	SDG 9: Industry, Innovation and Infrastructure	Technical documentation, proposals, and reports are vital for innovation, project development, and building efficient industrial practices.
4	SDG 17: Partnerships for the Goals	Collaborative writing, peer review, and team-based communication activities build skills necessary for effective teamwork and global cooperation.

1st / 2nd Semester	Humanities Science Course (HS) BIOLOGY FOR ENGINEERS	M26BBEK110/ 210
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Knowledge of Biology	A basic understanding of high school-level biology concepts can be beneficial. This includes knowledge of cell structure, basic physiology, and fundamental biological processes.
2	Basic Knowledge of Biochemistry	Familiarity with major biological molecules and their application (carbohydrates, proteins, lipids, nucleic acids, vitamins, enzymes, and hormones).
3	Basic Knowledge of Mathematics and Physics	Understanding the human anatomy and physiological systems in comparison with bioengineering principles.
4	Basic Concepts of Design	Understanding of basic design and system thinking, which will help in bioengineering design and nature-bioinspired materials and mechanisms.
5	Engineering Fundamentals	Ability to analyze and apply basic engineering principles to solve biological problems.

2. Syllabus

BIOLOGY FOR ENGINEERS SEMESTER – I/ II			
Course Code	M26BBEK210	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	16:0:0:0:0 = 16 Hours	SEE Marks	-
Credits	00	Total Marks	50
		Exam Hours	00
Course objectives: - To acquaint the students with fundamental biological principles and their application to bioengineering. - To enable the students to understand the bio-design principles to create novel devices and structures. - To show the students how biological systems can be re-designed as substitute products for natural systems. - To encourage students to create an interdisciplinary view of biological engineering.			
Module -1			
CELL BIOLOGY: Introduction to cell (Types, structure, and major functions of Cells and Cell Organelles) Stem cells and their application. Bio-molecules: Properties and functions of Carbohydrates, Nucleic acids, Proteins, Lipids, Enzymes, Vitamins, and Hormones.			
3 Hours			
Module -2			
BIOMOLECULES AND THEIR APPLICATION: Carbohydrates as Cellulose-based water filters, PHA and PLA as Bio-plastics, Nucleic acids in Vaccines and Diagnosis, Proteins in food production (Plant-based protein, Whey protein, and Meat analogs), Lipids as bio-diesel, and cleaning agents/detergents, Enzymes in Biosensors fabrication, Food processing, Detergent formulation, and Textile processing.			
3 Hours			
Module -3			
ADAPTATION OF ANATOMICAL PRINCIPLES FOR BIOENGINEERING DESIGN: Brain as a CPU System. Eye as a Camera System. Heart as a Pump System. Lungs as Purification System. Kidney as a Filtration System.			
2 Hours			
Module -4			
NATURE-BIOINSPIRED MATERIALS AND MECHANISMS: Echolocation, Photosynthesis. Bird Flying, Lotus Leaf Effect, Plant Burrs, Sharkskin, Kingfisher Beak. Human Blood Substitutes – Hemoglobin-Based Oxygen Carriers (Hbocs) and Perfluorocarbons (Pfc).			
2 Hours			

Module -5

TRENDS IN BIOENGINEERING: Scaffolds In Muscular, Skeletal Systems and Tissue Engineering, Bio-printing Techniques and Materials. Electrical Tongue and Electrical Nose in Food Science, DNA Origami and Bio-computing, Bio-imaging, and Artificial Intelligence for Disease Diagnosis. Bio-concrete. Bio-remediation. Bio-mining.

2 Hours**Suggested Learning Resources:**

- Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
- Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and
- Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
- Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
- Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
- Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
- Biomimetics: Nature-Based Innovation, Yoseph Bar-Cohen, 1st edition, 2012, CRC Press.
- Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
- Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
- 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.
- Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

Web links and Video Lectures (e-Resources):

- VTU EDUSAT / SWAYAM / NPTEL / MOOCS / Coursera / MIT-open learning resource
- <https://nptel.ac.in/courses/121106008>
- <https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists>
- <https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009>
- <https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006>
- <https://www.coursera.org/courses?query=biology>
- https://onlinecourses.nptel.ac.in/noc19_ge31/preview
- <https://www.classcentral.com/subject/biology>
- <https://www.futurelearn.com/courses/biology-basic-concepts>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Explanation via real-life problems, situation modelling, deliberation of solutions, hands-on sessions, reflective and questioning /inquiry-based teaching.
2	Live Demonstration	Instructions with interactions in classroom lectures (physical/hybrid).
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	ICT Tools	Use of ICT tools, including YouTube videos, related MOOCs, AR/VR/MR tools.
5	Problem-Based Learning (PBL)	Implement PBL to enhance analytical skills and practical application of competencies
6	Multiple Representations	Introduce topics in various representations to reinforce competencies
7	Gamification Tools	Use of gamification tools (in both physical/hybrid classes) for creative learning outcomes
8	Student Seminars	Solo, group /oral presentations.
9	Model Making	Demonstration using working models.

4. Assessment Details (both CIE and SEE)

The weight-age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

CIE Split UP:

Components		Number	Weight-age	Max. Marks	Min. Marks
(i)	Internal Assessment-Tests (A)	2	50%	25	10
(ii)	Assignments/Quiz/Activity (B)	2	50%	25	10
Total Marks				50	20

Final CIE Marks = (A) + (B)

Average internal assessment shall be the average of the 2 test marks conducted

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M25BBEK210.1	Elucidate the fundamentals of biological concepts employing pertinent health, and engineering applications.
M25BBEK210.2	Assess the biological ideologies for the design and development of novel bioengineering solutions.
M25BBEK210.3	Substantiate and apply the ideologies amid nature-inspired bio-mimetic perceptions for explicit engineering solutions.
M25BBEK210.4	Exploring innovative bio-based solutions for relevant biological complications.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M25BBEK210.1	3	-	-	-	-	-	3	-	-	-	-
M25BBEK210.2	3	-	3	-	-	3	-	-	-	-	-
M25BBEK210.3	3	3	3	-	-	-	3	-	-	-	-
M25BBEK210.4	3	-	3	-	3	-	3	-	-	-	-
M25BBEK210	3	3	3		3	3	3	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 3 – Good Health and Well-being	The syllabus includes stem cells, tissue engineering, bio-imaging, and AI for disease diagnosis, contributing to advanced healthcare and improved health outcomes.
2	SDG 6 –Clean Water and Sanitation	Application of cellulose-based water filters derived from carbohydrates helps in developing sustainable water purification systems for safe and clean water access.
3	SDG 9 – Industry, Innovation & Infrastructure	Modules on bio-inspired design, bio-printing, biosensors, and bio-mimetic promote innovation in sustainable engineering and infrastructure.
4	SDG 12 – Responsible Consumption & Production	Use of bio-plastics (PHA/PLA), bio-diesel from lipids, and enzyme-based green chemistry promotes eco-friendly production and reduced environmental impact.

2nd Semester

2nd Semester	Basic Science (BS) APPLIED MATHEMATICS-II FOR CSE STREAM	M26BMATS201
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Errors and Their Computation	Basic arithmetic operations, Scientific notation, Decimal and binary number representation, Calculator/computer arithmetic Basic algebra
2	ODE	Strong knowledge of basic differential equations, separation of variables to solve differential problems. Familiarity with identify the dependent and independent variables
3	Higher order ODE	Knowledge of factorization and ordinary differential equations. Familiarity with identify the dependent and independent variables
4	Numerical Methods-I & II	Understanding of algebraic expressions, equations, and functions. Fundamental concepts of calculus, including derivatives and integrals. Linear Algebra: Matrices and determinants. Programming Skills: Proficiency in a programming language (e.g., Python, C++, MATLAB) to implement numerical algorithms.

2. Syllabus

Applied Mathematics-II for CSE Stream SEMESTER – II			
Course Code	M26BMATS201	CIE Marks	50
Total Number of Teaching-Learning Hours/Sem (L: T: P:TW:SL)	3:0:2:30	SEE Marks	50
		Total Marks	100
Credits	4	Exam Hours	03
Course Objectives:			
1. Develop the knowledge of numerical methods and apply them to solve transcendental and differential equations. 2. Develop and implement interpolation techniques using finite differences, Newton–Gregory, Newton's divided difference, Lagrange, and piecewise interpolation methods to approximate data, perform curve fitting, and support applications in computer graphics, data analytics, image processing, and scientific computing. 3. Design and evaluate computational algorithms for numerical analysis by assessing convergence, stability, computational complexity and accuracy thereby strengthening problem-solving skills required in software development, data science, high-performance computing and computational research.			
Module -1			
Introduction to Numerical Methods: Errors and their computation: Round off error, Truncation error, Absolute error, Relative error and Percentage error, problems only. Solution of algebraic and transcendental equations: Bisection, Regula-Falsi, Secant and Newton-Raphson methods.			
Module -2			
Numerical Solutions for System of Linear Equations: Norms, Vector norms and Matrix norms- L_1 , L_2 and L_∞ , ill conditioned linear system, condition number. Solution of system of linear equations: Gauss Seidel method and LU-decomposition method. Eigenvalues and Eigen vectors: Rayleigh power method, Jacobi's method.			
Module -3			
Interpolation: Finite differences, interpolation using Newton Gregory forward and Newton Gregory backward difference formulae, Newton's divided difference. Lagrange interpolation formulae, piecewise interpolation-linear and quadratic.			

Module -4
Differential Equations of First and Higher Order: Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations with an Integrating factors on $\frac{1}{N} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$ & $\frac{1}{M} \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right)$. Homogeneous and non-homogeneous differential equations of higher order with constant coefficients. Inverse differential operators- e^{ax} , $\sin(ax + b)$, $\cos(ax + b)$ and x^n .
Module -5
Numerical Integration and Numerical Solution of Differential Equations: Numerical integration: Trapezoidal, Simpson's 1/3 rd , Simpson's 3/8 th rule and Weddle's rule. Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector method.
List of Laboratory experiments (2 hours/week per batch)
1. Quality Control in Manufacturing using Error Analysis. A manufacturing unit produces metal shafts with a target diameter of 50.00 mm; a sample measurement is 50.08 mm, giving an absolute error of 0.08 mm and relative error of 0.16%. Use error analysis to identify measurement deviations and ensure that the manufactured components remain within the specified quality tolerance.
2. Smart Water Tank System using Root Finding Methods. A smart water tank has a capacity of 1000 L, with an inlet flow of 20 L/min and an outlet flow dependent on the water level, $Q_{out}=2h$ L/min. Use root-finding methods to determine the equilibrium water level where $Q_{in}=Q_{out}$.
3. Image Noise Detection using Matrix Norms and Condition Number. A digital camera stores a grayscale image as a matrix of pixel values, such as a 3×3 image matrix, and noise changes some pixel values by up to 5 intensity units. Engineers use matrix norms and condition numbers to measure the noise level and determine the numerical stability of image-processing algorithms.
4. Smart Power Grid Analysis using Gauss-Seidel Method. A power utility monitors voltages at three interconnected substations using the linear system $10V_1 - 2V_2 = 100$, $-V_1 + 8V_2 - 2V_3 = 50$, $-2V_2 + 10V_3 = 80$. Engineers apply the Gauss-Seidel method to iteratively calculate the bus voltages, helping maintain stable and reliable power-grid operation.
5. Weather Forecasting using Newton-Gregory Forward and Backward Interpolation A weather station records temperatures of 28°C, 30°C, 33°C, and 35°C at 9 AM, 11 AM, 1 PM, and 3 PM, but the 12 PM value is missing. Meteorologists use Newton-Gregory forward or backward interpolation to estimate the missing temperature and improve the accuracy of weather forecasts.
6. GPS Route Estimation using Lagrange Interpolation. A GPS navigation system records vehicle positions at 10:00, 10:05, and 10:10 as (12, 20), (15,25), and (19,31) km, but the 10:07 position is unknown. Engineers use Lagrange interpolation to estimate the missing GPS coordinates and improve route tracking and navigation accuracy.
7. Drug Concentration Analysis using Differential Equations. A patient takes a 100 mg dose of medicine, and the drug concentration decreases at a rate of 0.1C per hour, modeled by $\frac{dt}{dc} = -0.1C$. The differential equation is used to calculate the drug concentration at different times and determine how quickly the medicine leaves the body.
8. Solar Energy Estimation using Numerical Integration. A solar panel receives sunlight with measured power values of 200, 500, 800, and 600 W/m ² at different times of the day. Engineers use numerical integration to estimate the total solar energy received and evaluate the panel's energy-generation performance.
9. Rocket Trajectory Prediction using Taylor's and Modified Euler Methods. A small research rocket is launched with an initial velocity of 50 m/s and acceleration of 9.8 m/s ² ; its height and velocity are calculated at 1-second intervals. Use Taylor's and Modified Euler methods to predict the rocket's trajectory and compare the accuracy of the two numerical methods.
10. Autonomous Drone Navigation using Fourth-Order Runge-Kutta Method.

An autonomous drone moves with an initial position of (0, 0) m and velocity of (5,3) m/s, with its motion described by differential equations. Use the RK4 method to calculate the drone's position at different times and predict its trajectory for safe and accurate navigation.

Suggested software: Mathematica/MatLab/Python/Scilab

TEXTBOOKS:

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna publishers, 45th Ed.2025.
2. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8th Ed., 2022.
3. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 5th Ed., 2023.

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding the concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE) for Theory Course with 4 credits including Practical Component

Components			Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)		3	60%	20	08
2	Alternate Assessment (B)		2	40%	10	---
3	Practical Component (C)	Conduction & Record	1	60%	12	5
		Project Work	1	40%	08	---
	Total Marks				50	20

$$\text{Final CIE Marks} = A + B + C$$

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

C = Sum of Lab Conduction and project work

Semester End Examination (SEE)

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BMATS201.1	Apply numerical methods to solve algebraic and transcendental equations, systems of linear equations, eigenvalue problems, and interpolation problems with appropriate accuracy and error analysis.
M26BMATS201.2	Analyze and solve ordinary differential equations and engineering problems using analytical and numerical techniques, including numerical integration and numerical methods for initial value problems.
M26BMATS201.3	Analyze engineering problems, construct mathematical models, implement computational solutions using appropriate software tools, and critically evaluate and interpret the outcomes.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BMATS201.1	3	3	-	-	-	-	-	-	-	-	-
M26BMATS201.2	3	3	-	-	-	-	-	-	-	-	-
M26BMATS201.3	-	-	-	-	3	-	-	-	-	-	-
M26BMATS201	3	3	-	-	3	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 3 : Good Health and Well-being	Supports scientific computing, AI, digital twins, healthcare simulations, engineering design, climate modelling and numerical analysis for real-world computational problems.
2	SDG 8 : Decent Work and Economic Growth	Develops computational and algorithmic skills for solving large-scale engineering and data science problems, supporting innovation, software development and advanced computing
3	SDG 11: Sustainable Cities and Communities	Enables data approximation, computer graphics, image processing, simulation and predictive modelling used in smart city applications and intelligent systems.

1st / 2nd Semester	Basic Science (BS) APPLIED CHEMISTRY FOR SMART COMPUTING SYSTEMS	M26BCHE102/ 202
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Chemistry	Understanding of atoms, molecules, chemical bonding, and chemical reactions Basic knowledge of acids, bases, oxidation-reduction reactions, and electrochemical principles.
2	Material Science	Familiarity with the classification of materials such as metals, polymers, and semiconductors. Basic understanding of physical and chemical properties of materials.
3	Physics and Electronics	Fundamental concepts of electricity, conductors, insulators, and semiconductors. Basic knowledge of light, energy conversion, and electronic devices.
4	Environmental Science	General understanding of environmental pollution, waste generation, and sustainable development. Awareness of renewable energy resources and recycling practices.
5	Mathematics	Proficiency in basic algebra, ratios, percentages, and logarithms. Ability to solve simple numerical problems involving averages, rates, and unit conversions.
6	Scientific and Analytical Techniques	Ability to interpret scientific information, diagrams, and graphical representations. Basic understanding of measurements, data analysis, and problem-solving approaches.
7	Polymer Chemistry	Elementary understanding of monomers, polymers, and polymerization. Awareness of the importance of polymers in everyday life and engineering applications.

2. Syllabus

Applied Chemistry for Smart Computing Systems SEMESTER – I/II			
Course Code	M26BCHE102/202	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	2:2:0:20:00 = 84 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives: This course will enable students to:			
Understand the chemistry of advanced materials such as memory materials, display systems, polymers, and quantum materials used in modern electronic and computing devices. Apply the principles of electrochemistry and materials chemistry in energy storage systems, sensors, and corrosion control relevant to engineering applications. Analyze the role of sustainable technologies, including green hydrogen, batteries, fuel cells, and environmentally responsible material utilization. Develop awareness regarding e-waste management, recycling technologies, and sustainable practices in the electronics and information technology sectors.			
MODULE 1: Fundamental Materials for Memory and Display Systems (8hr)			
Memory Devices: Introduction, classification of electronic memory devices, types- organic semiconductors: p-type semiconductor-pentacene and n- type semiconductor -perfluoropentacene, construction, working and advantages of pentacene semiconductor chip. Display Systems: Introduction, Liquid Crystals (LCs)- classification, properties and its application. Construction, working principle and applications of Light Emitting Diodes (LEDs), Properties and applications of Organic Light Emitting Diodes (OLEDs), and Quantum Light Emitting Diodes (QLEDs). Self-Study Component: Construction, working and applications of Active Matrix Organic Light Emitting Diodes (AMOLEDs).			
MODULE 2: Polymers and Quantum Materials (8hr)			

Polymer: Introduction, molecular weight of polymers - number and weight average molecular weight of polymers, numerical problems, synthesis and properties of Polyvinyl Chloride (PVC) and Polymethyl Methacrylate (PMMA) for device applications. Conducting polymers- Introduction, synthesis of polyaniline, conduction mechanism and its engineering applications. Quantum Dots: Introduction, size-dependent properties - surface-to-volume ratio and quantum confinement effect- optical properties. Synthesis and applications of Cd-Se Quantum dots by wet chemical method, Quantum Dot sensitized Solar cells (QDSSCs)- construction, working principle and applications. Self-Study Component: Synthesis and engineering applications of polyacetylene.
MODULE 3: Energy Storage and Green Energy Technologies (8hr)
Batteries: Introduction, classification of batteries. Components, construction, working and applications of modern batteries: Li-ion and sodium ion batteries. Solar Energy: Introduction, importance of solar PV cell, construction and working of solar PV cell, advantages and disadvantages. Fuel Cells: Introduction, construction, working and applications of Polymer Electrolyte Membrane (PEM) fuel cell. Green Fuels: Introduction, Generation of energy (green hydrogen) by electrolysis of water and its advantages. Self-learning: Regenerative fuel cells.
MODULE 4: Sensors and Corrosion Science (8hr)
Electrochemical Sensors: Introduction, conductometric Sensor- Principle, Instrumentation, and its application in the estimation of strong acid. Amperometry Sensor- Principle and its application in the measurement of Dissolved Oxygen (DO). Optical sensor- Introduction, principle, working mechanism in the estimation of Nickel. Biosensor- Principle and working mechanism for the detection of glucose in biofluids. Corrosion: Introduction, electrochemical theory of corrosion, types-differential metal and differential aeration corrosion, corrosion control- galvanization and anodization. Self-Study Component: Electrochemical gas sensors for the detection of NO_x & SO_x in air sample.
MODULE 5: E-Waste Management (8hr)
E-Waste: Introduction, sources of e-waste, composition, characteristics, and need for e-waste management. Toxic materials used in manufacturing electronic and electrical products, health hazards due to exposure to e-waste. Recycling and Recovery: Different approaches of recycling (separation, thermal treatments, hydrometallurgical extraction, pyrometallurgical methods, direct recycling). Extraction of gold and copper from E-waste. Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies). Role of AI in e-waste management. Self-learning: Impact of heavy metals on environment and human health.
TEXTBOOKS: 1. A Text Book of Engineering Chemistry, R.V.Gadag and Nityananda Shetty, I. K. International Publishing house. 2nd Edition, 2016 2. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN97 8-93-85155-70-3,2022 3. Chemistry for Engineering Students, B.S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014 4. Chemistry for Environmental Engineering and Science - by Clair Sawyer, Perry Mccarty, Gene Parkin. 5. Industrial chemistry by B K Sharma-GOEL Publishing House, ISBN 8187224002,2000 REFERENCE BOOKS: 1. "Engineering Chemistry", O.G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015. 2. Chemistry of Engineering materials, Malini S, KS Anantha Raju, CBS publishers Pvt Ltd., VIDEO LINKS: 1. https://youtu.be/u2gVQFmFf34?si=6H6ZdyPeTZbZX0Us 2. https://youtu.be/cw6h9bLqXbc?si=8KXzsLh3QXjfnB3H

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Deliver concepts related to memory devices, display systems, polymers, quantum materials, sensors, and e-waste management through interactive lectures and concept mapping.
2	Demonstration and Laboratory Learning	Demonstrate electrochemical sensors, battery models, display systems, and polymer synthesis to strengthen conceptual understanding.
3	Video/Animation Aids	Use animations to visualize OLEDs, QLEDs, memory chips, quantum dots, fuel cells, and corrosion mechanisms.
4	Collaborative and Peer Learning	Conduct group discussions on sustainable computing, e-waste management, and emerging smart materials.
5	Case-Based and Real-World Application	Discuss applications of Li-ion batteries, semiconductor materials, flexible displays, and AI in e-waste management.
6	Flipped Classroom Approach	Provide pre-class videos on batteries and display systems followed by in-class problem-solving and presentations.
7	Mini Projects and Surveys	Assign projects on e-waste auditing, smart material applications, and renewable energy technologies.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course**

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

$$\text{Final CIE Marks} = (A) + (B)$$

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Semester End Examination (SEE)

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice.
3. The questions from Module 2 and 3 will not have any choice.
4. Each of the question will have a maximum of two sub questions.
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks.

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BCHE102/202.1	Explain the structure, properties, and applications of advanced materials including memory devices, display technologies, polymers, and quantum materials used in electronic systems.
M26BCHE102/202.2	Apply the principles of electrochemistry and materials chemistry to analyze batteries, fuel cells, sensors, and corrosion phenomena relevant to engineering systems.
M26BCHE102/202.3	Evaluate sustainable energy technologies and green chemical processes for efficient energy generation and storage.
M26BCHE102/202.4	Analyze the environmental impacts of electronic waste and propose sustainable recycling and management strategies using scientific and technological approaches.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BCHES102/202.1	3	2	-	-	2	-	-	-	-	-	-
M26BCHES102/202.2	3	3	-	2	2	-	-	-	-	-	-
M26BCHES102/202.3	2	2	-	-	-	2	3	-	-	-	2
M26BCHES102/202.4	2	3	-	-	-	3	3	2	-	-	2
M26BCHES102/202	2.5	2.5	-	2	2	2.5	3	2	-	-	2

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 3: Good Health and Well-Being	Understanding electrochemical and optical sensors for monitoring pollutants and biomedical analytes, and studying the health hazards associated with e-waste exposure, contributes to improved human health and well-being.
2	SDG 7: Affordable and Clean Energy	Study of lithium-ion batteries, sodium-ion batteries, solar photovoltaic cells, fuel cells, and green hydrogen promotes the development and adoption of clean and sustainable energy technologies.
3	SDG 9: Industry, Innovation and Infrastructure	Knowledge of advanced materials such as conducting polymers, quantum dots, memory devices, display systems, and sensors fosters innovation and supports sustainable industrial and technological development.
4	SDG 11: Sustainable Cities and Communities	Applications of sensors for environmental monitoring, corrosion control methods, and sustainable waste management practices contribute to the development of safe, resilient, and sustainable communities.
5	SDG 12: Responsible Consumption and Production	E-waste management, recycling and recovery methods, extraction of valuable materials from waste, and responsible use of electronic materials encourage sustainable consumption and resource efficiency.
6	SDG 13: Climate Action	Promotion of green hydrogen, fuel cells, renewable energy systems, and reduction of toxic emissions from electronic waste supports strategies for mitigating climate change and protecting the environment.

1st / 2nd Semester	Engineering Science Course (ES) COMPUTER AIDED ENGINEERING DRAWING-CSE STREAM	M26BCEDK103/ 203
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Geometry and Mathematics	Understanding of geometric shapes, Cartesian coordinate system, algebra, and trigonometry.
2	Fundamentals of Engineering Concepts	Familiarity with engineering terminology and the purpose of engineering drawings.
3	Introduction to Technical Drawing	Awareness of different types of technical drawings and projection methods. Proficiency in free-hand sketching and using drawing instruments.
4	Computer Literacy	Basic knowledge of computer operations and software usage.
5	Visualization Skills	Ability to visualize 3D objects and their 2D representations.
6	Attention to Detail	Precision in creating accurate drawings and following technical standards. Capability to interpret technical drawings and solve related problems.
7	Communication and Learning Abilities	Effective communication of technical information, time management, and adaptability to new tools and techniques.

2. Syllabus

Computer Aided Engineering Drawing-CSE Stream			
Course Code	M26BCEDK103/203	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:0:32:20:00 = 84 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
- To understand fundamentals and conventions to grasp the significance of engineering drawing, BIS conventions, and scales for accurate representation - To familiarize with CAD software, coordinate systems, and reference planes for creating precise drawings in 2D and 3D environments. - To develop proficiency in using CAD commands and techniques to create various geometric entities and perform essential operations. - To understand orthographic projections for points, lines, planes, and solids, and master isometric projection techniques and conversion methods. - To apply learned concepts and skills in diverse engineering scenarios, including drawing views in 3D environments, lateral surface development, and creating diagrams and charts.			
Module -1			
Introduction: for CIE only			
Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.			
Orthographic Projections of Points, Lines and Planes:			
Introduction to Orthographic projections: Orthographic projections of points in 1 st and 3 rd quadrants. Orthographic projections of lines (Placed in First quadrant only).			

Orthographic projections of planes viz triangle, square, rectangle, pentagon, hexagon, and circular laminae (Placed in First quadrant only using change of position method). Application on projections of Lines & Planes (For CIE only)
Module -2
Orthographic Projection of Solids: Orthographic projection of right regular solids (Solids Resting on HP only): Prisms & Pyramids (square, pentagon, hexagon), Cylinders, Cones, Cubes & Tetrahedron. Projections of Frustum of cone and pyramids (For practice only, not for CIE and SEE).
Module -3
Isometric Projections: Isometric scale, Isometric projection of hexahedron (cube), right regular prisms, pyramids, cylinders, cones and spheres. Isometric projection of combination of two simple solids. Conversion of simple isometric drawings into orthographic views. Problems on applications of Isometric projections of simple objects / engineering components. Introduction to drawing views using 3D environment (For CIE only).
Module -4
Development of Lateral Surfaces of Solids: Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations. Problems on applications of development of lateral surfaces like funnels and trays. Problems on applications of development of lateral surfaces of transition pieces connecting circular duct and rectangular duct (For CIE Only)
Module-5
Perspective Projection for Computer Science Applications (For CIE Only): Introduction to the basics of perspective projection one-point and two-point perspectives. Perspective drawing of simple geometric solids such as cubes, prisms, cylinders, and cones. Application of perspective projection to draw real-world objects like desks, chairs, and room interiors. Perspective representation of computer lab layouts, office setups, and workstation environments. Use of perspective projection to enhance visual understanding in areas such as system layouts, and data center planning.
Text Books 1. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd edition, Charotar Publishing House Pvt. Limited, 2019. 2. K. R. Gopalakrishna, & Sudhir Gopalakrishna: Textbook Of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017 Reference Books 1. Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005. 2. S.N. Lal, & T Madhusudhan, Engineering Visualisation, 1st Edition, Cengage, Publication 3. Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press, 2015.

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Chalk and Talk method	The drawing views are explained using chalk and talk method
2	Videos Demonstration and Simulations	The assembly drawings are explained with the help of videos and simulations.
3	Use of Charts	The use of charts enables better visualization to students.
4	Software	Assign modeling and drafting tasks to reinforce practical skills associated with competencies.

4. Assessment Details (both CIE and SEE)

The weight-age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation (CIE):

The CIE marks for CAED course offered in the 1st year shall be assessed as follows:

1. The CIE marks awarded in the case of Drawing shall be based on Weekly evaluation of the classwork (sketching and computer display/printouts) with each drawing evaluated as mentioned module wise in the syllabus. The marks of all the drawing sheets are added and scaled do to 30marks
2. One class test similar to SEE will be conducted after completion of the syllabus for 100 marks and scaled down to 20Marks.
3. CIE marks (out of 50) scored by the student is the sum of classwork evaluation and test marks.
4. CIE component should comprise of Continuous evaluation of drawing work of students as and when the Modules are covered based on below detailed weightage.

Module	Max Marks Weightage	Evaluation weightage in marks	
		Computer Display & print out	Preparatory Sketching
Module – 1	20	15	05
Module – 2	25	20	05
Module – 3	20	15	05
Module – 4	20	15	05
Module-5	15	10	05
TOTAL	100	75	25
Consideration of Class work		100 Marks is scaled down to 25 marks	

5. At least one Test covering all the modules is to be conducted for 100 marks and evaluation to be based SEE pattern, and the same is to be scaled down to 25Marks
6. The final CIE = Class work marks + Test marks

Semester End Examination (SEE): SEE marks for the practical course is 50 Marks.

- The duration of SEE is 03 hours. Questions shall be set worth of 3 hours
- SEE shall be conducted jointly by the two examiners appointed by the COE.
- SEE shall be conducted and evaluated for maximum of 100 marks. Marks obtained shall be accounted for SEE final marks, reducing it to 50 marks.
- Two questions from each Modules to be set as per the below table weightage details. The student has to answer one from each module.
- Question paper for each batch of students has to be set before the commencement of Examination of each batch. The answer sheets will have to be jointly evaluated by the two examiners.
- Two questions to be set from each Module
- Student has to answer one question each from Module
- *However, the student may be awarded full marks, if he/she completes solution on computer display without sketch.*

Module	Max Marks Weightage	Evaluation weightage in marks	
		Computer Display & print out	Preparatory Sketching
Module-1	20	15	05
Module-2	30	25	05
Module-3	25	20	05
Module-4	25	20	05

TOTAL	100	80	20
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5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BCEDK103/203.1	Ability to apply orthographic projection principles to represent points and lines in various quadrants.
M26BCEDK103/203.2	Apply orthographic projection principles to represent regular plane surfaces for different resting positions and orientation within the first quadrant.
M26BCEDK103/203.3	Proficiently apply orthographic projection techniques to represent right regular solids resting on HP.
M26BCEDK103/203.4	Apply isometric scale and projection techniques to visualize and represent various solids facilitating a comprehensive understanding of engineering drawings
M26BCEDK103/203.5	Analyze and create lateral surfaces for solids resting on HP

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BCEDK103/203.1	3	-	-	-	-	-	-	-	-	-	-
M26BCEDK103/203.2	-	3	-	-	-	-	-	-	-	-	-
M26BCEDK103/203.3	-	-	3	-	-	-	-	-	-	-	-
M26BCEDK103/203.4	-	-	-	3	-	-	-	-	-	-	-
M26BCEDK103/203.5	-	-	-	-	2	-	-	-	-	-	-
M26BCEDK103/203	3	3	3	3	2	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Quality Education by providing essential technical and digital skills in engineering drawing and CAD. It promotes inclusive, skill-based learning aligned with modern industry and lifelong learning goals.
2	SDG 9: Industry, Innovation, and Infrastructure	By building foundational skills in technical drawing and CAD, essential for modern engineering design and manufacturing. It fosters innovation and contributes to sustainable industrial development through accurate visualization and digital drafting tools.
3	SDG 12: Responsible Consumption and Production	By teaching precise design and drafting techniques that reduce material wastage and support efficient manufacturing. It encourages sustainable design practices through accurate development of surfaces and optimized use of resources in engineering production.

1st /2nd Semester	Engineering Science Course (ES) INTRODUCTION TO CIVIL ENGINEERING	M26BESK104A/ 204A
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Science and Mathematics	Knowledge of basic physics (mechanics, forces) and mathematics (algebra, geometry).
2	Environmental Awareness	Basic knowledge of pollution, sanitation, and sustainable issues.
3	Engineering Drawing and Visualization	Knowledge of sketches, visualization of shapes, sections and projections of buildings.
4	Logical Reasoning and Spatial Ability	Skill to understand space, balance, and visualize structures and forces.

2. Syllabus

Introduction to Civil Engineering SEMESTER – I/II			
Course Code		CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	2:2:0: 20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
1. Explore Civil Engineering scope, materials, and building components aligned with Sustainable Development Goals. 2. Apply fundamental concepts of force systems, equilibrium, and free-body diagrams in basic structural analysis. 3. Calculate and locate centroid of simple and built-up sections for structural applications. 4. Calculate moment of inertia of simple and built-up sections for structural applications.			
Module -1			
Introduction: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics and Water Resources Engineering, Transportation Engineering, Environmental Engineering. Basic Materials of Construction: Bricks, cement, steel, concrete and mortar. Building components: substructure and super-structure components. Introduction to sustainable development goals. Infrastructure: types of infrastructure Activity: Identification and classification of common building materials, structural components, and Civil Engineering disciplines through observation and group discussion.			
Module -2			
Concurrent force systems: Concept of idealization, system of forces, Resolution and composition of forces, Law of Parallelogram of forces, principle of transmissibility, Resultant of concurrent force systems, free body diagram, types of forces, Lami's theorem, equations of equilibrium. Force Board Activity: Experimental determination of the resultant and equilibrium of concurrent force systems using a force board or graphical vector method			
Module -3			
Non-concurrent force systems: Resultant of non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, types of loads and supports, equilibrium of non-concurrent coplanar force systems. Moment Balance Activity: Verification of the principle of moments and equilibrium of non-concurrent force systems using a simple balance setup			
Module - 4			
Centroid: Introduction, centre of gravity, centroid, axis of symmetry, locating the centroid of plane lamina and composite figures from first principles and Numerical examples. Paper Cut-Out Activity: Experimental determination of the centroid of plane lamina using the suspension (plumb line) method and comparison with analytical results.			

Module -5

Moment of inertia: Introduction, method of determining the second moment of area of plane sections from first principles, parallel axis and perpendicular axis theorem, radius of gyration, polar moment of inertia, moment of inertia of built-up sections and numerical examples.

Section Comparison Activity: Comparative study of the bending behaviour of different cross-sections to demonstrate the influence of moment of inertia on structural stiffness.

TEXTBOOKS

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

REFERENCE BOOKS

1. Beer F.P. and Johnston E. R., *Mechanics for Engineers, Statics and Dynamics*, 1987, McGraw Hill.
2. Irving H. Shames, *Engineering Mechanics*, 2019, Prentice-Hall.
3. Timoshenko S, Young D. H., Rao J. V., *Engineering Mechanics*, 5th Edition, 2017, Pearson Press.

VIDEO LINKS

1. <https://www.youtube.com/watch?v=nGfVTNfNwnk&list=PLOSWwFV98rfKXq2KBphJz95rao7q8PpwT>
2. <https://www.youtube.com/watch?v=3YBXteL-qY4>
3. https://www.youtube.com/watch?v=atoP5_DeTPE
4. <https://www.youtube.com/watch?v=ksmsp9OzAsI>
5. <https://www.youtube.com/watch?v=x1ef048b3CE>
6. https://www.youtube.com/watch?v=l_Nck-X49qc
7. https://play.google.com/store/apps/details?id=appinventor.ai_jgarc322.Resultant_Force
8. <https://www.youtube.com/watch?v=RIbceW1DSZg>
9. <https://www.youtube.com/watch?v=R8wKV0UQtlo>
10. https://www.youtube.com/watch?v=0RZHHgL8m_A
11. <https://www.youtube.com/watch?v=Bl5KnQOWkY>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Interactive Lectures	Use multimedia presentations, models, and physical samples to explain building materials and structural components.
2	Field Visits	Organize visits to construction sites, water treatment plants, and urban infrastructure projects.
3	Group Activities	Facilitate collaborative work on smart city models and environmental impact discussions.
4	Problem Solving Sessions	Introduce conceptual and numerical problem-solving on centroid, force systems, and moment of inertia.
5	ICT Tools and Videos	Use NPTEL lectures, animations and simulations to demonstrate real-time force analysis and building science.
6	Seminars and Presentations	Assign students short presentations on infrastructure, smart cities, and sustainable practices.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course with 3 credits**

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	8
	Total Marks			50	20

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Self-Learning (SL): the teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The faculty must collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE)

1. Question paper will be containing 8 questions. Each question is set for 20 marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice.
3. The questions from Module 2 and 3 will not have any choice.
4. Each of the question will have a maximum of two sub questions.
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks.

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BESK104A.1	Apply knowledge of Civil Engineering disciplines, materials, structural elements, and infrastructure for sustainable development practices.
M26BESK104A.2	Assess the resultant and equilibrium of force systems on the rigid bodies.
M26BESK104A.3	Determine and locate the centroid of plane and built-up sections.
M26BESK104A.4	Determine the moment of inertia of plane and built-up sections.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BESK104A.1	3	-	-	-	-	2	3	-	-	-	2
M26BESK104A.2	3	3	-	2	2	-	-	-	-	-	2
M26BESK104A.3	3	3	-	2	-	-	-	-	-	-	2
M26BESK104A.4	3	3	-	2	-	-	-	-	-	-	2
M65BESK104	3	3	-	2	2	2	3	-	-	-	2

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 9: Industry, Innovation and Infrastructure	Students explore fundamental infrastructure design concepts promoting innovation and resilient development.
2	SDG 11: Sustainable Cities and Communities	Incorporates clean city, smart city, and solid waste management topics to improve urban livability.
3	SDG 13: Climate Action	Introduces environment-friendly practices in construction and energy- efficient buildings.

1st/ 2nd Semester	Engineering Science Course (ES) INTRODUCTION TO ELECTRICAL ENGINEERING	M26BESK104B/ 204B
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic concepts of Circuit Elements	Basic understanding of active and passive elements of a circuit. Familiarity with fundamentals of discrete elements such as resistors, capacitors and inductors.
2	Electrical Circuits	Understanding of voltage, current and their characteristic behavior in electrical circuits and relevant laws.
3	Fundamentals of electromagnetic induction	Faraday's laws of electromagnetic induction, Lenz's law and Fleming's left and right hand rule.
4	Basic knowledge of measuring instruments.	Knowledge of measuring instruments such as ammeter, voltmeter and multimeter etc.

2. Syllabus

INTRODUCTION TO ELECTRICAL ENGINEERING SEMESTER – I/II			
Course Code	M26BESK104B/204B	CIE Marks	50
Total Number of Teaching-Learning Hours/sem(L:T:P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
- To explain electric power generation, transmission and distribution - To explain the laws used in the analysis of DC and AC circuits. - To explain the behaviour of circuit elements in single-phase AC circuits. - To explain the construction and operation of Transformers, AC generators, DC motors and Induction motors. - To introduce concepts of circuit protecting devices, earthing and electricity billing			
Module -1: Electrical Energy Sources & DC circuits			
Introduction to electrical energy sources, Single line diagram approach. Brief introduction to the electrical generation using Thermal, Solar, Hydro, Wind using Block diagram approach. DC circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series – parallel circuits excited by independent voltage sources. Power and energy, Illustrative examples			
Module -2: Single phase and Three phase AC circuit			
A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, Derivations of average value, RMS value, form factor, peak factor. Voltage and current relationship with phasor diagrams in R, L, and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor and Numerical. Three Phase Circuits: Advantages and limitations; star and delta connection, relationship between line and phase quantities excluding derivation.			
Module -3: Transformers & Three phase synchronous generators			
Transformers: Necessity of transformer, principle of operation, Types and construction of single-phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency and numerical. Three-phase synchronous generators: Principle of operation and constructional details of salient and non-salient pole generators, synchronous speed, frequency of generated voltage, emf equation, with the concept of winding factor excluding the derivation and calculation of winding factors and numerical.			
Module -4: Motors			
Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and slip ring. Slip, its significance and numerical.			

DC Motor: Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and Simple numerical.

Module -5: Domestic Wiring & Electrical Safety

Domestic Wiring: Requirements, Types of wiring: casing, capping. Two way and three way control of load.

Electricity Bill: Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of “unit” used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.

Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock

TEXTBOOKS:

1. Fundamentals of Electrical Engineering & Electronics by B L Theraja, S. Chand and Company Pvt. Ltd. Reprint edition, 2022
2. Basic Electrical Engineering D. C. Kulshreshtha McGraw-Hill Education 1st edition, 2019

REFERENCE BOOKS:

1. Electrical Technology E Hughes Pearson International Students 9th edition
2. Principles of Electrical Engineering & Electronics V K Mehta and Rohit Mehta S. Chand and Company Pvt. Ltd.

VIDEO LINKS:

1. <https://youtu.be/OC8Lbyeyh-E>
2. <https://youtu.be/5CHufqAF-p0>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of generation of electrical energy.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies
6	Laboratory Learning	Utilize the facilities available in the laboratories to understand the behavior of the materials by performing few experiments.

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE)

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment-Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

$$\text{Final CIE Marks} = (A) + (B)$$

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Self-Learning (SL): If applicable, the teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The faculty must collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE) For Theory Course with 3 or 4 credits

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BESK104B.1	Understand the concepts of hydro, thermal, solar & wind energy sources and Electric circuits.
M26BESK104B.2	Apply Ohm's law and Kirchhoff's laws to solve DC & AC circuits
M26BESK104B.3	Illustrate the construction and working principles of DC & AC Machines
M26BESK104B.4	Describe the types of wiring, tariff and safety measures in an electrical system.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BESK104B.1	3	3	-	-	-	-	-	-	-	-	-
M26BESK104B.2	3	3	-	-	-	-	-	-	-	-	-
M26BESK104B.3	3	3	-	-	-	-	-	-	-	-	-
M26BESK104B.4	-	-	-	-	-	3	-	-	-	-	-
M26BESK104B	3	3	-	-	-	3	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 7: Affordable and Clean Energy	Electrical engineers are crucial in designing, installing, and maintaining systems for solar, wind, hydro, and geothermal power. This involves understanding circuits, power electronics, energy conversion, and grid integration.
2	SDG 9: Industry, Innovation, and Infrastructure	Applying basic electrical engineering principles leads to the development of energy-efficient industrial processes, automation, and control systems that reduce resource consumption and waste.
3	SDG 11: Sustainable Cities and Communities	Smart Cities: The development of smart cities heavily relies on electrical engineering for smart infrastructure, energy conservation, efficient waste management, and sustainable urban living. Sustainable Transportation: Electrical engineers are vital in the design and development of electric vehicles (EVs) and their charging infrastructure, reducing reliance on fossil fuels and improving air quality in urban areas.

1st / 2nd Semester	Engineering Science Course – I (ES) INTRODUCTION TO ELECTRONICS AND COMMUNICATION	M26BESK104C/ 204C
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic knowledge on Physics	A fundamental understanding of physics.
2	Basic knowledge on Mathematics	A fundamental understanding of mathematics.
3	Semiconductor Fundamentals	Basic knowledge of semiconductor physics and semiconductor devices is beneficial.
4	Basic knowledge of analog and digital signals	Elementary electronic components such as resistors, capacitors, inductors, diodes, and transistors.

2. Syllabus

INTRODUCTION TO ELECTRONICS AND COMMUNICATION SEMESTER – I/II			
Course Code	M26BESK104C/204C	CIE Marks	50
Total Number of Teaching-Learning Hours/sem(L:T:P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
- To prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering. - To equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems. - Professionalism & Learning Environment: To inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context, and life-long learning needed for a successful professional career.			
Module -1			
Power Supplies – PN Junction Diode: Forward and Reverse Bias Characteristics, DC-powersupply Block diagram, Half-wave rectifier, Full-wave rectifiers, Voltage regulators, switch mode power supplies. Amplifiers – Basics of MOSFET: Construction, Symbol, Types (Enhancement and Depletion), Types of amplifiers, Gain, Input and output resistance, Negative feedback.			
Module -2			
Oscillators –Positive feedback, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator. (Only Concepts, working, and waveforms. No mathematical derivations) Operational amplifiers –symbol and connections, Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits.			
Module -3			
Boolean Algebra and Logic Circuits: Number Base Conversion, Complements, Binary subtraction using 1's and 2's, Basic Theorems and Properties of Boolean Algebra, Canonical and Standard Forms, Digital Logic Gates . Combinational logic: Introduction, Design procedure, Adders and Subtractors.			
Module -4			
Embedded Systems – Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, purpose of embedded system, Elements of an Embedded System, Microprocessor vs Microcontroller, RISC vs CISC. Sensors and Interfacing – Instrumentation and control systems, Transducers, Sensors, Actuators, LED, 7-Segment LED Display.			

Module -5	
Communication Schemes – Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) , Concept of Radio wave propagation (Ground, space, sky) An Overview of Wireless Systems: Introduction, First- and Second-Generation Cellular Systems, Cellular Communications from 1G to 3G, Road Map for Higher Data Rate Capability in 3G, Wireless 4G Systems.	
Text Books 1. Mike Tooley, ‘Electronic Circuits, Fundamentals & Applications’, 4th Edition, Elsevier, 2015. DOI https://doi.org/10.4324/9781315737980. eBook ISBN 9781315737980 2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-84. 3. K V Shibu, ‘Introduction to Embedded Systems’, 2nd Edition, McGraw Hill Education (India), Private Limited, 2016 4. S L Kakani and Priyanka Punglia, ‘Communication Systems’, New Age International Publisher, 2017. 5. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 11th Edition, Pearson Education, 2013. 6. Vijay K. Garg, Wireless Communications and Networking, Morgan Kaufmann Publishers (Elsevier), 2nd Edition.	

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of basic electronics concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies

4. Assessment Details (both CIE and SEE) Continuous Internal Evaluation (CIE)

Components		Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment-Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
Total Marks				50	20

$$\text{Final CIE Marks} = (A) + (B)$$

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Semester End Examination (SEE)

1. Question paper will be containing 8 questions. Each question is set for 20 marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice

4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BESK104C/204C.1	Describe the working principles of PN junction diodes, DC power supplies, rectifiers, voltage regulators, switch mode power supplies, amplifier fundamentals, and MOSFET basics.
M26BESK104C/204C.2	Illustrate the principles of oscillators, operational amplifiers configurations used in basic electronic circuits.
M26BESK104C/204C.3	Apply number system concepts, Boolean algebra, and logic gates to implement logic circuits such as adders and subtractors.
M26BESK104C/204C.4	Discuss the fundamentals of communication systems, modulation concepts, radio wave propagation, and the development of wireless communication technologies from 1G to 4G.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BESK104C/204C.1	3	-	-	-	2	-	-	-	2	2	-
M26BESK104C/204C.2	3	3	-	-	2	-	-	-	2	2	-
M26BESK104C/204C.3	3	3	2	-	2	-	-	-	2	-	-
M26BESK104C/204C.4	3	2	-	-	-	-	-	-	-	-	-
M26BESK104C/204C	3	-	2	-	2	-	-	-	2	2	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Learning advanced electronics builds foundational engineering skills.
2	SDG 9: Industry, Innovation and Infrastructure	Embedded systems, communication technologies, amplifiers, digital logic.
3	SDG 11: Sustainable Cities and Communities	Sensors, automation, embedded applications in smart cities

1st/2nd Semester	Engineering Science Course (ES) INTRODUCTION TO MECHANICAL ENGINEERING	M26BESK104D/ 204D
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic understanding of Engineering disciplines	Familiarity with different engineering disciplines and their role in society, industry, and technological development.
2	Basic knowledge of Mathematics and Physics	Understanding of fundamental concepts such as force, motion, energy, power, heat, and simple calculations related to engineering systems.
3	Analytical Thinking Skills	Ability to observe, analyze, and solve simple engineering problems using logical reasoning.
4	Visualization Skills	Ability to interpret basic engineering diagrams, machine components, schematic representations, and manufacturing processes.
5	Interest in Engineering Systems and Emerging Technologies	Curiosity to understand the working principles of machines, manufacturing processes, automation, robotics, and future mobility technologies.

2. Syllabus

Introduction to Mechanical Engineering SEMESTER – I/II			
Course Code	M26BESK104D/204D	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
Credits	03	Total Marks	100
		Exam Hours	03
Course Objectives:			
1. To develop basic knowledge of Mechanical Engineering, its role in industries, emerging technologies, and conventional and renewable energy sources. 2. To understand the concepts of different machine tool operations, industrial automation, and advanced manufacturing systems such as CNC machines and Additive Manufacturing (3D Printing). 3. To understand the working principles and applications of Internal Combustion (IC) engines and future mobility technologies including Electric, Hybrid, and Autonomous Vehicles. 4. To provide exposure to engineering materials, joining processes and their applications in manufacturing industries. 5. To acquire a basic understanding of mechatronics, robotics, and their role in industrial automation and modern manufacturing.			
Module -1			
Introduction: Role of Mechanical Engineering in Industries and Society. Emerging trends and technologies in Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. Energy: Introduction and applications of conventional and renewable energy sources including Thermal, Hydrel, Nuclear, Solar Photovoltaic (PV), and Wind Energy. Environmental issues such as Global Warming and Carbon Neutrality.			
Module -2			
Machine Tool Operations: Working principle of Lathe and operations such as Turning, Facing and Knurling. Working principle of Drilling Machine and operations including Drilling, Boring and Reaming. Working principle of Milling Machine and operations such as Plain Milling, End Milling and Slot Milling. (<i>No sketches of machine tools; sketches to be used only for explaining the operations</i>). Automation in Industry: Definition, types – Fixed, Programmable and Flexible Automation, basic elements with block diagrams, advantages and industrial applications.			
Module -3			

Introduction to IC Engines: Components and working principles, four-stroke Petrol and Diesel engines, applications of IC engines, and basic performance parameters of IC engines (**Simple numerical problems**).

Future Mobility: Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), components of electric and hybrid vehicles, advantages and limitations of EVs and Hybrid Vehicles, and an introduction to Autonomous Vehicles.

Module -4

Engineering Materials: Types, properties and applications of Ferrous and Non-Ferrous Metals, Ceramics, Glass, Polymers, Graphite, Diamond and Shape Memory Alloys.

Joining Processes: Soldering, Brazing and Welding, definitions, classification of welding processes, Arc Welding, Gas Welding and TIG Welding.

Module -5

Introduction to Mechatronics and Robotics: Open-loop and Closed-loop Mechatronic Systems. Robot Anatomy, Robot Configurations (Cartesian, Cylindrical, Polar and Articulated), applications, advantages and limitations of Industrial Robots.

Introduction to Advanced Manufacturing Systems: Introduction to CNC machines, components of CNC, advantages and applications of CNC, Introduction to Additive Manufacturing (3D Printing), and Introduction to Industry 4.0.

TEXTBOOKS:

1. K. R. Gopala Krishna, Elements of Mechanical Engineering, Subhash Publications, 35th Edition.
2. **R. K. Rajput**, *a Textbook of Elements of Mechanical Engineering*, **Laxmi Publications**, Fourth Edition.

REFERENCE BOOKS:

1. **Jonathan Wickert and Kemper Lewis**, *an Introduction to Mechanical Engineering*, **Cengage Learning**, Fourth Edition.
2. **P. N. Rao**, *Manufacturing Technology: Foundry, Forming and Welding*, **McGraw Hill Education**, Fifth Edition.

VIDEO LINKS:

1. https://www.nptel.ac.in/courses/112104526?utm_source=chatgpt.com
2. <https://mitlibraryblog.wordpress.com/mitm-videos/>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lectures & Presentations	Deliver core concepts and foundational knowledge. - Utilize multimedia (images, diagrams, and animations, videos) to enhance understanding.
2	Interactive Discussions & Q&A	Encourage active participation and clarification of doubts. Facilitate critical thinking and analysis of concepts through student-led discussions
3	Hands-on Activities	Provide laboratory or simulation-based activities to demonstrate real-world applications of mechanics or machine tools.
4	Case Studies	Present real-world engineering challenges and have students analyze potential solutions.
5	Flipped Class Technique	Utilize a flipped class approach, providing materials before class to facilitate deeper understanding of competencies
6	Project-Based Learning	Encourage research and design thinking through project-based learning activities

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course with 3 credits**

Components		Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
Total Marks				50	20

Final CIE Marks = (A) + (B)**A** = Average of best two Test marks**B** = Average of two Alternate Assessment marks

Self-Learning (SL): If applicable, the teaching faculty shall motivate the students to take up online courses from any recognized platforms. There shall not be any assessment of the Self-Learning component. The faculty must collect the certificate from the students who have successfully completed the self-learning relevant to the course.

Semester End Examination (SEE)

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BESK104D/204D.1	Interpret the working principles and applications of conventional and renewable energy sources, with environmental issues such as global warming and carbon neutrality.
M26BESK104D/204D.2	Analyse the working principles and functionalities of various machine tools, industrial automation systems, their control strategies, and industrial applications.
M26BESK104D/204D.3	Evaluate the construction and working principles of Internal Combustion (IC) engines, and the basic concepts, components, and applications of Electric, Hybrid, and Autonomous Vehicles.
M26BESK104D/204D.4	Interpret the properties of engineering materials for selection in engineering applications, and the working principles and applications of welding, brazing, and soldering.
M26BESK104D/204D.5	Analyse the basic concepts of mechatronic systems, robotic systems, CNC machines, Additive Manufacturing (3D Printing), and Industry 4.0 in modern manufacturing.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BESK104D/204D.1	3	-	-	-	-	-	-	-	-	-	-
M26BESK104D/204D.2	3	-	-	-	-	-	-	-	-	-	-
M26BESK104D/204D.3	-	3	-	-	-	-	-	-	-	-	-
M26BESK104D/204D.4	3	-	-	-	-	-	-	-	-	-	-
M26BESK104D/204D.5	3	-	-	-	-	-	-	-	-	-	-
M26BESK104D/204D	3	3	-	-	-	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 7: Affordable and Clean Energy	The course introduces conventional and renewable energy sources, environmental sustainability, and future mobility technologies such as Electric and Hybrid Vehicles, promoting awareness of clean energy solutions, energy efficiency, and sustainable transportation, thereby supporting SDG 7.
2	SDG 9: Industry, Innovation and Infrastructure	Topics such as machine tools, industrial automation, CNC machines, Additive Manufacturing (3D Printing), robotics, and Industry 4.0 foster innovation, enhance manufacturing productivity, and strengthen sustainable industrial infrastructure, contributing to SDG 9.
3	SDG 12: Responsible Consumption and Production	The study of engineering materials, joining processes, advanced manufacturing systems, and automation promotes efficient utilization of resources, sustainable manufacturing practices, waste reduction, and responsible production, aligning with SDG 12.

1st / 2nd Semester	Engineering Science Course (ES) INTRODUCTION TO C PROGRAMMING	M26BESK104E/ 204E
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic computer Skills	Understanding how to use a computer, Functionality of Computer and perform basic Programming.
2	Logical Thinking	Ability to think logically and analytically, which is crucial for understanding algorithms and problem-solving in programming.
3	Understanding of Algorithms	Understanding the logic behind different algorithms (e.g., sorting, searching) can improve the efficiency of the code and its role in solving problems efficiently.
4	Basic Modular Arithmetic	Basic Number Theory: Understanding of integers, Datatypes. Algebra: Proficiency in algebraic manipulations and understanding of congruence relations.
5	Problem-Solving Skills	Ability to break down complex problems into smaller, manageable parts and develop step-by-step solutions

2. Syllabus

INTRODUCTION TO C PROGRAMMING SEMESTER – I/II			
Course Code	M26BESK104E/204E	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
Credits	03	Total Marks	100
		Exam Hours	03
Course Objectives:			
1. To introduce the fundamentals of computers, algorithmic thinking, and structured problem solving. 2. To build strong foundations in C syntax, control structures, and modular programming. 3. To develop the ability to design solutions using arrays, pointers, structures, and files. 4. To cultivate debugging discipline and good programming practices from the very first semester.			
Module -1			
Introduction to computers: Definition, Characteristics of Computer, Stored Program Concept, Applications of Computers, Basic Organization of Computer. Computer memory and Processors: Memory Organization, memory Hierarchy, Sequential and random Access, cache memory, Primary Memory. Design efficient programs: Program design Tools: Algorithms, Flowcharts, Pseudo codes. Programming in C: Introduction to C, Structure of C Program, writing the First C Program,. Introduction to C, Files used in a C program, C tokens, Character set in C, keywords, Identifiers, Basic Datatypes in C, variables, constants, Input/output statements in C. Textbook 1: Chapter 1.1,1.2, 1.3, 1.6,1.7 , 3.1-3.7 8.4, 9.1-9.4, 9.7-9.14			
Module -2			
Programming in C: Operators in C, Type conversion and typecasting. Decision control and Looping statements: Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements. Textbook 1: Chapter 9.15-9.16, 10.1-10.5			
Module -3			
Functions: Introduction, Using Functions, Function declaration, Function definition, Function call, return statement, passing parameters to functions, scope of variables, recursive functions. Arrays: Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays (Traverse, Searching, Sorting). Textbook 1: Chapter 11.1-11.8, 11.10. Chapter 12.1-12.5			
Module -4			
Arrays: Two dimensional arrays, operations on two-dimensional arrays Strings: Introduction, string taxonomy, operations on strings, (length, uppercase, lowercase, concatenate, compare, reverse) Miscellaneous string and character functions. Textbook 1: Chapter 12.7-12.8 Chapter 13.1, 13.3-13.6,			

Module -5	
Pointers: Concepts, pointer Variable, Accessing Variables through pointers, pointer Declaration and Definition, Initialization Pointer Variables, Pointer and Functions, pointers to pointers, Compatibility. Structures and Unions: Introduction, defining a structure, declaring structure Variables, accessing structure members, structure initialization, copying and comparing structure variables, operation on individuals' members. Textbook 2: Chapter 11, Chapter 13	
Illustrative Mini Project Ideas (Students May Choose Other Relevant Topics)	
<i>Mini projects are to be executed in teams of 2-3 students over the last 3-4 weeks of the semester, with a project report and a live demonstration for evaluation.</i> Mini Project 1: Digital Voltmeter Simulator Simulate a set of voltage readings, classify them into safe/unsafe ranges using functions, and log the readings to a file. Mini Project 2: Ohm's Law Based Circuit Calculator Given any two of voltage, current, and resistance, compute the third for a series of readings stored in an array, and save results to a file. Mini Project 3 Smart Site Alert Simulator Simulate a set of sensor-style readings (e.g., vibration or crack width) in an array, flag any reading beyond a safe limit, and log alerts to a file. Mini Project 4 Concrete Mix Quantity Calculator Given the volume of concrete and mix ratio, use functions to compute the required quantities of cement, sand, and aggregate, and save the report to a file. Mini Project 5: Frequency Unit Converter Utility Build a utility that converts frequency values between Hz, kHz, and MHz using functions and macros, with results logged to a file.	
Textbooks:	
1. Reema Thareja, Computer fundamentals and programming in c, Oxford University, Third edition, 2023 2. Behrouz Forozon, Richard Gilberg, A structured Programming Approach using C, 2nd edition Thomson Learning, 2003.	
Reference Books:	
1. E. Balaguruswamy, Programming in ANSI C, 8th Edition, Tata McGraw-Hill. 2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Pearson Publishers 2015. 3. Behrouz Forozon, Richard Gilberg, A structured Programming Approach using C, 2nd edition Thomson Learning, 2003.	
VIDEO LINKS:	
https://onlinecourses.nptel.ac.in/noc22_ce54/preview https://mitlibraryblog.wordpress.com/mitm-videos/ https://www.tutorialspoint.com/what-is-an-algorithm-and-flowchart-in-c-language https://www.tutorialspoint.com/cprogramming/c_data_types.htm https://www.tutorialspoint.com/cprogramming/c_operators.htm https://www.ccbp.in/blog/articles/decision-making-statements-in-c https://www.tutorialspoint.com/cprogramming/c_arrays.htm https://www.geeksforgeeks.org/variables-in-c/ https://www.w3schools.com/c/c_arrays.php https://www.programiz.com/c-programming/c-strings https://www.programiz.com/c-programming/c-pointers https://www.scaler.com/topics/c/structures-c/	

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of programming concepts.
3	Collaborative Learning	Encourage collaborative learning for improved competency application.

4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Programming Assignments	Assign programming tasks to reinforce practical skills associated with competencies.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course with 3 credits**

Components		Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
Total Marks				50	20

Final CIE Marks = (A) + (B)**A** = Average of best two Test marks**B** = Average of two Alternate Assessment marks**Semester End Examination (SEE) For Theory Course with 3 or 4 credits**

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BESK104E/204E.1	Apply the basic knowledge of computer hardware, functionalities of a computer to develop Simple C Programs.
M26BESK104/204E.2	Identify the appropriate operators, Branching and Looping constructs of C language to solve the real-world problem.
M26BESK104E/204E.3	Utilizing the Modularity of functions to implement arrays and strings to perform data Manipulation to inscribe the Application.
M26BESK104E/204E.4	Apply pointers, structures, unions in C programming to develop Application that efficiently manage, manipulate the data.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BESK104E/204E.1	3	-	-	-	-	-	-	-	-	-	-
M26BESK104E/204E.2	-	3	-	-	-	-	-	-	-	-	-
M26BESK104E/204E.3	-	3	3	-	-	-	-	-	-	-	-
M26BESK104E/204E.4	-	3	3	-	-	-	-	-	-	-	-
M26BESK104E/204E	3	3	3	-	-	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	The course builds critical computational and analytical thinking skills, empowering students with lifelong learning tools in computer science. Promotes technical education and employability
2	SDG 8: Decent Work and Economic Growth	By equipping students with key programming and problem-solving skills, the course enhances career opportunities in IT and software sectors, contributing to economic growth.
3	SDG 9: Industry, Innovation and Infrastructure	Programming using C form the backbone of modern technology and software infrastructure. The course fosters innovation and prepares students for building efficient, scalable digital systems

1st / 2ND Semester	Programming Language Course (PL) BASICS OF JAVA	M26BPLK105A / 205A
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Foundational Programming Logic	Comfort with variables, control structures, and functions from an earlier programming course (POP/Python).
2	Basic Data Structures Awareness	Familiarity with arrays and the idea of organizing data in memory.
3	Basic Computer Skills	Ability to set up a JDK/IDE, compile, and run programs from the command line or an IDE.
4	Elementary OOP Vocabulary	Awareness of terms like class, object, and method, even if not yet applied.

2. Syllabus

BASICS OF JAVA SEMESTER – I/ II			
Course Code	M26BPLK105A/205A	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
- To build a strong foundation in object-oriented principles (encapsulation, inheritance, polymorphism, abstraction) using Java. - To develop proficiency in exception handling, multithreading, and the Java Collections Framework. - To equip students with skills to design robust, reusable Java classes and packages. - To introduce students to Java-based GUI and basic client-server (socket) programming.			
Module -1			
Module 1: Java & OOP Foundations:			
Java Buzzwords, JVM/JRE/JDK, bytecode, and the compile-run cycle. Classes and objects: fields, methods, constructors, the 'this' keyword. Data types, operators, arrays, and Java Strings/StringBuilder. Control statements: selection, iteration, and jump statements in Java. Static members, method overloading, and constructor overloading.			
Lab Programs:			
- Construct and execute a Java program to determine the largest among three user-defined numbers. - Construct and execute a Java program that illustrates the concept of constructor overloading. - Construct and execute a Java program capable of verifying whether a given string qualifies as a palindrome.			
Text Book 1: Ch 1–2, Ch 3, Ch 4, Ch 5, Ch 6, Ch 7, Ch 18 (Strings) Text Book 2: Ch 2–3, Ch 4, Ch 5, Ch 6–7, Ch 8			
Module -2			
Module 2: Inheritance, Polymorphism, Interfaces & Packages			
Inheritance basics, the 'super' keyword, method overriding, and dynamic method dispatch. Abstract classes and methods; the 'final' keyword. Interfaces: defining, implementing, default and static interface methods. Packages: creating, importing, and access protection (public/private/protected/default). Polymorphism in practice: designing extensible class hierarchies.			
Lab Programs:			
- Construct and execute a Java program that illustrates single inheritance through the application of the super keyword. - Construct and execute a Java program that demonstrates the concept of method overriding. - Construct and execute a Java program to implement a Shape interface across two distinct classes.			
Text Book 1: Ch 8 (Inheritance), Ch 9 (Packages and Interfaces) Text Book 2: Ch 8 (extends/overriding), Ch 10 (Interfaces), Ch 11 (Packages)			
Module -3			

Templates & Exception Handling :

Exception hierarchy, try-catch-finally, multiple catch blocks, throw/throws. Creating and using custom (user-defined) exceptions. The Java thread model: creating threads via Thread class and Runnable interface. Thread lifecycle, synchronization, inter-thread communication (wait/notify), avoiding deadlocks. Executor framework basics for managing thread pools.

Lab Programs:

1. Construct and execute a C++ program to determine the maximum of two numbers by implementing a generic function template.
2. Construct and execute a C++ program that illustrates exception handling through the try-catch construct.
3. Construct and execute a C++ program to define a custom exception class derived from the standard std::exception class.

Text Book 1: Ch 10 (Exception Handling), Ch 11 (Multithreaded Programming) | Text Book 2: Ch 13 (Errors and Exceptions), Ch 12 (Multithreaded Programming)

Module -4**Collection hierarchy:**

List, Set, Map interfaces and key implementations (ArrayList, Linked List, HashSet, TreeSet, HashMap, TreeMap). Iterators, Comparable and Comparator for custom sorting. Generics: generic classes and methods, bounded type parameters, wildcards. Autoboxing/unboxing and the java.util utility classes.

Lab Programs:

1. Construct and execute a C++ program to store and present a collection of elements using a vector container.
2. Construct and execute a C++ program to arrange a vector of integers in order by employing the sort() algorithm.
3. Construct and execute a C++ program that illustrates the storage and retrieval of key-value pairs using a map container.

Text Book 1: Ch 14 (Generics), Ch 20 (java.util Part 1: Collections Framework) | Text Book 2: Ch 16 (Java Collections)

Module -5**Java I/O streams:**

Byte vs character streams, reading/writing files, try-with-resources. Serialization basics for persisting Java objects. Introduction to Java Swing: components, layouts, event handling for simple GUIs. Networking basics: Socket and ServerSocket classes for simple client-server communication.

Lab Programs:

1. Construct and execute a C++ program capable of reading from and writing to a file using the fstream class.
2. Construct and execute a C++ program that illustrates the use of a unique_ptr smart pointer for automatic memory management.
3. Construct and execute a C++ program to apply a lambda expression in conjunction with the for each STL algorithm.

Text Book 1: Ch 13 (I/O & Try-with-Resources), Ch 22 (java.io), Swing chapters (~Ch 28–30), Networking (~Ch 24) | Text Book 2: Ch 15 (I/O Files), Ch 14 (Graphics/AWT/Swing)

Text Books:

1. Herbert Schildt, Java: The Complete Reference, 12th Edition, McGraw-Hill.
2. E. Balagurusamy, Programming with Java, 6th Edition, McGraw-Hill Education.

Reference Books:

1. Cay S. Horstmann, Core Java Volume I - Fundamentals, 12th Edition, Pearson.
2. Kathy Sierra and Bert Bates, Head First Java, 2nd Edition, O'Reilly.

Video Link:

1. https://onlinecourses.nptel.ac.in/noc22_cs27/preview

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of programming concepts.
3	Collaborative Learning	Encourage collaborative learning (pair programming, peer code review) for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Programming Assignments	Assign programming/lab tasks and mini-projects to reinforce practical skills associated with competencies.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course with 3 credits**

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Semester End Examination (SEE) For Theory Course with 3 or 4 credits

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BPLK105A.1	Understand and apply the fundamental programming constructs of OOP with Java.
M26BPLK105A.2	Design and implement modular, well-structured programs using the language's core features.
M26BPLK105A.3	Analyze problems and select appropriate data organization techniques to build efficient solutions.
M26BPLK105A.4	Develop complete mini-applications that integrate multiple course concepts to solve real-world problems.
M26BPLK105A.5	Demonstrate professional coding practices including debugging, documentation, and version-appropriate style

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BPLK105A.1	3	-	-	-	-	-	-	-	-	-	-
M26BPLK105A.2	-	3	-	-	-	-	-	-	-	-	-
M26BPLK105A.3	-	-	3	3	-	-	-	-	-	-	-
M26BPLK105A.4	-	-	-	3	-	-	-	-	-	-	-
M26BPLK105A.5	-	-	3	-	-	-	-	-	-	-	-
M26BPLK105A	3	3	3	3	-	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Strengthens rigorous computational thinking and systems-level programming skills as part of a well-rounded technical education.
2	SDG 9: Industry, Innovation and Infrastructure	C++ underpins performance-critical systems, embedded software, and game engines, directly supporting infrastructure innovation.
3	SDG 8: Decent Work and Economic Growth	Proficiency in C++ opens career pathways in systems programming, finance, gaming, and embedded industries.

1st/2nd Semester	Programming Language Course - (PL) INTRODUCTION TO PYTHON PROGRAMMING	M26BPLK105B/ 205B
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Computer Skills	Understanding how to use files, folders, and applications. Familiarity with installing and using software
2	Logical Thinking and Problem Solving	The ability to understand a problem and solve it step by step. The process of understanding a problem, writing a Python program to solve it, and checking the result.
3	Basic Math Skills	Knowledge of arithmetic operations, percentages, averages, and simple mathematical formulas to perform calculations in Python programs.
4	Elementary Programming Concepts	Basic understanding of variables, data types, operators, input/output, conditional statements, loops, and functions to develop simple Python programs.

2. Syllabus

INTRODUCTION TO PYTHON PROGRAMMING SEMESTER – I/II			
Course Code	M26BPLK105B/205B	CIE Marks	50
Number of Lecture Hours/Week (L:T: P: S:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
		Total Marks	100
Credits	03	Exam Hours	03
Course Objectives:			
1. Learn the syntax and semantics of the Python programming language. 2. Illustrate the process of structuring the data using lists, tuples. 3. Appraise the need for working with various documents like Excel, PDF, Word and Others. 4. Demonstrate the use of built-in functions to navigate the file system. 5. Implement the Object Oriented Programming concepts in Python.			
Module -1			
Python Basics:			
Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program, Flow control:			
Boolean Values, Comparison Operators, Boolean Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys.exit().			
Functions:			
def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print() function, Local and Global Scope, The global Statement, Exception Handling.			
Textbook 1: Ch. 1, 2, 3			8 Hours
Lab Programs:			
1. Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.			
2. Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.			
3. Develop a program to generate Fibonacci sequence of length (N). Read N from the console.			
Module -2			
Lists: Dictionaries and Structuring Data:			
The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Strings and Tuples, References,			
Dictionaries and Structuring Data:			
The Dictionary Data Type, Dictionary vs List, The Keys(), values() and items() methods, Pretty Printing, Using Data Structures to Model Real-World Things.			

Textbook 1: Ch. 4, 5 Lab Programs: 1. Design a program that defines a factorial function and uses it to determine the binomial coefficient for the given inputs N and R. 2. Develop a program to read N numbers from the console into a list and calculate the mean, variance, and standard deviation. Display the results with suitable messages. 3. Develop a program to accept a multi-digit number as characters from the console and print the occurrence count of each digit with suitable messages.	8 Hours
Module -3	
Manipulating Strings: Working with Strings, Useful String Methods ,Copying and pasting string with the pyperclip() module. Reading and writing Files: Files and File Paths, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the pprint.format() Function Textbook 1: Ch. 6, 9 Lab Programs: 1. Implement a program that reads a text file, counts the frequency of each distinct word using a dictionary, sorts the words in decreasing order of frequency, and prints the top 10 most frequent words. 2. Develop a program to read the contents of a text file, sort them in ascending order, and write the sorted contents to a separate text file. Use appropriate string, list, and file handling methods. 3. Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.	8 Hours
Module -4	
Organizing Files: The shutil Module, walking a Directory Tree, Compressing Files with the zipfile Module, Debugging: Raising Exceptions, Getting the Traceback as a String, Assertions, Logging. Textbook 1: Ch. 10, 11 Lab Programs: 1. Develop a Python program that defines a function DivExp(a, b) to perform division. Use an assertion to validate that a is greater than zero and handle the divide-by-zero condition by raising an appropriate exception. Read the input values from the console and call the function. 2. Construct and execute a Python program to walk a directory tree using os.walk() and list all files with a specific extension. 3. Develop a Python program to simulate the operation of a traffic light. Use an assertion to ensure that the input signal is one of Red, Yellow, or Green. Display the corresponding traffic instruction and handle invalid inputs appropriately.	8 Hours
Module -5	
Classes and objects: Programmer-defined type,Attributes, Rectangles, Instances as return values, Objects are mutable, Copying. Classes and functions: Time, Pure functions, Modifiers, Classes and methods: Printing objects, The __init__ method, The __str__ method, Operator overloading,Polymorphism Textbook 2: Ch. 15, 16, 17 Lab Programs: 1. Develop a Python program to define a class Complex for representing complex numbers. Implement a function to perform the addition of two Complex objects and use it to calculate the sum of N ($N \geq 2$) complex numbers entered by the user. 2. Construct and execute a Python program that demonstrates the use of the __init__ and __str__ methods within a programmer-defined class. 3. Write a Python program using a Student class to read a student's details and marks in three subjects, calculate the total and percentage, and display the score card using appropriate class methods.	8 Hours
TEXT BOOKS 1. Al Sweigart, "Automate the Boring Stuff with Python", 2nd Edition, No Starch Press, 2020. 2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.	
REFERENCE BOOKS:	

1. Naomi Ceder, The Quick Python Book, 4th Edition
2. Mark Lutz, Learning Python, 5th Edition

Video Links:

1. <https://automatetheboringstuff.com/>
2. <https://greenteapress.com/wp/think-python-2e/>
3. <https://youtube.com/@mitmysorecse2071>

Illustrative Mini Project Ideas (Students May Choose Other Relevant Topics)

Mini projects are to be executed in teams of 2–3 students over the last 3–4 weeks of the semester, with a project report and a live demonstration for evaluation.

1. Mini Project 1: Personal File Organizer & Backup Utility

Build a command-line utility that scans a target folder, organizes files into sub-folders by type/extension using the `os` and `shutil` modules, and creates a dated ZIP backup of the organized folder using the `zipfile` module, with a logging-based summary report of every operation performed.

2. Mini Project 2: Secure Password Locker with Persistent Storage

Develop a dictionary-based password manager that lets a user add, retrieve, update, and delete account credentials, persisting the data between runs using the `shelve` module, with input validation and try-except blocks to gracefully handle missing or duplicate entries.

3. Mini Project 3: Student Record Management System (OOP-based)

Design a Student class with attributes for name, marks, and grade, implement the `__init__` and `__str__` methods for clean object display, and build a program that stores a list of Student objects, computes each student's grade, and saves/loads the records to/from a text file.

4. Mini Project 4: Text Analyzer & Wiki Formatter

Create a tool that reads a text file, uses a dictionary to compute word-frequency statistics, pretty-prints the results with the `pprint` module, and reformats selected lines into wiki-style bulleted markup, building directly on the string-manipulation and dictionary techniques from Modules 2 and 3.

5. Mini Project 5: Debug-Aware Contact Book with Exception Handling

Build a contact book application that stores contacts as dictionaries within a list, supports adding/searching/deleting entries, and persists data to a file, while using assertions and the logging module to record errors and full tracebacks for invalid input, per the debugging practices covered in Module 4.

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Hands-on Coding	Python is best learned by doing. Provide plenty of opportunities for students to write code, debug, and experiment with Python programs. Use coding exercises, projects, and challenges to reinforce learning.
2	Interactive Learning	Use interactive Python environments like Jupyter Notebooks, REPL (Read-Eval-Print Loop), or IDEs such as PyCharm or Visual Studio Code. These tools allow students to see immediate results and interactively explore concepts.
3	Real-world Examples	Relate Python concepts to real-world applications and examples that resonate with students' interests or future career paths. For example, show how Python is used in data analysis, web development, or artificial intelligence.
4	Incremental Complexity	Start with simple Python concepts and gradually increase the complexity of topics as students gain proficiency. This approach helps build a strong foundation and prevents overwhelming students with advanced topics too soon.
5	Laboratory Learning	Utilize the facilities available in the laboratories to understand the behavior of the materials by performing few experiments.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Theory Course with 3 credits**

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Semester End Examination (SEE) For Theory Course with 3 or 4 credits

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BPLK105B/205B.1	Apply the fundamentals of Python programming to solve complex problems.
M26BPLK105B/205B.2	Analyse different data structures, concepts of string manipulation used in python programming
M26BPLK105B/205B.3	Interpret the concepts of object oriented programming using Python
M26BPLK105B/205B.4	Develop Solutions to the real world problems using python and justify through formal reasoning with complete experimental documentation.

CO-PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BPLK105B/205.1	3	-	-	-	-	-	-	-	-	-	-
M26BPLK105B/205.2	-	3	-	-	-	-	-	-	-	-	-
M26BPLK105B/205.3	-	-	3	-	-	-	-	-	-	-	-
M26BPLK105B/205.4	-	-	-	3	3	-	-	-	-	-	-
M26BPLK105/205B	3	3	3	3	3	-	-	-	-	-	-

6. Mapping to Sustainable Development Goals (SDG)

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Python is free, beginner-friendly, and widely used in digital education platforms and coding literacy campaigns.
2	SDG 8: Decent Work and Economic Growth	Python helps in workforce analytics, automation, and developing digital skills that boost employability.
3	SDG 9: Industry, Innovation, and Infrastructure	Python drives innovations in AI, IoT, and automation in industries, enhancing infrastructure management.

1st Semester	Programming language Course (PC) INTRODUCTION TO C++ PROGRAMMING	M26BPLK105C/ 205C
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Foundational Programming Logic	Comfort with variables, control structures, and functions, typically from POP in C.
2	Basic Understanding of Pointers	Familiarity with the concept of memory addresses and pointer variables.
3	Basic Computer Skills	Ability to compile and run C++ programs using a compiler/IDE (g++, Code::Blocks, VS Code).
4	Elementary OOP Vocabulary	Awareness of terms like class and object, even if not yet applied in code.

2. Syllabus

INTRODUCTION TO C++ PROGRAMMING SEMESTER – I			
Course Code	M26BPLK105C	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
Credits	03	Total Marks	100
		Exam Hours	03
Course Objectives:			
1. To build a strong foundation in object-oriented principles (encapsulation, inheritance, polymorphism) using C++. 2. To develop skills in operator overloading, templates, and exception handling for robust, reusable code. 3. To introduce the Standard Template Library (STL) for efficient data management. 4. To develop an appreciation of resource management (RAII) and modern C++ practices..			
Module -1			
C++ & OOP Foundations			
From C to C++: new features, references, inline functions, default arguments.			
Classes and objects: data members, member functions, access specifiers.			
Constructors (default, parameterized, copy) and destructors.			
Static members and static member functions; the 'this' pointer. Friend functions and friend classes.			
Lab Programs:			
1. Construct and execute a C++ program to compute the area of a rectangle by encapsulating the relevant data and logic within a class. 2. Construct and execute a C++ program that illustrates the sequence in which constructors and destructors are invoked. 3. Construct and execute a C++ program to interchange the values of two numbers by implementing a friend function.			
Text Book 1: Ch 2 (Beginning with C++), Ch 5 (Classes and Objects), Ch 6 (Constructors and Destructors) Text Book 2: Ch 16 (Classes), Ch 17 (Construction, Cleanup, Copy, and Move)			
Module -2			
Inheritance & Polymorphism			
Types of inheritance: single, multiple, multilevel, hierarchical, hybrid. Function overriding, virtual functions, and pure virtual functions (abstract classes). Runtime polymorphism via virtual function tables; early vs late binding. Operator overloading: unary and binary operators, overloading using friend functions. Virtual destructors and safe polymorphic object destruction.			
Lab Programs:			
1. Construct and execute a C++ program that illustrates the concept of single-level inheritance. 2. Construct and execute a C++ program that demonstrates runtime polymorphism through the implementation of virtual functions. 3. Construct and execute a C++ program to overload the + operator such that it supports the addition of two complex numbers.			

Text Book 1: Ch 8 (Inheritance: Extending Classes), Ch 9 (Virtual Functions and Polymorphism), Ch 7 (Operator Overloading) | Text Book 2: Ch 20 (Derived Classes), Ch 21 (Class Hierarchies), Ch 18–19 (Overloading, Special Operators)

Module -3

Templates & Exception Handling: Function templates and class templates; template parameters. Template specialization basics. Exception handling: try-catch-throw, exception hierarchies, standard exceptions. Custom exception classes derived from `std::exception`. Resource Acquisition Is Initialization (RAII) concept and its role in exception safety.

Lab Programs:

1. Construct and execute a C++ program to determine the maximum of two numbers by implementing a generic function template.
2. Construct and execute a C++ program that illustrates exception handling through the try-catch construct.
3. Construct and execute a C++ program to define a custom exception class derived from the standard `std::exception` class.

Text Book 1: Ch 12 (Templates), Ch 13 (Exception Handling) | Text Book 2: Ch 23 (Templates), Ch 24 (Generic Programming), Ch 13 (Exception Handling) | 8 Hours

Module -4

Standard Template Library (STL)

STL overview: containers, iterators, algorithms, functions. **Sequence containers:** vector, list, deque; associative containers: map, set, multimap. **Iterators:** types and usage; range-based for loops.

STL algorithms: sort, find, count, accumulate, transform. Choosing the right container for performance and use-case requirements.

Lab Programs:

1. Construct and execute a C++ program to store and present a collection of elements using a vector container.
2. Construct and execute a C++ program to arrange a vector of integers in order by employing the `sort()` algorithm.
3. Construct and execute a C++ program that illustrates the storage and retrieval of key-value pairs using a map container.

Text Book 1: Ch 14 (Introduction to the STL) | Text Book 2: Ch 31 (STL Containers), Ch 32 (STL Algorithms), Ch 33 (STL Iterators)

Module -5

File Handling & Modern C++ Practices

File streams: `ifstream`, `ofstream`, `fstream`; reading/writing objects to files. Namespaces and their role in avoiding naming conflicts. **Introduction to smart pointers** (`unique_ptr`, `shared_ptr`) for automatic memory management. Lambda expressions basics and their use with STL algorithms. Overview of building a small end-to-end application combining OOP, STL, and file handling.

Lab Programs:

1. Construct and execute a C++ program capable of reading from and writing to a file using the `fstream` class.
2. Construct and execute a C++ program that illustrates the use of a `unique_ptr` smart pointer for automatic memory management.
3. Construct and execute a C++ program to apply a lambda expression in conjunction with the `for_each` STL algorithm.

Text Book 1: Ch 11 (Working with Files), Ch 16 (New Features of ANSI C++ Standard) | Text Book 2: Ch 38 (I/O Streams), Ch 14 (Namespaces), Ch 34 (Memory and Resources — smart pointers), lambda coverage in Ch 11 (Select Operations)

Text Books:

1. E. Balagurusamy, Object Oriented Programming with C++, 8th Edition, McGraw-Hill Education.
2. Bjarne Stroustrup, The C++ Programming Language, 4th Edition, Addison-Wesley.

Reference Books:

1. Herbert Schildt, C++: The Complete Reference, 4th Edition, McGraw-Hill.
2. Nicolai M. Josuttis, The C++ Standard Library, 2nd Edition, Addison-Wesley.

Video Link:

2. https://onlinecourses.nptel.ac.in/noc22_cs28/preview

Illustrative Mini Project Ideas (Students May Choose Other Relevant Topics)

Mini projects are to be executed in teams of 2–3 students over the last 3–4 weeks of the semester, with a project report and a live demonstration for evaluation.

1. Mini Project 1: Hotel Reservation System

Design a hotel reservation system using classes for Room, Guest, and Booking, storing reservations in a file, with STL containers to manage room availability and a simple search for available rooms by date range.

2. Mini Project 2: Multi-Account Banking System using Inheritance

Build a banking system with a base Account class and derived Savings Account/Current Account classes with different interest/overdraft rules, using virtual functions for polymorphic transaction processing and exception handling for invalid transactions.

3. Mini Project 3: Library Management System using STL

Implement a library system using a map for ISBN-based book lookup and a vector for tracking issued books per member, supporting issue, return, and overdue-fine calculation, persisted to a file.

4. Mini Project 4: 8-Puzzle Solver

Implement a solver for the classic 8-puzzle using a search algorithm (BFS or A*) with STL containers (queue/priority queue, set/map for visited states) to find and display the sequence of moves to reach the goal state.

5. Mini Project 5: Employee Management System with Smart Pointers

Create an employee management system using classes for different employee types (via inheritance), managing employee objects using shared_ptr/unique_ptr to demonstrate automatic memory management, with custom exceptions for invalid data and file-based persistence.

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Video/Animation	Incorporate visual aids like videos/animations to enhance understanding of programming concepts.
3	Collaborative Learning	Encourage collaborative learning (pair programming, peer code review) for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world competencies.
5	Programming Assignments	Assign programming/lab tasks and mini-projects to reinforce practical skills associated with competencies.
6	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE) for Theory Course with 3 credits

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

$$\text{Final CIE Marks} = (A) + (B)$$

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Semester End Examination (SEE) For Theory Course with 3 or 4 credits

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions

5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BPLK105C.1	Understand and apply the fundamental programming constructs of OOP with C++.
M26BPLK105C.2	Design and implement modular, well-structured programs using the language's core features.
M26BPLK105C.3	Analyze problems and select appropriate data organization techniques to build efficient solutions.
M26BPLK105C.4	Develop complete mini-applications that integrate multiple course concepts to solve real-world problems.
M26BPLK105C.5	Demonstrate professional coding practices including debugging, documentation, and version-appropriate style.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BPLK105C.1	3	2	-	-	-	-	-	-	-	-	-
M26BPLK105C.2	-	3	2	-	-	-	-	-	-	-	-
M26BPLK105C.3	-	-	3	2	-	-	-	-	-	-	-
M26BPLK105C.4	-	-	-	2	3	-	-	-	2	-	-
M26BPLK105C.5	-	-	-	-	-	-	-	-	2	2	2
M26BPLK105C	3	2.5	2.5	2	3	-	-	-	2	2	2

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Strengthens rigorous computational thinking and systems-level programming skills as part of a well-rounded technical education.
2	SDG 9: Industry, Innovation and Infrastructure	C++ underpins performance-critical systems, embedded software, and game engines, directly supporting infrastructure innovation.
3	SDG 8: Decent Work and Economic Growth	Proficiency in C++ opens career pathways in systems programming, finance, gaming, and embedded industries.

1st /2nd Semester	Programming Language Course (PL) INTRODUCTION TO WEB PROGRAMMING	M26BPLK105D/ 205D
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Programming Concepts:	Understanding core programming concepts like variables, loops, and conditional statements will make learning JavaScript and other languages easier.
2	Web Servers and Hosting:	Having a basic understanding of how websites are hosted and served on the internet is beneficial.
3	Problem-Solving and Logical Thinking	Ability to analyze problems and apply logical steps to solve them and Familiarity with algorithmic thinking.
4	Understanding of Markup Language	Basic understanding of what HTML and CSS
5	Developer Tools	Familiarize yourself with browser developer tools, which are essential for debugging and testing web pages.

2. Syllabus

INTRODUCTION TO WEB PROGRAMMING SEMESTER – I/II			
Course Code	M26BPLK105D/205D	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	32:32:0:20:20 = 104 Hours	SEE Marks	50
Credits	03	Total Marks	100
Exam Hours			
03			
Course Objectives:			
1. To use the syntax and semantics of HTML and XHTML 2. To develop different parts of a web page 3. To understand how CSS can enhance the design of a webpage. 4. To create and apply CSS styling to a webpage 5. To get familiarity with the JavaScript language and understand Document Object Model handling of Java Script			
Module -1			
HTML: Understanding elements, physical style elements, DIV and SPAN elements, exploring hyperlink and URLs, Table elements, Images in web page, input element, button, multi choice, submitting forms Textbook1: Ch. 2.1, 3.1,3.2,4.1,5.1.1, 5.1.2,6.1,7.1.1, 8.1.1,8.1.2, 8.1.10, 7.2 8 Hours			
Module -2			
CSS: Syntax of CSS, CSS selectors, CSS in HTML doc, Color property, image property, size property, background property, font family, font size property, font style property, font variant property, font weight property, font property, CSS to text, box model, template layout model, display of an element using CSS, positioning an element, floating element. Textbook 1:Ch 8.1.2, 18.1.3, 18.1.4, 19.1.1, 19.1.2, 19.1.8, 19.1.11,20.1.1,20.1.2, 20.1.5-20.1.8, 20.3, 21.1,21.3,22.1-22.3,25.1 8 Hours			
Module -3			
Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo class Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element . Textbook 2 : 5.2 to 5.8, 6.2, 6.3, 6.6., 6.7, 6.9, 6.10, 6.12, 7.2 to 7.4 8 Hours			

Module -4	
XML: Working with basics of XML, XML namespaces, XML schema: simple type, data types, DOM parser, XSLT processor, JAXP, XPath language, XLink language, XPointer language, XML encoding. Textbook1: 28.1-28.7, 29.1,29.2.1,29.2.3, 30.1,30.3,30.4, 32.1-32.3,29.4,29.5 8 Hours	
Module -5	
Introduction to JavaScript: Functions, DOM, Forms, and Event Handlers History of JavaScript, Hello World Web Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects, Document Object Model, Client-Side Versus Server-Side, form Element, Controls, Text Control, accessing a Form's Control Values, reset and focus Methods TextBook2: 8.2 to 8.13, 8.15, 8.16 8 Hours	
TEXTBOOKS: 1.Dreamtech Press India Pvt. Ltd HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, Second Edition,2019 2.John Dean, Jones & Bartlett Learning, WEB PROGRAMMING with HTML5, CSS and JavaScript, First Edition,2018 REFERENCE BOOKS: 1. S Rattan, Strength of Materials, Second Edition, McGraw Hill, 2011. 2. Ferdinand Beer and Russell Johnston, Mechanics of materials, Tata McGraw Hill, 2003. VIDEO LINKS: 1. https://onlinecourses.swayam2.ac.in/aic20_sp11/preview	

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Learning Objectives	Understand the basic concepts of the internet and the World Wide Web. Differentiate between websites, web pages, web servers, and web browsers. Introduce HTML, CSS, and basic client-server architecture. Understand how data travels on the internet using protocols like HTTP/HTTPS and Develop a simple static web page.
2	Learning Resources	Basic Web Technology or Web Development books., Online Tutorials: W3Schools, MDN Web Docs. Software Tools: Text Editor (VS Code, Notepad++), Browsers (Chrome, Firefox). Hardware Requirements: Computer Lab with internet access
3	Collaborative Learning	Encourage collaborative learning for improved competency application.
4	Real-World Application	Discuss practical applications to connect theoretical concepts with real-world Competencies.
5	Outcomes	Create and host a basic webpage. Demonstrate understanding of web browser and server interaction.

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation (CIE) for Theory Course with 3 credits

	Components	Number	Weightage	Max. Marks	Min Marks
1	Internal Assessment - Tests (A)	3	60%	30	12
2	Alternate Assessment (B)	2	40%	20	---
	Total Marks			50	20

Final CIE Marks = (A) + (B)
A = Average of best two Test marks

B = Average of two Alternate Assessment marks

Semester End Examination (SEE) For Theory Course with 3 or 4 credits

1. Question paper will be containing 8 questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. The questions from Module 1, 4 and 5 will have 100% choice
3. The questions from Module 2 and 3 will not have any choice
4. Each of the question will have a maximum of two sub questions
5. The students have to answer 5 full questions selecting one full question from each module.
6. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BPLK105D.1	Apply the knowledge of fundamental concepts of HTML, XHTML, CSS and JavaScript
M26BPLK105D.2	Identify complex engineering problems and providing suitable solutions using HTML5 and JavaScript
M26BPLK105D.3	Analyse various attributes, values and types of CSS to design Web components.
M26BPLK105D.4	Investigate the core constructs and event handling mechanisms of JavaScript and CSS for Providing valid solutions.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
M26BPLK105D.1	3	-	-	-	-	-	-	-	-	-	-	3	-
M26BPLK105D.2	-	3	-	-	-	-	-	-	-	-	-	-	-
M26BPLK105D.3	-	-	3	-	-	-	-	-	-	-	-	3	3
M26BPLK105D.4	-	-	-	3	-	-	-	-	-	-	-	-	3
M26BPLK105D	3	3	3	3	-	-	-	-	-	-	-	3	3

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Provides learners with essential digital and technical skills such as HTML, CSS, JavaScript—empowering them in a technology-driven world.
2	SDG 9: Industry, Innovation, and Infrastructure	Equips students to build digital platforms that can support modern services, innovation, and IT infrastructure development
3	SDG 10: Reduced Inequalities,	Web technologies allow marginalized groups to access opportunities and information, bridging digital and social gaps

1st / 2nd Semester	Basic Science Lab (BSL) APPLIED CHEMISTRY LABORATORY FOR SMART COMPUTING SYSTEMS	M26BCHELS106/ 206
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Analytical Chemistry Techniques	Understanding of acid-base, redox, and complexometric titrations. Familiarity with indicators, titration curves, and stoichiometric calculations.
2	Instrument Handling	Prior experience in handling instruments like pH meters, conductivity meters, potentiometers, viscometers and colorimeters.
3	Sensor and Digital Interface Usage	Basic knowledge of using electrochemical sensors and optical sensors. Understanding how digital sensors interface with microcontrollers or PC-based data acquisition systems.
4	Chemical Handling and Lab Safety	Knowledge of MSDS (Material Safety Data Sheet), safe handling of acids, bases, and organic solvents. Correct usage of PPE like gloves, goggles, and lab coats.
5	Data Recording and Interpretation	Ability to systematically record observations, tabulate data, calculate molarity/normality, and perform result interpretation with suitable units and significant figures.
6	Fundamentals of Electrochemistry	Understanding of electrochemical cells, electrode potential, plating mechanisms, and corrosion. Required for plating, corrosion rate, and battery acid strength experiments.

2. Syllabus

Applied Chemistry Laboratory for Smart Computing Systems SEMESTER – I/II			
Course Code	M26BCHELS106/206	CIE Marks	50
Number of Lecture Hours/Week (L: T: P: S:TW:SL)	(0:0:2:0:0)=32Hrs	SEE Marks	50
		Total Marks	100
Credits	01	Exam Hours	03
Course objectives: This course will enable students to: - Understand the chemical principles underlying smart materials, nanomaterials, conducting polymers, sensors, computational chemistry, and environmentally sustainable technologies relevant to Computer Science Engineering applications. - Develop practical skills in modern analytical techniques, chemical sensors, molecular modelling software, and virtual simulation tools for characterization of materials and environmental samples. - Apply chemical and computational approaches for solving interdisciplinary problems related to smart sensing, e-waste management, water quality monitoring, and digital technologies. - Analyze and interpret experimental data using scientific reasoning and software tools and correlate the findings with real-world computing and sensor applications. - Promote sustainable engineering practices through experiments involving virtual laboratories, smart materials, resource recovery from e-waste, and environmental monitoring.			
Sl. No	Experiments		
1	Quantitative analysis of iron in simulated corrosion extract of electronic components. During the recycling of electronic hardware, corrosion products containing iron are separated from the components. A simulated corrosion extract is available for analysis. How would you use diphenylamine indicator to estimate the iron present in the sample?		
2	The total alkalinity of the given industrial wastewater sample is to be determined using suitable indicators through volumetric analysis.		

	An industry needs to neutralize its alkaline wastewater before sending it to a treatment facility. Given a wastewater sample, how would you determine its total alkalinity and estimate the amount of acid required for neutralization?
3	The combined hardness due to calcium and magnesium ions in the given cooling-water sample is to be quantified using EDTA titration. A data-centre facility has introduced a new cooling-water treatment process and wants to verify its effectiveness. How would you determine the total hardness of the simulated cooling-water sample by EDTA complexometric titration and use the result to assess the water quality?
4	The organic load of the given sewage water sample is to be assessed by determining its Chemical Oxygen Demand (COD). A sewage water sample contains an unknown amount of oxidizable organic matter. As an environmental chemist, how would you determine its Chemical Oxygen Demand (COD) and assess the degree of organic pollution?
5	The acidity of the given simulated UPS battery electrolyte is to be evaluated using conductometric titration. A battery-recycling facility is recovering electrolyte from spent UPS batteries and needs to characterize its acid content before treatment. How would you use conductometric analysis to determine the acid concentration in the simulated electrolyte?
6	The concentration of iron in the given simulated biomedical fluid sample is to be examined using a suitable potentiometric method. A laboratory receives a simulated patient-fluid sample suspected of containing an altered iron level. As an analytical chemist, how would you employ potentiometric analysis to estimate the iron concentration and interpret the analytical result?
7	The pKa of the given acidic beverage sample is to be estimated from pH measurements using a glass-electrode sensor. During a soft-drink stability study, changes in acidity are observed after storage. As a chemist, how would you determine the pKa of the beverage's acidic component using a glass-electrode pH sensor to assess its acid–base behaviour?
8	The nickel content of the given sample is to be identified and quantitatively estimated using a colorimeter. A simulated battery-leachate sample is suspected to contain nickel ions that could pose an environmental concern if released untreated. How would you identify and quantify nickel using a colorimeter.
Project/Virtual lab (For CIE only – not to be included for SEE)	
1	The chloride concentration of different water samples is to be determined and comparatively evaluated using an electrochemical sensor. An environmental laboratory receives water samples collected from a river, groundwater source, and treated-water outlet. How would you use a chloride-sensitive electrochemical sensor to estimate the chloride content of each sample? Compare and interpret the results to identify possible sources of chloride contamination.
2	Investigate and compare the viscosity coefficients of toluene and nitrobenzene using a virtual Ostwald's viscometer: In a virtual laboratory project, simulate the measurement of flow times of toluene, nitrobenzene, and water using an Ostwald's viscometer under identical conditions. Calculate and compare the viscosity coefficients of the solvents, analyze their flow behaviour, and relate the findings to solvent handling and processing in electronics and semiconductor-related applications.
Reference Books:	
1. Vogel's textbook of qualitative chemical analysis By: Vogel, A. I Mendham, J Denney, R.C Barnes, J.D Thomas, M Siavsankar -6 th edn-Pearson Education Services Pvt.Ltd, 2017.	
2. Vogel's Qualitative Inorganic Analysis, 7th Edition, Pearson Learning by Svehla.	

3. Teaching-Learning Process Strategies

S/L	TLP Strategies:	Description
1	Pre-Lab Sessions	The instructor introduces the theoretical background of experiments covering computational chemistry, molecular modelling, nanomaterials, conducting

		polymers, sensors, electrochemical systems, and environmental applications. The sessions include objectives, principles of instruments/software, safety precautions, and expected outcomes.
2	Pre-Lab Assignments	Students are assigned relevant laboratory manuals, simulation videos, research articles, and tutorials on ChemDraw, virtual laboratories, sensor technologies, e-waste management, and data analysis to ensure preparedness before experimentation.
3	Experimentation	Students individually or in teams perform experiments involving smart materials, industrial water samples, battery systems, e-waste, and sensor-based measurements. Activities include apparatus setup, safe handling of chemicals, software utilization, operation of instruments, data acquisition, calculations, and interpretation of results.
4	Live Demonstration & Guidance	Faculty members demonstrate proper handling and calibration of analytical instruments and software tools such as pH meters, conductometric sensors, optical sensors, potentiometric sensors, ChemDraw, and virtual simulation platforms while providing continuous guidance and ensuring adherence to safety practices.
5	Lab Reports, conclusion & Inference	Students prepare laboratory reports including: • Objectives of the experiment • Experimental procedure • Data presentation using tables and graphs • Calculations and analysis • Discussion of observations, possible errors, conclusions, engineering significance, and applications related to smart computing systems and sustainable technologies.
6	Reflection & Peer Discussion	Students discuss their findings with peers and instructors to strengthen conceptual understanding, compare observations, solve experimental challenges, and relate laboratory concepts to computing applications, smart sensors, environmental monitoring, and digital technologies.

4. Assessment Details

Continuous Internal Evaluation (CIE) for Practical Lab Course

Sl. No.	Components	Number	Weightage	Max. Marks	Min Marks
1	Write up, Conduction & Record (A)	1	60%	30	12
2	Lab IA test (B)	1	20%	10	---
3	Project Work (C)	1	20%	10	---
Total Marks				50	20

$$\text{Final CIE Marks} = A + B + C$$

A = Average of marks for all the experiments

B = Lab Internal Assessment marks

C = Project work marks

❖ SEE for the Practical Course:

1. SEE marks for a practical course shall be 50 marks.
2. The practical course is evaluated for 100 marks, and the scored marks shall be scaled down to 50 marks.
3. A change of experiment/program is allowed only once, and 20% of the marks allotted to the procedure/write-up part will be zero.
4. The duration of SEE shall be 3 hours.

Marks distribution for the Practical Course

SL. No.	Description	% Marks	Marks
1	Write-up, Procedure	20%	20
2	Conduction and result	70%	70
3	Viva-Voce	10%	10
Total		100%	100

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BCHELS107/207.1	Apply chemical principles to analyze smart materials, industrial samples, battery systems, and e-waste using appropriate experimental techniques and computational tools.
M26BCHELS107/207.2	Operate modern analytical instruments, sensors, and software tools for determining physicochemical properties and processing experimental data.
M26BCHELS107/207.3	Analyze experimental results, interpret sensor data, and communicate findings related to smart materials, sustainable technologies, and digital applications.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BCHELS106/206.1	3	2	-	2	-	-	2	-	-	-	-
M26BCHELS106/206.2	2	2	-	2	3	-	-	-	-	-	2
M26BCHELS106/206.3	2	3	-	3	2	-	2	-	2	2	2
M26BCHELS106/206	2.33	2.33	-	2.33	2.5	-	2	-	2	2	2

Assessment Plan**Continuous Internal Evaluation (CIE)**

	CO1	CO2	CO3	Total
Total	17	17	16	50

Semester End Examination (SEE)

	CO1	CO2	CO3	Total
Total	36	36	28	100

6. SGD: Sustainable Development goals with justification

Sl. No.	SDG	Justification
1	SDG 3: Good Health and Well-being	Experiments involving industrial wastewater analysis, biomedical fluid analysis, and COD determination contribute to pollution monitoring and protection of human health by ensuring safer environmental conditions.
2	SDG 4: Quality Education	Molecular visualization using ChemDraw/ ChemSketch and virtual chemistry simulations promote technology-enabled learning, computational thinking, and digital laboratory skills.
3	SDG 6: Clean Water and Sanitation	Experiments on hardness, alkalinity, COD, and chloride estimation facilitate water quality assessment, pollution control, and sustainable management of industrial and potable water resources.
4	SDG 7: Affordable and Clean Energy	Analysis of battery electrolytes enhances understanding of electrochemical energy storage systems and supports the development and maintenance of sustainable energy technologies.
5	SDG 9: Industry, Innovation, and Infrastructure	Synthesis of iron oxide nanoparticles, use of modern analytical sensors, molecular modeling software, and studies on electronic materials promote innovation in smart materials, electronic devices, and sustainable industrial technologies.
6	SDG 12: Responsible Consumption and Production	Estimation of nickel in spent rechargeable batteries and analysis of industrial effluents encourage recycling, resource recovery, waste minimization, and environmentally responsible manufacturing practices.
7	SDG 13: Climate Action	Virtual laboratory experiments reduce chemical consumption and laboratory waste, while environmental monitoring experiments support pollution mitigation and sustainable industrial practices that contribute to climate action.

1st/ 2nd Semester	Ability Enhancement Course (AE) AI AND ITS APPLICATIONS	M26BAIS107/ 207
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Computer Fundamentals	Basic knowledge of computers, operating systems, web browsers and internet usage.
2	Communication Skills	Ability to write clear instructions, ask questions, and communicate ideas effectively while interacting with AI tools.
3	Data Awareness	Basic understanding of tables, spreadsheets, CSV files, and simple data interpretation for visualization activities.
4	Ethical and Responsible Use of Technology	Awareness of responsible AI usage, including privacy, fairness, plagiarism, and ethical considerations while using AI applications.

2. Syllabus

AI AND ITS APPLICATIONS SEMESTER – I/II			
Course Code	M26BAIS107/207	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	0:0:2:12:0 = 28 Hours	SEE Marks	50
		Total Marks	100
Credits	01	Exam Hours	01
Course Objectives:			
- To introduce students to the practical applications of Artificial Intelligence through real-world, scenario-based problems. - To familiarize students with Large Language Models and AI-powered tools for learning, information retrieval, and decision support. - To develop the ability to design effective prompts and interact efficiently with Generative AI applications. - To enable students to analyze data, visualize insights using Power BI, and recognize ethical issues in AI-based systems.. - To encourage students to utilize AI tools such as Claude AI, Perplexity AI, NotebookLM, and other no-code platforms to design solutions for academic and real-world applications.			
Sl. No	Experiments		
1.	A hospital wants to reduce patient waiting time. Students identify where AI can assist (appointment scheduling, diagnosis support, chatbots, etc.) and classify the AI branches involved. Prepare a concept map showing AI components used in the solution. Tools: Canva Whiteboard / Google Drawings / Miro		
2.	A college plans to introduce an AI-powered smart campus. Students compare tasks better suited for humans and AI (security, attendance, counselling, grading, cleaning robots, etc.) and justify their decisions using AI concepts. Tools: ChatGPT or Claude AI + Canva		
3.	A start-up wants to build an AI customer support assistant. Students interact with different LLMs, observe how responses change with different prompts, identify tokens, and compare response quality, speed, and usefulness. Tools: ChatGPT, Claude AI, Gemini		

4.	A company must choose between an Open-Source LLM and a SaaS-based LLM. Students compare both options based on cost, privacy, accessibility, customization, and ease of use, and then recommend the best solution with justification. Tools: Perplexity AI, ChatGPT, Google Sheets
5.	A first-year student wants AI to generate notes for an upcoming examination. Students design poor, average, and effective prompts for the same topic, compare the outputs, and explain how prompt quality influences AI responses. Tools: Claude AI / ChatGPT
6.	A travel company wants AI to prepare personalized travel plans for customers with different budgets and interests. Students create zero-shot, few-shot, role-based, and chain-of-thought prompts and evaluate which produces the best itinerary. Tools: Claude AI / ChatGPT / Gemini
7.	A university has student performance data stored in a CSV file. Students import the data into Power BI, create charts showing attendance, marks, and subject-wise performance, and prepare a dashboard for academic review. Tools: Microsoft Power BI Desktop
8.	An organization plans to use AI for employee recruitment. Students identify ethical concerns such as bias, privacy, transparency, fairness, and accountability, and present recommendations using an infographic or presentation. Tools: Canva / Microsoft PowerPoint
9.	A student struggles to manage multiple engineering subjects. Students use Claude AI to generate a personalized weekly study planner based on available study hours, learning preferences, and examination schedule, then refine the plan through iterative prompting. Tools: Claude AI
10.	A student has notes, PDFs, and lecture slides from different subjects. Students upload these resources into NotebookLM, generate summaries, ask questions, create revision notes and quizzes, and verify additional information using Perplexity AI. Tools: NotebookLM + Perplexity AI

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Scenario-Based Learning	Students solve real-world problems such as smart hospitals, AI-powered campuses, and personalized learning using AI tools to understand practical applications of Artificial Intelligence.
2	Hands-on AI Tool Workshops	Students gain practical experience by working with AI tools such as ChatGPT, Claude AI, Perplexity AI, NotebookLM, and Power BI through guided laboratory exercises.
3	Collaborative Learning	Students work in pairs or small teams to analyze AI scenarios, design prompts, develop dashboards, and present AI-assisted solutions, promoting teamwork and peer learning.
4	Problem-Based Learning (PBL)	Students investigate real-world challenges, identify suitable AI techniques, compare multiple solutions, and justify their approach using AI concepts and ethical considerations.
5	Interactive Demonstrations	The instructor demonstrates AI applications, prompt engineering techniques, and Power BI visualizations, followed by guided student practice and experimentation.
6	Project-Based Learning	Students integrate multiple AI tools to develop mini projects that address academic or industrial problems and demonstrate practical AI applications.

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation (CIE) for Practical Lab Course with 1 Credits**

Sl. No.	Components	Number	Weightage	Max. Marks	Min Marks
1	Conduction & Record (A)	1	60%	30	12
2	Lab IA test (B)	1	20%	10	4
3	Project Work (C)	1	20%	10	4
Total Marks				50	20

Final CIE Marks = A + B + C**A** = Average of marks for all the experiments**B** = Lab Internal Assessment marks**C** = Project work marks**SEE for the Practical Course:**

- SEE marks for a practical course shall be 50 marks.
- The practical course is evaluated for 100 marks, and the scored marks shall be scaled down to 50 marks.
- A change of experiment/program is allowed only once, and 20% of the marks allotted to the procedure/write-up part will be zero.
- The duration of SEE shall be 1 hours.

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BAIS207.1	Understand the applications of Artificial Intelligence and identify suitable AI techniques for solving real-world problems using scenario-based analysis.
M26BAIS207.2	Apply Large Language Models and AI-powered tools to perform information retrieval, comparison, summarization, and problem-solving tasks.
M26BAIS207.3	Analyze and design effective prompts to obtain accurate, relevant, and context-aware responses from Generative AI systems.
M26BAIS207.4	Analyze data using Power BI and evaluate ethical, privacy, fairness, and transparency issues associated with AI applications.
M26BAIS207.5	Design AI-assisted solutions using tools such as Claude AI, Perplexity, NotebookLM, and other AI applications to support learning, decision-making, and real-world engineering scenarios.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
M26BAIS207.1	3	-	-	-	2	-	-	-	-	-	-	2	-
M26BAIS207.2	-	3	-	-	3	-	-	-	-	-	-	2	-
M26BAIS207.3	-	3	2	-	3	-	-	-	-	2	-	2	-
M26BAIS207.4	-	2	2	3	3	-	-	2	-	2	-	2	-
M26BAIS207.5	-	2	3	2	3	-	-	-	2	2	-	3	3
M26BAIS207	3	2.5	2.3	2.5	2.8	-	-	2	2	2	-	2.2	3

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Promotes AI-assisted learning through intelligent tutoring, personalized study planning, AI-powered note generation, NotebookLM, and interactive learning tools, enabling inclusive, equitable, and lifelong learning opportunities.

2	SDG 9: Industry, Innovation & Infrastructure	Encourages innovation by exposing students to emerging AI technologies, Large Language Models, Generative AI, data visualization using Power BI, and AI-driven solutions for real-world engineering applications.
3	SDG 16: Peace, Justice and Strong Institutions	Promotes responsible and ethical use of Artificial Intelligence by addressing fairness, transparency, accountability, privacy, bias, and trustworthy AI systems, enabling students to develop socially responsible AI solutions.

1st / 2nd Semester	Humanities Science (HS) SAMSKRUTHIKA KANNADA	M26BKSKK108/ 208
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1. Prerequisites

S/L	Proficiency	Prerequisites
1	Knowledge of Kannada Literature	Samskruthika Kannada

2. Syllabus

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ SEMESTER – I/II			
Course Code	25BKSKK108/208	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	0:1:0:0:15 = 100 Hours	SEE Marks	50
		Total Marks	100
Credits	01	Exam Hours	01
Course objectives: ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು: 1.ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು. 2.ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ವಾಚನದ ಮೂಲಕ ಪರಿಚಯಿಸುವುದು. 3.ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಶಿಕ್ಷಣ, ಕ್ರೀಡೆ, ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ, ಉದ್ಯಮ, ಚಳುವಳಿ ಕ್ಷೇತ್ರದ ಸಾಧಕರ ಪರಿಚಯ ಹಾಗೂ ಪ್ರೇರಣೆ ಆಸಕ್ತಿಯನ್ನು ಸಂಪೂರ್ಣ ಮೂಲಕ ಮೂಡಿಸುವುದು. 4.ತಾಂತ್ರಿಕ ವೃತ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು. 5.ಕಥೆ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.			
Module -1			
ಘಟಕ-1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು:			3 ಘಂಟೆ
1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ. 2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ: ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ ಜಿ ವೆಂಕಟಸುಬ್ಬಯ್ಯ 3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ- ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ ಕೇಶವಮೂರ್ತಿ			
Module -2			
ಘಟಕ-2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳು			3ಘಂಟೆ
ವಚನಗಳು: ಬಸವಣ್ಣ, ಅಲ್ಲಮಪ್ರಭು, ಅಕ್ಕಮಹಾದೇವಿ, ಕಿರ್ತನೆಗಳು: ಪುರಂದರದಾಸ, ಕನಕದಾಸ ತತ್ವಪದ: ಶಿಶುನಾಳ ಶರೀಫ ಕವಿತೆಗಳು: ಬಿ.ಎಂ ಶ್ರೀಕಂಠಯ್ಯ, ಎಂ ಗೋವಿಂದ ಪೈ, ಉಯಿಲಗೋಳ ನಾರಾಯಣರಾವ್, ಡಿ ಎಸ್ ಕರ್ಕಿ, ಕೆ ವಿ ಪುಟ್ಟಪ್ಪ, ದ ರಾ ಬೇಂದ್ರೆ, ಪು ತಿ ನರಸಿಂಹಾಚಾರ್, ಸಿದ್ದಯ್ಯ ಪುರಾಣಿಕ, ಕೆ ಎಸ್ ನರಸಿಂಹಸ್ವಾಮಿ, ವಿ ಕೃ ಗೋಕಾಕ್, ಎಂ ಗೋಪಾಲಕೃಷ್ಣ ಅಡಿಗ, ಚನ್ನವೀರ ಕಣವಿ, ಚಂದ್ರಶೇಖರ ಕಂಬಾರ, ಜಿ ಎಸ್ ಶಿವರುದ್ರಪ್ಪ, ಕೆ ಎಸ್ ನಿಸಾರ್ ಅಹಮದ್, ಪಿ. ಲಂಕೇಶ್, ಸಿದ್ದಲಿಂಗಯ್ಯ, ಎಚ್ ಎಸ್ ವೆಂಕಟೇಶಮೂರ್ತಿ, ವೈದೇಹಿ, ಎಚ್ ಎಸ್ ಶಿವಪ್ರಕಾಶ್, ಎಚ್ ಎಲ್ ಪುಷ್ಪ, ಎಲ್ ಹನುಮಂತಯ್ಯ, ಸರಜೂ ಕಾಟ್ರರ್, ಸ ಉಷಾ, ಬೆಳಗೆರೆ ಜಾನಕಮ್ಮ			
Module -3			
ಘಟಕ-3 ಜಗತ್ತಿನ ಆಯ್ದ 62 ಸಾಧಕರ ಪರಿಚಯ:			3ಘಂಟೆ
ಲ್ಯಾರಿ ಪೇಜ್ ಸರ್ ಜೇಬ್ರೀನ್, ಜೆಪಿ ಹಿಂಟನ್, ಗಾಲಿ ಮಾಧವೀಲತಾ, ಬಾನು ಮುಷ್ತಾಕ್, ಸಾಲುಮರದ ತಿಮ್ಮಕ್ಕ, ಸೂಲಗಿತ್ತಿ ನರಸಮ್ಮ, ಸುಧಾ ಮೂರ್ತಿ, ನಾರಾಯಣ ಮೂರ್ತಿ, ಅಜೀಂ ಪ್ರೇಮ್ ಜಿ, ಕಿರಣ್ ಮಜುಮ್ದಾರ್, ಮುಖೇಶ್ ಅಂಬಾನಿ, ಹರಿಶೋಡ್, ಗೋಪಿನಾಥ್, ರತನ್ ಟಾಟಾ, ಸ್ವಾಮಿ ವಿವೇಕಾನಂದ, ರಾಮಕೃಷ್ಣ ಪರಮಹಂಸ, ಶಾರದಾದೇವಿ, ಬಾಲಗಂಗಾಧರ ತಿಲಕ್, ಸುಭಾಷ್ ಚಂದ್ರ ಬೋಸ್, ಮಹಾತ್ಮ ಗಾಂಧಿ, ಕಿತ್ತೂರು ಚೆನ್ನಮ್ಮ, ನಾಲ್ವಡಿ ಕೃಷ್ಣರಾಜ ಒಡೆಯರ್, ಜಯಚಾಮರಾಜ ಒಡೆಯರ್, ರವೀಂದ್ರನಾಥ ಟ್ಯಾಕೂರ್, ವಿಕ್ರಮ ಸಾರಾಭಾಯಿ, ಪಂಚಾಕ್ಷರಿ ಗವಾಯಿ, ಸಾವಿತ್ರಿಬಾಯಿ ಪುಲೆ, ವಿಂಟನ್ ಸರ್ಫೆ, ಟಿ ಎನ್ ಶೇಷನ್, ಎಚ್ ಎಸ್ ದೊರಸ್ವಾಮಿ, ಎಚ್ ನರಸಿಂಹಯ್ಯ, ಕೆಂಗಲ್ ಹನುಮಂತಯ್ಯ, ಬಿ ಆರ್ ಅಂಬೇಡ್ಕರ್, ಎ ಜಿ ಸದಾಶಿವ, ಕಸ್ತೂರಿ ರಂಗನ್, ಯು ಆರ್ ರಾವ್, ಕಲ್ಪನಾ ಚಾವ್ಲಾ, ಸುನೀತಾ ವಿಲಿಯಮ್ಸ್, ಸುನಿಲ್ ಗವಾಸ್ಕರ್, ಸಚಿನ್ ತೆಂಡೂಲ್ಕರ್, ರಾಹುಲ್ ದ್ರಾವಿಡ್, ಕಿರಣ್ ಕುಮಾರ್ (ಡಿಆರ್‌ಡಿಓ), ಡಾ.ರಾಜಕುಮಾರ್, ಡಾ. ವಿಷ್ಣುವರ್ಧನ್, ಡಾ. ಅಂಬರೀಶ್, ಎಂ ಡಿ ನಂಜುಂಡಸ್ವಾಮಿ, ಶಾಂತವೇರಿ ಗೋಪಾಲಗೌಡ, ಲತಾ ಮಂಗೇಶ್ಕರ್, ರಾಜಾರಾಮಣ್ಣ, ಸರ್ವಪಲ್ಲಿ ರಾಧಾಕೃಷ್ಣನ್, ಸಿ ರಾಜಗೋಪಾಲಚಾರಿ, ಸರ್ ಸಿ ವಿ ರಾಮನ್, ಲಾಲ್ ಬಹದ್ದೂರ್ ಶಾಸ್ತ್ರಿ, ಮನಮೋಹನ್ ಸಿಂಗ್, ಧ್ಯಾನ ಚಂದ್, ಪ್ರಕಾಶ್ ಪಡುಕೋಣ್, ಪದ್ಮಶ್ರೀ ರಾಜಣ್ಣ, ದ್ರೌಪದಿ ಮುರ್ಮು, ನೀರಜ್ ಚೋಪ್ರಾ ಪಿ.ಟಿ ಉಷಾ, ಮಾಲತಿ ಹೊಳ್ಳೆ, ನರೇಂದ್ರ ದಾಮೋದರದಾಸ್ ಮೋದಿ			
Module -4			
ಘಟಕ-4 ತಾಂತ್ರಿಕ ವೃತ್ತಿಗಳ ಪರಿಚಯ			3ಘಂಟೆ
1. ಡಾ. ಸರ್ ಎಂ ವಿಶ್ವೇಶ್ವರಯ್ಯ: ವೃತ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ- ಎ.ಎನ್ ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ			

Module -5	
ಘಟಕ-5 ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ	3ಘಂಟೆ
1.ಯುಗಾದಿ: ವಸುಧೇಂದ್ರ	
2. ಮೆಗಾನ್ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ: ಹಿ ಚಿ ಬೋರಲಿಂಗಯ್ಯ	
TEXTBOOKS: ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ	
REFERENCE BOOKS: ಅಧುನಿಕ ಕನ್ನಡ ಕಾವ್ಯಗಳು ಮೈವಿವಿ	

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1		Contents related activities (Activity-based discussions)
2		For active participation of students instruct the students to prepare Flowcharts and Handouts
3		Organizing Group wise discussions
4		Quizzes and Discussions
5		Seminars and assignments
6		Contents related activities (Activity-based discussions)

4. Assessment Details (both CIE and SEE)

Continuous Internal Evaluation:

CIE Split up for Professional Course (PC)

Components		Number	Weightage	Max. Marks
1	Internal Assessment - Tests (A)	3	50%	25
2	Term Work - TW (B)	2	50%	25
Total Marks				50

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Term Work marks

Semester End Examination:

1. Question paper pattern will be ten questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. There shall be 2 question from each module, each of the two questions under a module (with a maximum of 3 sub questions), may have mix of topics under that module if necessary.
3. The students have to answer 5 full questions selecting one full question from each module.
4. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
CO1	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡುತ್ತದೆ.
CO2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಕಾವ್ಯಗಳನ್ನು ಮತ್ತು ಕಥೆಗಳನ್ನು ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಫೂರ್ತಿ ಮೂಡುತ್ತದೆ.
CO3	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ಉದ್ಯಮ ಕ್ಷೇತ್ರದ ಬಗ್ಗೆ ಚಳುವಳಿ ಕ್ಷೇತ್ರದ ವೈಯಕ್ತಿಕ ಪರಿಚಯ ಹಾಗೂ ಅವರು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದು ಕೊಂಡು ಇವರಿಗೂ ಕೌಶಲ ಹೆಚ್ಚುತ್ತದೆ.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	2	-	2	-
CO2	-	-	-	-	-	-	-	2	-	2	-
CO3	-	-	-	-	-	-	-	2	-	2	-
	-	-	-	-	-	-	-	2	-	2	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	Presenting Seminars	Students will be at ease with all seminar presentation
2	Facing Employment Process	If the student taken any civil service examination and their problem issue

1st / 2nd Semester	Humanities Science (HS) BALAKE KANNADA	M26BKSKK108/ 208
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1. Prerequisites

S/L	Proficiency	Prerequisites
1	Knowledge of Kannada Literature	Samskruthika Kannada

2. Syllabus

ಬಲಕೆ ಕನ್ನಡ SEMESTER – I/II			
Course Code	25BKSKK108/208	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	0:1:0:0:15 = 100 Hours	SEE Marks	50
Credits	01	Total Marks	100
		Exam Hours	01
Course objectives: ಬಲಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು: 1. ಕನ್ನಡ ಭಾಷೆಯ ಮಹತ್ವವನ್ನು ತಿಳಿಸುವುದು. 2. ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಬರೆಯುವ. ಓದುವ ಮತ್ತು ಸಂವಹಿಸುವ ಕೌಶಲವನ್ನು ಬೆಳೆಸುವುದು.			
Module -1			
Introduction, Necessity of learning a local language. Methods to learn the Kannada language. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conversation, Listening and Speaking Activities Key to Transcription. ವೈಯಕ್ತಿಕ ಸ್ವಾಮ್ಯ ಸೂಚಕ/ಸಂಬಂಧಿತ ಸಾರ್ವಜನಿಕ ಮತ್ತು ಪ್ರತ್ಯರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words			
Module -2			
ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು ಸಂದೇಹಪ್ರಶ್ನೆ ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು Possessive forms of nouns, dubitive question and Relative nouns ಗುಣ ಪರಿಂಚನ ಮತ್ತು ವರ್ಣಬಂಧನ ವಿಶೇಷಗಳು ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and Colour Adjectives, Numerals ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ(ಆ ಆದು ಆವು ಆಲ್ಲಿ) Predictive Forms, Locative Case			
Module -3			
ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಲಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು Dative Cases, and Numerals ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು-Ordinal numerals and Plural markers ನ್ಯೂನ ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು Defective / Negative Verbs and Colour Adjectives			
Module -4			
ಅಪ್ಪಣೆಒಪ್ಪಿಗೆ ನಿರ್ದೇಶನ ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು Permission, Commands, encouraging and Urging words (Imperative words and sentences) ಗ್ರಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ಸ್ವತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು Accusative Cases and Potential Forms used in General Communication ಇರು ಮತ್ತು ಇರಲ್ಲ ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕಕ್ರಿಯಾ ಪದಗಳು Helping Verbs “iru and iralla”, Corresponding Future and Negation Verbs ಹೋಲಿಕೆ ಸಂಬಂಧ ಸೂಚಕ ಮತ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕಪದಗಳು Comparitive, Relationship, Identification and Negation Words			
Module -5			
ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳು ವಿವಿಧ ಪ್ರಕಾರಗಳು different types of forms of Tense, Time and Verbs ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಲೋಂಧಿಗೆ ಭೂತ ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲವಾಕ್ಯ Formation of Past, Future and Present Tense Sentences with Verb Forms ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿಕಕನ್ನಡ ಪದಗಳು Kannada Vocabulary List Kannada Words in Conversation			

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Utilize various teaching methods within the lecture format to reinforce competencies.
2	Activity based	Conversational practices
3	Collaborative Learning	
4	Writing exercises	Writing practices
5	Real-World Application	

4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation:****CIE Split up for Professional Course (PC)**

Components		Number	Weightage	Max. Marks
1	Internal Assessment - Tests (A)	3	50%	25
2	Term Work - TW (B)	2	50%	25
Total Marks				50

Final CIE Marks = (A) + (B)

A = Average of best two Test marks

B = Average of two Term Work marks

Semester End Examination:

1. Question paper pattern will be ten questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. There shall be 2 question from each module, each of the two questions under a module (with a maximum of 3 sub questions), may have mix of topics under that module if necessary.
3. The students have to answer 5 full questions selecting one full question from each module.
4. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
CO1	To understand the necessity of learning of local language for comfortable life.
CO2	To speak, read and write Kannada language as per requirement.
CO3	To communicate (converse) in Kannada language in their daily life with kannada speakers.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	2	-	2	-
CO2	-	-	-	-	-	-	-	2	-	2	-
CO3	-	-	-	-	-	-	-	2	-	2	-
	-	-	-	-	-	-	-	2	-	2	-

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	Presenting Seminars	Students will be at ease with all seminar presentation
2	Facing Employment Process	If the student taken any civil service examination and their problem issue

2nd Semester	Humanity Science Course (HS) PROFESSIONAL ENGLISH - 2	M26BENGK209
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic knowledge of English grammar and vocabulary	Students should have a foundational understanding of sentence structure, parts of speech, tenses, and commonly used vocabulary.
2	Familiarity with general writing formats	Prior exposure to writing simple paragraphs, letters, or essays at the school level helps ease the transition into structured and formal writing.
3	Ability to comprehend spoken English	Students should be able to follow general English conversations, classroom instructions, and audio content, which will be enhanced further in listening modules.
4	Fundamental computer and internet usage skills	Basic skills such as using a word processor, browsing the web, and using email are essential for completing blog writing, document formatting, and online communication activities.

2. Syllabus

Professional English - 2 Semester II			
Course Code	M26BENGK209	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	1:0:0:0:0=16	SEE Marks	50
		Total Marks	100
Credits	-	Exam Hours	1
Course Objectives:			
To develop students' active listening skills by introducing them to barriers, techniques, and strategies for effective listening in academic and professional environments. To enhance interpersonal communication abilities through conversation practice, situational dialogues, and the application of care, courtesy, and consideration in social and professional interactions. To improve reading comprehension and analytical skills by training students to identify and overcome reading obstacles, and by applying effective reading strategies. To strengthen verbal communication and presentation skills by addressing Mother Tongue Influence (MTI) and building confidence in oral presentations using appropriate structure and delivery techniques.			
Module -1 SPEAKING PRACTICE (PHASE-2) & PROFESSIONAL SKILLS DEVELOPMENT			
UNIT I: Mock GD & Shadowing Practice			
a) Group Discussion (GD) Skills - GD types: Topic-based, Case-based, Abstract - Entry strategies and initiation techniques - Logical argument building and data referencing - Listening skills and constructive participation - Conflict management (non-personal approach) - Summarization skills - Mock GD practice sessions with evaluation rubrics			
b) Shadowing Practice - Concept of shadowing and its benefits - Pronunciation and fluency improvement exercises - Listening-repeat drills using professional speeches - Accent neutralization basics - Recording and feedback-based improvement			
c) Listening Tests and Practice – International language test formats			
Module -2			

UNIT II:**a) Storytelling & Story Retelling**

- Importance of storytelling in professional communication
- Elements of an effective story (context, characters, conflict, resolution)
- Structuring narratives logically and coherently
- Emotional engagement and audience connection techniques
- Summarization and paraphrasing techniques
- Improvisational storytelling activities
- Peer storytelling practice with feedback

b) Read Aloud (Listen & Speak)

- Pronunciation accuracy and articulation practice
- Voice modulation, stress, rhythm, and intonation
- Listening comprehension and repetition drills
- Fluency development through guided reading
- Audio-based listening and speaking shadowing activities
- Read-aloud evaluation and corrective feedback

c) Basics of Interpersonal skills: Developing skills through conversations and dialogues, Purpose of general conversations: interaction, awareness, building credibility, Tips for improving conversations, application of “the three Cs”: Care, Courtesy and Consideration in conversation

Module -3**UNIT III: Resume Building****a) Resume Fundamentals**

- Purpose and recruiter expectations
- Keyword optimization and ATS-friendly resumes

b) Content Development

- Writing strong career objectives / professional summary
- Academic project presentation
- Internships and work experience description using action verbs
- Skill categorization (technical, soft skills, domain skills)
- Certifications and achievements presentation

c) Personal Branding

- LinkedIn profile alignment with resume
- Portfolio development basics
- Email etiquette and professional communication
- Cover letter fundamentals

d) Reading Skills: Differences between efficient and inefficient readers; Basics steps and tips for improving reading ability, Overcoming common obstacles to effective reading, strategies for effective reading.

Module -4**UNIT IV (a): Verbal Ability Essentials (Phase 2)**

(Note: Only placement-focused areas)

- **Voices – Active & Passive**
- **Speech – Direct & Indirect**
- **Vocabulary practice – Synonyms, Antonyms, Homophones, Idioms, Phrasal Verbs**
- **Sentence Improvement**
- **Para Jumble**
- **Short Essay Writing**
- **Placement-focused grammar: concise email language, formal request structures, common interview sentence patterns**
- **Mock practice - short email to recruiter; short message writing**

b) Overcoming MTI or Mother Tongue Influence: Awareness of numerous deviations from Standard English Usage in Indian English, Techniques for the neutralization of MTI.

Module -5**UNIT V: a) INTERVIEW PREPARATION (PHASE-1)****A. Interview Fundamentals**

- Types of interviews (HR, Technical, Panel, Virtual)
- Interview process awareness and employer expectations

- Professional grooming and dress etiquette B. Core HR Question Preparation - Self-introduction structuring techniques - Strengths, weaknesses, achievements framing (STAR method); SWOC (Strengths-Weakness-Opportunities-Challenges) Analysis - Career goals and motivation-based answers - Handling difficult interview questions C. Communication & Behavioural Skills - Verbal clarity and structured responses - Active listening during interviews - Non-verbal communication in interviews - Confidence and stress management techniques D. Practice & Evaluation - Mock HR interview sessions - Feedback-based performance improvement - Interview etiquette (before, during, after) - Post-interview follow-up communication b) Oral Presentation and PPTs
REFERENCE BOOKS: - Sanjay Kumar & Pushp Lata – Communication Skills (Oxford University Press) - Stephen E. Lucas – The Art of Public Speaking (McGraw-Hill Education) - Ashraf Rizvi – Effective Technical Communication (McGraw-Hill Education) - Practical English Usage by Michael Swan, Oxford University Press. - Technical communication by Gajendra Singh Chauhan, Cengage Learning India Recommended Digital Learning Resources: TED Talks – Public speaking, leadership, and communication models. British Council Learn English – Listening, pronunciation, grammar, and vocabulary practice. Grammarly – Writing support for emails, reports, and academic writing. LinkedIn Learning – Professional communication, presentation skills, and career readiness modules. Cambridge Dictionary (Online) – Pronunciation and vocabulary support.

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Explain key communication concepts, barriers, and strategies through structured lectures using whiteboard/PowerPoint, supported by real-life examples.
2	Audio & Video Listening Practice	Use podcasts, speeches, news clips, and TED Talks to develop listening comprehension and identify poor vs. effective listening practices.
3	Role Play & Situational conversation	Conduct role plays and dialogues based on workplace and social scenarios to improve interpersonal communication and apply the "Three Cs."
4	Group Discussions & Peer Interaction	Foster interpersonal and reading skills by encouraging student-led discussions, topic sharing, and peer evaluation of listening and reading practices.
5	Reading Circles & Skimming Activities	Conduct group reading activities focused on identifying main ideas, improving vocabulary, and distinguishing efficient from inefficient reading habits.
6	Flipped Classroom	Flipped Classroom
7	Pronunciation Labs & MTI Correction	Use language lab tools and drills (tongue twisters, minimal pairs, phoneme practice) to neutralize MTI and promote standard pronunciation.
8	PPT and Oral Presentation Practice	Conduct mock presentations on various topics to build student confidence, body language, clarity, and coherence in verbal expression.
9	ICT-Enabled Tools	Use digital tools like Google Slides (for PPTs), Grammarly (for writing), YouTube (for listening), and online quizzes (for listening/reading practice).

10	Self and Peer Feedback Sessions	Encourage students to reflect on their performance and provide constructive feedback on each other's listening, speaking, and presentation tasks.
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4. Assessment Details (both CIE and SEE)**Continuous Internal Evaluation:**

	Components	Number	Weightage	Max. Marks
1	Internal Assessment - Tests (A)	3	50%	25
2	Term Work - TW (B)	2	50%	25
	Total Marks			50

Final CIE Marks=(A) + (B)**A** = Average of best two Test marks**B** = Average of two Term Work marks**Semester End Examination:**

1. Question paper pattern will be ten questions. Each question is set for 20marks. The medium of the question paper shall be English unless otherwise it is mentioned.
2. There shall be 2 questions from each module, each of the two questions under a module (with a maximum of 3 sub questions), may have mix of topics under that module if necessary.
3. The students have to answer 5 full questions selecting one full question from each module.
4. Marks scored will be proportionally scaled down to 50 marks

5. Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M25BENGK209.1	Apply effective listening, reading, and interpersonal communication strategies in both academic and professional contexts.
M25BENGK209.2	Demonstrate improved verbal communication skills by reducing Mother Tongue Influence (MTI) and delivering structured oral presentations.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M25BENGK209.1	-	-	-	-	-	-	-	-	2	3	2	2
M25BENGK209.2	-	-	-	-	-	-	-	-	2	3	2	2
	-	-	-	-	-	-	-	-	2	3	2	2

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Enhances essential communication skills including listening, reading, speaking, and presentation—key components of a quality, holistic education.
2	SDG 8: Decent Work and Economic Growth	Improves workplace readiness through effective communication, interpersonal skills, and presentation abilities—critical for employment and career advancement.
3	SDG 10: Reduced Inequalities	Reducing MTI and promoting clear, inclusive communication helps students from diverse linguistic backgrounds participate equally in academic and professional spaces.
4	SDG 17: Partnerships for the Goals	Promotes teamwork, collaboration, and respectful dialogue—skills essential for global partnerships and effective communication in multidisciplinary settings.

1st Semester	Domain Based Lab (ESL) (NMC) Graphics Design Mastery	M26BCSLK110
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1. Prerequisites (Minimum 4 Pre-requisites)

Sl. No.	Proficiency	Pre-requisites
1	Basic Computer Skills	Ability to operate a computer or smartphone, manage files and folders, and use web browsers and common software applications.
2	Internet and Digital Literacy	Basic understanding of internet usage, online account creation, cloud-based applications, and digital communication platforms.
3	Fundamentals of Visual Communication	Awareness of basic design concepts such as colors, typography, images, layouts, and visual presentation is beneficial but not mandatory.
4	Creativity and Content Development Interest	Interest in creating digital content for presentations, social media, marketing materials, websites, or personal branding projects.

2. Syllabus

Graphics Design Mastery SEMESTER – I			
Course Code	M26BCSLK110	CIE Marks	50
Total Number of Teaching-Learning Hours/Sem (L:T: P:TW:SL)	0:0:32: 0:0 = 32 Hours	SEE Marks	-
		Total Marks	50
Credits	00	Exam Hours	-
Course Objectives:			
Understand the Canva platform and its interface, including account setup, workspace management, folder organization, and content planning tools. Develop professional-quality visual content using Canva templates, layouts, brand kits, and website design features for various digital communication needs. Apply Canva's design and editing tools to manipulate images, text, charts, tables, frames, grids, and other visual elements effectively. Create and edit multimedia content by incorporating images, videos, animations, and background-removal techniques to produce engaging digital designs. Design and publish creative digital assets such as social media posts, presentations, marketing materials, and websites while adhering to visual design principles and branding requirements.			
Module -1			
Getting Started with Canva: Introduction to Canva, creating a Canva account, installation and setup, organizing folders, using the scheduler and planner, using templates, editing templates, starting and finding designs, creating designs using templates, publishing designs, designing websites using templates and using layouts Textbook 1: Chapter 1, Chapter 2.			
Module -2			
Tools and Unique Features in Canva: Adding, duplicating and deleting elements, Resizing and cropping elements, adding borders and rounded corners to guides, Creating advanced charts via flourish, using frames and cropping images into a shape, using grids, Adding and deleting tables, Rows, and Columns. Textbook 1: Chapter 3.			
Module -3			
Creating Designs: Adding Images to design, uploading and importing videos from computer or phone, Changing or removing animations, removing photo and video backgrounds, Erase and Brushes, importing			

images from SharePoint to Canva, Aligning and spacing text, Positioning elements, Background remover tools.

Creating professional graphic designs: Addition of gradients to achieve depth, using the quick create function, designing with frames, creating graphs for documents.

Textbook 1: Chapter 4, Chapter 6.

Practical Component

Experiment 1: Adding Images to a Design

Scenario: You are designing a promotional poster for a college technical event. The poster requires the college logo, event photographs, and decorative images.

Experiment 2: Uploading and Importing Videos

Scenario: The college is conducting an annual cultural fest and requires a short promotional video.

Experiment 3: Changing or Removing Animations

Scenario: A presentation has been prepared with animations, but some animations are distracting and need modification.

Experiment 4: Removing Photo Backgrounds

Scenario: A faculty profile poster requires a faculty photograph without its original background.

Experiment 5: Removing Video Backgrounds

Scenario: A student has recorded a short introduction video, but the original background is unsuitable for a professional presentation.

Experiment 6: Using Erase and Brush Tools

Scenario: An image contains unwanted objects and requires minor corrections before being used in a brochure.

Experiment 7: Importing Images from SharePoint

Scenario: The college media team stores official photographs in SharePoint. These images need to be used to create an annual report cover page.

Experiment 8: Aligning and Spacing Text

Scenario: You are creating a seminar invitation, and the title, date, venue, and speaker details must be properly aligned.

Experiment 9: Positioning Design Elements

Scenario: You are designing a brochure containing images, text, shapes, and logos. All elements must be properly arranged.

Experiment 10: Applying Background Remover Tools

Scenario: Create a social media advertisement for a new college programme using a photograph of a student.

TEXTBOOKS:

1. Canva Design Mastery Course by Alex Morganfield, Printed in the United States of America, 2024.

REFERENCE BOOKS:

1. Canva Professional Tips and Tricks When You Design with Canva By Patrick Ejeke 2021
2. Canva® For Dummies® by Jesse Stay, John Wiley & Sons, Inc, 2025.

VIDEO LINKS:

<https://youtube.com/playlist?list=PLjVLYmrlmjGevBiUmkbQ5isfnBufjnAu3&si=Ql0qFJ0C1S4L1Egv>
<https://youtube.com/playlist?list=PLATYfhN6gQz9OO7qe9FILY4NrfvWCbdGl&si=exSX5qZ8PSdhZYOe>

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Interactive Lectures and Demonstrations	Introduce Canva concepts, tools, and features through instructor-led presentations and live demonstrations of design workflows.

2	Hands-on Laboratory Sessions	Enable learners to practice Canva functionalities such as template customization, image editing, content planning, and multimedia design in guided lab sessions.
3	Case Studies and Design Analysis	Analyze existing digital designs and branding materials to understand effective visual communication, layout selection, and design principles.
4	Collaborative Learning Activities	Encourage teamwork through group assignments and peer reviews where students collaborate on design projects and provide constructive feedback.
5	Problem-Solving and Creative Challenges	Assign design challenges that require learners to apply Canva tools creatively to meet specific communication and branding objectives.

1. Assessment Details (CIE only)

Continuous Internal Evaluation (CIE) Domain Based Lab - Non-Credit Mandatory Course

Components		Number	Weightage	Max.	Min
1	Conduction & Record (A)	1	60%	30	12
2	Lab IA test (B)	1	20%	10	-
3	Project Work (C)	1	20%	10	-
Total Marks				50	20

Final CIE Marks = A + B + C

A: Guided Canva Design Activities (Template Editing, Content Planning, Image & Video Editing, Design Creation) Five guided Canva activities assessing design, editing, templates, layouts, and content creation skills.

B: Internal Skill Assessment (Design Challenge / Practical Test): Individual skill assessment evaluating independent application of Canva tools and design principles.

C: Design Portfolio and Project Demonstration (Digital Portfolio Submission and Presentation): Final portfolio and project demonstration assessing creativity, design quality, presentation, and professionalism.

Note: There shall be no Semester End Examination (SEE) for this course.

2. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BCSLK110.1	Configure and manage Canva workspaces by setting up accounts, organizing folders, and utilizing content planning features for efficient design management.
M26BCSLK110.2	Create and customize professional digital content using Canva templates, layouts, brand kits, and website design tools.
M26BCSLK110.3	Apply Canva's design and editing features, including frames, grids, tables, charts, cropping, resizing, and element management, to develop visually appealing designs.
M26BCSLK110.4	Design, edit, and publish multimedia content by integrating images, videos, animations, background removal, and advanced photo editing tools to produce engaging and professional-quality digital assets.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BCSLK110.1	2	1	-	-	2	-	-	-	-	-	-
M26BCSLK110.2	2	2	3	-	2	-	-	-	-	-	-
M26BCSLK110.3	2	3	3	2	3	-	-	-	-	-	-
M26BCSLK110.4	2	3	3	2	3	-	-	-	-	-	-
M26BCSLK110	2	2.25	3	2	2.5	-	-	-	-	-	-

3. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Enhances digital literacy, creativity, communication, and visual design skills through modern content creation tools and technologies.
2	SDG 8: Decent Work and Economic Growth	Develops industry-relevant digital design and content creation skills that improve employability, freelancing opportunities, entrepreneurship, and professional productivity.
3	SDG 9: Industry, Innovation and Infrastructure,	Encourages the use of innovative digital platforms and cloud-based design technologies for creating professional and scalable visual communication solutions.

1st Semester	Domain Specific Lab (ESL) GIT AND GITHUB FOR PROJECT DEVELOPMENT	M26BCAK110
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Computer Operations	Ability to operate a computer, create and organize folders and files, install or open applications, and identify file locations and paths.
2	Programming Awareness	Familiarity with simple source-code or text files and the ability to create, edit, save, and execute basic programs with guidance.
3	Internet and Web Usage	Ability to use a web browser, email account, online forms, and file upload/download facilities while following basic password and account-safety practices.
4	Communication and Teamwork	Basic written communication skills for naming files, writing short descriptions, and working responsibly with peers on shared academic tasks.

2. Syllabus

GIT AND GITHUB FOR PROJECT DEVELOPMENT SEMESTER - I			
Course Code	M26BCAK110	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T:P:TW:SL)	0:0:32:0:0 = 32 Hours	SEE Marks	-
		Total Marks	50
Credits	00	Exam Hours	-
Course Objectives: 1. Introduce the purpose of version control and the roles of Git and GitHub in managing software and academic project files. 2. Develop the ability to configure Git and perform the fundamental local repository workflow using status, add, commit, diff, log, and gitignore. 3. Enable students to manage remote repositories and organize project changes using push, pull, branches, merges, conflict resolution, and clone operations. 4. Build introductory collaboration skills using forks, a structured Git workflow, and pull requests. 5. Develop project documentation and publishing skills using Visual Studio Code, README files, GitHub Markdown, and a GitHub profile.			
Module -1			
Git, GitHub and Local Repositories: Version Control Fundamentals, Introduction to Git and GitHub, Git Installation and Configuration, Essential Shell Commands, GitHub Account and Repository Creation, Local Repository Workflow, README Basics. Textbook: Selected sections, pp. 11-30 and 33-40.			
Practice Programs: 1. Install Git, verify the installation, and configure the user name, email, and default branch. 2. Create a GitHub account and a repository with a suitable name and description. 3. Initialize a local repository, add a README file, and record at least three meaningful commits. 4. Create, rename, move, and delete files or folders in a local repository and record the changes using meaningful commits. 5. Update the README file with project title, objective, execution steps, and repository description, and verify the changes using git status and git log.			

Module -2

Managing Changes, Remotes and Branches: Inspecting Changes and Commit History, Managing Ignored Files, Remote Repositories, Push and Pull Operations, Git Branches, Merging and Simple Conflict Resolution, Cloning Repositories.

Textbook: Selected sections, pp. 47-62, 67-90 and 96-97.

Practice Programs:

1. Use git diff and git log to inspect changes and history, and create a suitable .gitignore file.
2. Connect a local repository to GitHub, push the project, demonstrate a pull operation, and clone the repository to another location.
3. Create a feature branch, commit a change, merge it into the main branch, and resolve a simple guided merge conflict.
4. Create two feature branches for two small changes, compare branch changes using git diff and git log, and merge the selected branch into the main branch.
5. Simulate a remote update using GitHub web editing, pull the remote changes locally, and correct a rejected push by following the pull-before-push workflow.

Module -3

Collaborative Development and Project Publishing: Forking Repositories, Collaborative Git Workflow, Pull Requests and Review, Git with Visual Studio Code, README Documentation and GitHub Markdown, Publishing Laboratory Programs and Small Projects, GitHub Profile and Project Portfolio.

Textbook: Selected sections, pp. 98-113 and 140-154.

Practice Programs:

1. Fork a repository, contribute in a branch, and submit a pull request.
2. Use Visual Studio Code to clone or open a repository, make a change, commit it, and synchronize it with GitHub.
3. Publish a laboratory program or small project with a structured README.md, relevant Markdown elements, and a visible project entry on the GitHub profile.
4. Review a peer pull request by checking commit history, changed files, and comments, and incorporate suggested feedback in the repository.
5. Prepare a GitHub project portfolio by organizing repositories, improving README documentation, and adding suitable project links to the GitHub profile.

TEXTBOOK:

Bobby Iliev, Introduction to Git and GitHub, Open-Source eBook, version published 30 October 2023, MIT License.

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Concept Explanation with Live Demonstration	Explain each Git/GitHub concept briefly and demonstrate the corresponding command or GitHub action during the same session.
2	Guided Hands-On Practice	Provide a structured sequence of commands and repository tasks for students to practise individually after each concept.
3	Incremental Repository-Based Learning	Use one evolving repository across the semester so that students experience status, staging, commits, remotes, branches, and documentation as a connected workflow.
4	Collaborative Learning	Organize pair or small-team activities for branch creation, merging, forking, pull requests, and peer review.
5	Problem-Based Troubleshooting	Present common situations such as untracked files, rejected pushes, divergent changes, or simple merge conflicts and guide students to interpret Git messages and resolve them.
6	Project-Based Learning	Require each student or team to publish and demonstrate a properly documented laboratory program or small project repository.

4. Assessment Details (CIE and SEE)

Continuous Internal Evaluation (CIE) for Practical Lab Course with 1 Credit will be considered.

Sl. No.	Components	Number	Weightage	Max. Marks	Min. Marks
1	Conduction & Record (A)	1	60%	30	12
2	Lab IA Test (B)	1	20%	10	---
3	Project Work (C)	1	20%	10	---
Total Marks				50	20

Final CIE Marks = A + B + C

A = Average of marks awarded for completion, correctness, record/repository evidence, and demonstration of all practice programs.

B = Marks obtained in Lab Internal Assessment involving interpretation and execution of essential Git/GitHub operations.

C = Marks awarded for the final GitHub project repository based on correctness, README documentation, meaningful commit history, collaboration evidence where applicable, and demonstration.

There shall be no Semester End Examination (SEE) for this course.**5. Course Outcomes (COs) and Mapping with POs/PSOs****Course Outcomes (COs)**

COs	Description
M26BCAK110.1	Explain the purpose of version control, distinguish Git from GitHub, and configure Git for first-time use.
M26BCAK110.2	Apply the local Git workflow to initialize a repository, track files, stage and commit changes, inspect differences and history, and manage ignored files.
M26BCAK110.3	Manage remote repositories and project branches using remote linking, push, pull, clone, merge, and simple conflict-resolution operations.
M26BCAK110.4	Collaborate on a shared project using forks, a structured Git workflow, pull requests, and review practices.
M26BCAK110.5	Document and publish laboratory programs or small projects using README files, GitHub Markdown, and a GitHub profile.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
M26BCAK110.1	2	-	-	-	2	-	-	-	-	-	-
M26BCAK110.2	-	-	-	-	3	-	-	-	-	-	-
M26BCAK110.3	-	2	-	-	3	-	-	-	2	-	-
M26BCAK110.4	-	-	-	-	3	-	-	-	3	2	2
M26BCAK110.5	-	-	-	-	3	-	-	-	2	3	2
M26BCAK110	2	2	-	-	3	-	-	-	3	3	2

6. Mapping to Sustainable Development Goals (SDG)

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Develops foundational digital, documentation, and collaborative project-management skills through an openly accessible learning resource and structured repository practice.
2	SDG 8: Decent Work and Economic Growth	Builds industry-relevant version-control and portfolio skills that support employability, internships, teamwork, and continued professional learning.
3	SDG 9: Industry, Innovation and Infrastructure	Introduces modern software-development infrastructure for reliable change tracking, collaborative development, and publication of innovative academic projects.

1st Semester	Engineering Science Lab (ESL) CYBER SECURITY ESSENTIALS	M26BICLK110
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Computer Fundamentals	• Basic knowledge of computers and operating systems. • Familiarity with Internet usage and web browsing. • Awareness of digital devices and online applications.
2	Cyber Security Awareness	• Basic understanding of safe Internet practices. • Familiarity with smartphones and digital communication. • Awareness of the need for information security.
3	Infrastructure Security Concepts	• Basic understanding of computer networks and digital resources. • Awareness of physical and cyber security in everyday life. • Interest in secure and responsible use of technology.

2. Syllabus

2. Syllabus

Cyber Security Essentials			
SEMESTER – I			
Course Code	M26BICLK110	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	0:0:32:0:0 = 32 Hours	SEE Marks	-
		Total Marks	50
Credits	00	Exam Hours	-
Course Objectives:			
1. Understand and Explain the fundamentals of cybersecurity and infrastructure security, including security challenges, objectives, and their role in protecting organizational assets.			
2. Analyze the concepts of access control, security policies, authentication mechanisms, security monitoring, and mobile device security.			
3. Describe the principles, components, and applications of surveillance systems and intrusion detection systems used for infrastructure protection			
4. Apply cybersecurity tools and techniques such as Kali Linux, Nmap, Wireshark, and Social-Engineer Toolkit (SET) for basic security analysis, awareness, and responsible management of physical and cyber infrastructure.			
Module -1			
Fundamentals of Infrastructure Security: Overview of Cyber Security, Infrastructure Security and its Importance, Security Challenges, Security Risk Scenarios, Security Objectives, Overview of Physical and Cyber Infrastructure Security.			
Practical		Components:	
1.Installation and familiarization with Kali Linux.			
2.Perform basic network diagnostics using Nmap.			
Textbook 1: Chapter 1			
Module -2			
Module 2: Access Control, Security Monitoring and Mobile Devices: Infrastructure Security Overview, Access Control Concepts, Security Policies, Physical Security Controls, Authentication Systems, Remote Access Monitoring, Automated Access Control Systems, Security Posed by Mobile Devices, Registry Settings for mobile devices, Attacks on Mobile Phones, Mobile device security Implications.			
Practical		Components:	
1. Capture and analyze network traffic using Wireshark to identify common protocols such as ICMP, DNS, HTTP, and TCP.			
Textbook 1: Chapter 2			
Textbook 2: Chapter 3			
Module -3			

Surveillance and Intrusion Detection Systems: Introduction to Video Surveillance Systems, Camera Systems and Applications, Intrusion Detection and Reporting Systems, Security Controllers, Sensors and Fire Detection Sensors, Output Devices, Applications of Surveillance and Intrusion Detection Systems

Practical Components:

1. Installation and Familiarization with SET

Textbook 1: Chapter 3 and 4

TEXTBOOKS:

1. Charles J. Brooks, Christopher Grow, Philip Craig, and Donald Short, Cybersecurity Essentials, John Wiley & Sons, Inc., 2018.
2. Nina Godbole and Sunit Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India Pvt. Ltd., First Edition, 2011.

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Deliver fundamental concepts of cybersecurity, infrastructure security, access control and surveillance systems through interactive lectures.
2	Demonstration Based Learning	Demonstrate cybersecurity tools such as Kali Linux, Nmap, Wireshark and the Social-Engineer Toolkit (SET) to familiarize students with their features, applications, and ethical use in a controlled laboratory environment.
3	Hands-on Laboratory Sessions	Conduct guided laboratory exercises using Kali Linux, Nmap, Wireshark, and introductory activities with SET to reinforce cybersecurity concepts, emphasizing ethical use and security awareness.
3	Collaborative Learning	Encourage group discussions, case studies and team-based laboratory activities on cybersecurity challenges, infrastructure protection, and social engineering awareness.
4	Real-World Application	Discuss real-world cybersecurity incidents, infrastructure attacks, surveillance applications and mobile security threats to relate theory to practice.
5	Flipped Class Technique	Provide reading materials, videos, or online resources before class to facilitate active learning and classroom discussions.

4. Assessment Details

Continuous Internal Evaluation (CIE) for Engineering Science Lab Course with 0 Credits

Sl. No.	Components	Number	Weightage	Max. Marks	Min Marks
1	Conduction & Record (A)	1	60%	30	12
2	Lab IA test (B)	1	20%	10	4
3	Case Study Work (C)	1	20%	10	4
Total Marks				50	20

Final CIE Marks = A + B + C

A = Average of marks for all the experiments, B = Lab Internal Assessment marks

C = Case Study Work

Note: There shall be no Semester End Examination (SEE) for this course.

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BICLK110.1	Understand and Explain the fundamentals of cybersecurity, infrastructure security, security challenges, and security objectives.
M26BICLK110.2	Describe access control mechanisms, authentication systems, security monitoring techniques and security issues related to mobile devices.

M26BICLK110.3	Explain the concepts and applications of video surveillance and intrusion detection systems for infrastructure security.
M26BICLK110.4	Apply basic cybersecurity tools and techniques such as Kali Linux, Nmap, Wireshark, and Social-Engineer Toolkit (SET) for security analysis and responsible use of digital resources.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
M26BICLK110.1	3	2	-	-	2	-	-	3	-	-	-	3	3
M26BICLK110.2	2	3	-	-	3	-	-	2	-	-	-	3	3
M26BICLK110.3	2	3	-	-	3	-	-	2	-	-	-	3	3
M26BICLK110.4	2	2	-	-	-	-	-	2	-	-	-	3	3
M26BICLK110	3	3	-	-	3	-	-	3	-	-	-	3	3

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 9: Industry, Innovation and Infrastructure,	The course introduces infrastructure security, access control, surveillance and intrusion detection systems, contributing to the development of secure and resilient infrastructure.
2	SDG 11: Sustainable Cities and Communities	Understanding surveillance systems, security monitoring, and infrastructure protection helps improve the safety and resilience of public spaces, institutions, and smart cities.
3	SDG 16: Peace, Justice and Strong Institutions	The course promotes cybersecurity awareness, secure access control, protection of digital assets, and responsible use of technology, supporting secure institutions and reducing cyber threats.

1st Semester	Engineering Science Lab (ESL) EXCEL FOR BUSINESS	M26BCBLK110
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Computer Fundamentals	Knowledge of computer operations, file management, folders, and operating systems.
2	Basic Mathematics	Understanding of arithmetic operations, percentages, averages, and basic calculations.
3	Logical Thinking	Basic problem-solving and analytical skills required for spreadsheet tasks.
4	Microsoft Windows Environment	Familiarity with launching applications, saving files, and managing folders.
5	Data Entry Skills	Ability to accurately enter and edit text, numbers, and simple datasets.

2. Syllabus

Excel for Business SEMESTER – I			
Course Code	M26BCBLK110	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	0:0:32:0:0 = 32 Hours	SEE Marks	-
		Total Marks	50
Credits	00	Exam Hours	00
Course objectives: This course enables students to: 1. Develop proficiency in Microsoft Excel for business applications. 2. Analyze and visualize business data using Microsoft Excel functions. 3. Apply spreadsheet techniques to solve business and engineering problems.			
Module -1			
Introduction to Microsoft Excel: Workbook and Worksheet, Ribbon Interface, Cell Referencing (Relative, Absolute, Mixed), Data Entry and Editing, Data Formatting, Conditional Formatting, Page Setup and Printing. Basic Excel Functions: SUM(), AVERAGE(), COUNT(), COUNTA(), COUNTIF(), IF(), MAX(), MIN(), LARGE(). Text Book 1: Chapter 1,2 and 3 Practical Component: 1. A company has recorded the performance scores of its employees in an Excel worksheet. Using appropriate Excel functions: • Find the average score. • Determine the median and mode of the scores. • Calculate the standard deviation. • Use IF() to identify whether an employee has passed (Score ≥ 50). • Use AND(), OR(), and NOT() functions to evaluate the given conditions.			
Module -2			
Mathematical, Statistical, Logical, and Date-Time Functions: Logical Functions – IF(), AND(), OR(), NOT(); Statistical Functions – MEAN (AVERAGE), MEDIAN(), MODE(), Standard Deviation (STDEV); Date and Time Functions – DATE(), DATEDIF(), NETWORKDAYS(), EOMONTH(). Application of these functions in business data analysis and report generation. Text Book 1: Chapter 2 and 3 Practical Component: 1. A shop owner has recorded the daily sales of products in an Excel worksheet. Using Excel functions: • Calculate the average daily sales. • Find the median, mode, and standard deviation of the sales. • Use DATE(), DATEDIF(), NETWORKDAYS(), and EOMONTH() to generate a simple sales report. • Apply IF(), AND(), OR(), and NOT() wherever required. 2. A college library has recorded the issue and return dates of books. Using Excel:			

- Calculate the number of days a book was issued using DATEDIF(). - Find the number of working days using NETWORKDAYS(). - Display the last day of the month using EOMONTH(). - Use IF() to determine whether the book was returned on time.
Module -3
Financial Functions: Present Value (PV()), Future Value (FV()), Net Present Value (NPV()), Internal Rate of Return (IRR()), Accounting Rate of Return (ARR), Profitability Index (PI), Payback Period (PBP). Data Visualization: Creating and customizing Charts (Column, Bar, Pie, Line, Histogram), Data Labels, Chart Formatting, and selecting appropriate chart types for business reporting and decision-making. Textbook1: Chapter 9 and 10 Practical Component: - A customer deposits ₹1,00,000 in a bank at an annual interest rate of 8% for 5 years. - Calculate the Present Value (PV) and Future Value (FV) using Excel functions. - Calculate the Net Present Value (NPV) for the given annual cash flows. - Interpret the obtained results. - A retail store has recorded the monthly sales of six products in an Excel worksheet. - Create a Column Chart, Pie Chart, and Line Chart using the given data. - Customize each chart by adding a Chart Title, Axis Titles, Data Labels, and appropriate Chart Formatting. - Select the most suitable chart for presenting the sales report and justify your choice. Case Study: - Employee Salary and Loan EMI Calculator. - Inventory Management System - Personal Financial Tracking system TEXTBOOKS: Microsoft Excel 2019, Data Analysis and Business Modeling, Sixth Edition, Wayne L. Winston Excel 2019 All-in-one, Master the new features of Excel 2019/ office 365, Lokesh Lalwani REFERENCE BOOKS: Microsoft Excel Step by Step (Office 2021 and Microsoft 365), Joan Lambert, Curtis Frye Web Resources: https://support.microsoft.com/en-us/excel/?utm_source=chatgpt.com https://exceljet.net/?utm_source=chatgpt.comhttps://www.excel-easy.com/?utm_source=chatgpt.com

3. Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Interactive Lectures	Explain Microsoft Excel concepts through presentations, demonstrations, and real-world examples.
2	Hands-on Laboratory Sessions:	Conduct hands-on exercises involving Excel functions, formulas, formatting, and data analysis.
3	Demonstration-Based Learning:	Faculty members demonstrate spreadsheet creation, chart generation, PivotTables, and dashboards.
4	Case Study Method:	Analyze real-world business datasets to enhance data interpretation and decision-making skills.
5	Data Visualization Activities	Create charts, PivotCharts, PivotTables, and slicers to present business insights effectively.

4. Assessment Details (CIE)

Continuous Internal Evaluation (CIE) for Engineering Science Lab Course with 0 Credits

Sl. No.	Components	Number	Weightage	Max. Marks	Min Marks
1	Conduction & Record (A)	1	60%	30	12
2	Lab IA test (B)	1	20%	10	---
3	Case Study Work (C)	1	20%	10	---
Total Marks				50	20

$$\text{Final CIE Marks} = A + B + C$$

A = Average of marks for all the experiments, B = Lab Internal Assessment marks

C = Case Study Work

5. Course Outcomes (COs) and Mapping with POs/ PSOs

Course Outcomes (COs)

COs	Description
M26BCBLK110.1	Understand the fundamentals of Microsoft Excel, including workbook and worksheet management, cell referencing, data entry, formatting, and printing techniques.
M26BCBLK110.2	Apply basic, mathematical, statistical, logical, and date-time functions to organize, analyze, and interpret business data.
M26BCBLK110.3	Utilize financial functions to solve business and financial decision-making problems using Microsoft Excel.
M26BCBLK110.4	Analyze real-world datasets using Excel functions and data visualization tools to support informed business decision-making.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
M26BCBLK110.1	-	-	-	-	-	-	-	-	-	-	2	3	-
M26BCBLK110.2	3	-	-	-	-	-	-	-	-	-	-	-	3
M26BCBLK110.3	-	-	3	-	3	-	-	-	-	-	-	3	-
M26BCBLK110.4	-	3	-	-	-	-	-	-	-	-	-	-	3
M26BCBLK110	3	3	3	-	3	-	-	-	-	-	2	3	3

6. Mapping to Sustainable Development Goals (SDG):

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Develops digital literacy, spreadsheet competency, and analytical skills that are essential for higher education and lifelong learning.
2	SDG 8: Decent Work and Economic Growth	Equips students with industry-relevant Microsoft Excel skills for business analysis, financial management, reporting, and workplace productivity.
3	SDG 12: Responsible Consumption and Production	Enables efficient resource planning, inventory management, budgeting, and performance monitoring through the effective use of spreadsheets.

1st Semester	DOMAIN BASED LAB(ESL) (NMC) INTRODUCTION TO DATA SCIENCE	M26BCDLK110
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1. Prerequisites

Sl. No.	Proficiency	Pre-requisites
1	Basic Computer Skills	Ability to use a computer, manage files and folders, install software, and work with basic office applications.
2	Mathematics	Familiarity with basic algebra, introductory probability and statistics, and the ability to interpret simple graphs and charts.
3	Programming Fundamentals	Basic understanding of programming concepts such as variables, data types, operators, conditional statements, loops, and functions. Prior exposure to Python is desirable but not mandatory.
4	Analytical and Logical Thinking	Ability to analyze problems systematically, recognize patterns, and apply logical reasoning to solve simple real-world problems.

2. Syllabus

INTRODUCTION TO DATA SCIENCE SEMESTER – I			
Course Code	M26BCDLK110	CIE Marks	50
Total Number of Teaching-Learning Hours/sem (L:T: P:TW:SL)	0:0:32:0:0 = 32 Hours	SEE Marks	-
		Total Marks	50
Credits	00	Exam Hours	-
Course Objectives: - Understand the fundamental concepts, terminology, applications, and workflow of Data Science. - Explain different types of data, data repositories, data storage methods, and basic statistical techniques used in data analysis. - Apply the stages of the Data Science process, including data collection, preprocessing, exploratory data analysis, and model building. - Use Python-based tools and libraries, such as Matplotlib, to visualize, explore, and interpret datasets for informed decision-making.			
Module -1		10 Hours	
FUNDAMENTALS OF DATA SCIENCE: Data Science, Terminology Related with Data Science, Methods of Data Repository, Personnel Involved with Data Science, Types of Data, Popular Data Science ToolKits, Familiarity with example applications.			
Program1: A school wants to evaluate students' academic performance by calculating their total marks across multiple subjects. Based on the total marks, the school needs to assign ranks to each student.			
Program2: A company maintains the monthly salary records of its employees and wants to identify salaries that are unusually high or low compared to the rest. The HR department analyzes these records to detect possible payroll errors, data entry mistakes, or exceptional salary packages.			
Text Book 1: Chapter 1			
Module -2		10 Hours	
THE DATA SCIENCE PROCESS: Overview of the data science process, Defining research goals and creating a project charter, Retrieving data, Cleansing, integrating, and transforming data, Exploratory data analysis and Build the models, Presenting findings and building applications on Top of them.			
Program3: A school stores student records in a CSV file. Read the data and display the first five records.			
Program4:A college stores student personal details and marks in two separate datasets. Merge the datasets using the student ID, then calculate the total marks, average marks, and assign grades based on the average.			
TextBook 2: Chapter 2			
Module -3		12 Hours	

APPLICATIONS OF DATA SCIENCE, TECHNOLOGIES FOR VISUALISATION AND BOKEH (PYTHON): Applications of Data Science Technologies for Visualisation, Introduction to Python, Basic Numeric Operations, Data Types in Python, Modules, Library, Introduction to Matplotlib and Bokeh

Program5: A retail company wants to analyze its monthly sales using different visualization techniques. Create **Bar Chart, Line Chart, Scatter Plot, and Histogram** in a single window to better understand sales performance.

Program6: An online retail company wants to analyze its monthly sales data by cleaning missing values, calculating profit, exploring sales trends, normalizing the data, and reducing multiple sales features into principal components for better business analysis.

TextBook 1: Chapter 5

TEXTBOOKS:

2. V K Jain ,DATA SCIENCE AND ANALYTICS(with python, R and SPSS Programming) Edition 2018
3. Davy Cielen, Arno D.B. Meysman, Mohamed Ali ,Introducing Data Science , dreamtech press 2024

REFERENCE BOOKS:

4. Cathy O Neil, Rachel Schutt, Doing Data Science-Straight Talk from the Frontline, Orielly,2014
5. Jure Leskovek, AnandRajaraman, Jeffrey Ullman, Mining of Massive Data Sets, Cambridge University press, 2014
6. Joel Grus – Data Science from Scratch ,Orielly,2015

VIDEO LINKS:

1. <https://youtu.be/ua-CiDNNj30>
2. <https://youtu.be/xav69AEAADI>
3. https://youtu.be/kmS7nMK2_3k
4. <https://youtu.be/tVQZvJwi-ec>
5. <https://youtu.be/RiFrbyiYpRs>
6. https://youtu.be/W8i_HUHDQnU
7. https://youtu.be/l-k_1RQmmVY

3.Teaching-Learning Process Strategies

Sl. No.	TLP Strategies	Description
1	Lecture Method	Deliver fundamental concepts of Data Science, data analytics, statistics, and the data science process using interactive lectures.
2	Demonstration using Python Tools	Demonstrate data analysis and visualization using Python libraries such as Matplotlib and real-world datasets.
3	Collaborative Learning	Encourage group discussions, peer learning, and team-based activities for data exploration and problem-solving.
4	Case Studies and Real-World Applications	Present real-world data science applications from domains such as healthcare, finance, agriculture, and social media to connect theory with practice.
5	Flipped Classroom Technique	Provide reading materials, video lectures, or tutorials before class to promote active participation and discussion during classroom sessions.
6	Hands-on Laboratory Learning	Conduct laboratory sessions involving data preprocessing, exploratory data analysis, and visualization using Python tools to strengthen practical skills.

4. Assessment Details (CIE Only)

Continuous Internal Evaluation (CIE) for Domain Based Lab - Non-Credit Mandatory Course

Sl. No.	Components	Number	Weightage	Max. Marks	Min. Marks
1	Conduction & Record (A)	3	60%	30	12
2	Lab IA test (B)	2	20%	10	-
3	Project Work (C)		20%	10	-
	Total Marks			50	20

Final CIE Marks = (A) + (B) + C

A = Average of best two Test marks

B = Average of two Alternate Assessment marks

C = Project work marks

5.Course Outcomes (COs) and Mapping with POs/ PSOs**Course Outcomes (COs)**

COs	Description
M26BCDLK110.1	Explain the fundamental concepts of Data Science, data repositories, data science terminology, and the roles of professionals in the data science ecosystem.
M26BCDLK110.2	Classify different types of data, describe data storage and representation methods, and apply basic statistical techniques for data analysis.
M26BCDLK110.3	Demonstrate the stages of the Data Science process, including data collection, preprocessing, exploratory data analysis, and model building for solving simple data-driven problems.
M26BCDLK110.4	Use Python-based data science tools to explore, visualize, and interpret datasets using appropriate charts and graphical techniques.

CO-PO-PSO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
M26BCDLK110.1	3	-	-	-	-	-	-	-	-	-	-	3	-
M26BCDLK110.2	3	-	-	-	-	-	-	-	-	-	-	3	-
M26BCDLK110.3	3	-	-	-	-	-	-	-	-	-	-	3	-
M26BCDLK110.4	3	2	-	-	2	-	-	-	-	-	-	-	3
M26BCDLK110	3	2	-	-	2	-	-	-	-	-	-	3	3

7. Mapping to Sustainable Development Goals (SDG):

Note: Minimum 3 SDG's to be mapped with each course

Sl. No.	SDG	Justification
1	SDG 4: Quality Education	Data Science equips students with essential digital, analytical, and problem-solving skills, fostering quality education and lifelong learning.
2	SDG 9: Industry, Innovation and Infrastructure	Data-driven decision-making, analytics, and visualization support innovation, optimize industrial processes, and contribute to the development of intelligent infrastructure.
3	SDG 11: Sustainable Cities and Communities	Data Science techniques enable the analysis of urban data for smart city applications, transportation planning, resource management, and improving public services.
4	SDG 17: Partnerships for the Goals	Data sharing, collaborative analytics, and open-data initiatives promote cooperation among academia, industry, government, and society to address global challenges.