Semester 1

Course Title:	Computational Mathematics – I		
Course Code:	**BMAT1001**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:1:0:0	Exam Hours	2
Total Hours of Pedagogy	45 hours Theory + 15 hours Tutorial	Credits	04

Course objectives:

1. Understand Fundamental Concepts: Students will learn the basic principles of discrete mathematics, including logic, sets, functions, and relations.
2. Apply Concepts to Solve Problems: Students will apply discrete mathematics concepts to solve various problems in computer science.
3. Communicate Mathematical Ideas: Students will develop the ability to clearly and effectively communicate mathematical ideas and solutions, both orally and in writing.

Course outcomes:

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

1. To explain the fundamental concepts and principles of discrete mathematics, including logic, sets, functions, and relations.
2. To apply discrete mathematics concepts to solve problems in computer science.
3. To analyze and evaluate the correctness and efficiency of algorithms, and the validity and soundness of logical arguments.
4. To synthesize discrete mathematics concepts to create mathematical models for real-world problems, such as scheduling and network optimization.
5. To evaluate the strengths and limitations of various discrete mathematics techniques, and make informed decisions about which approach to use in a given context.
6. To communicate mathematical ideas and solutions clearly and effectively, both orally and in writing.

Module-1:Basic Logic & Proof Techniques

Logic Expedition: Exploring Proof, Propositions, and Axioms, Logic Everywhere, First Order Logic, Assignment | Propositional Logic, Proof Pathways: Navigating Through Different Methods of Proof, Proving The Inductive Steps, Assignment | Induction, Disproof Techniques

Module-2:Introduction to Counting

Mathematical Mastery: From Counting Techniques to Progressions, Introduction to Counting & Counting Rules, Permutations and Combinations, Navigating from progression to recurrence, Progression,Binomial Theorem, Introduction to recurrence relations, Assignments on Counting

Module-3: Sets,Relations & Functions
Sets and Relations, Set Theory Basics, Types and Operations on Set, Demystifying Relations and Partial Orders, Relations and Partial Orders, Introduction to functions, Assignment | Set Basics, Assignment | Relations
Module-4: Introduction to Structures
Graph Theory | Application, Introduction to Trees, The Art of Efficiency: Optimizing Code with Time Complexity, Minimum Spanning Trees & Graph Isomorphism, Introduction to Asymptotics, Assignment | Graph Theory
Module-5: Discrete Probability
The Fundamentals of Probability, Events and Probability, Conditional Probability, Assignment | Probability, Unveiling the Unexpected - Advanced Probability Concepts, Independent Events, Expectations and Deviations, Random Walk, Assignment | Probability II

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):
The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. Mathematics for Computer Science; Eric Lehman, F Thomson Leighton, Albert R Meyer; 12th Media Services (5 June 2017)

Reference Books

1. Discrete Mathematics and Its Application; Kenneth H Rosen & Dr Kamala Krithivasan; McGraw Hill; 8th edition
2. A Textbook on Discrete Mathematics; CV Sastry and Rakesh Nayak; Wiley (1 October 2020)

Web links and Video Lectures (e-Resources):

- https://ocw.mit.edu/courses/6-042j-mathematics-for-computer-science-fall-2010/
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions

Course Title:	Engineering Physics		
Course Code:	**BPHY1002**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:1:0:0	Exam Hours	2
Total Hours of Pedagogy	45 hours Theory + 15 hours Tutorial	Credits	04

Course objectives:

1. To provide a foundational understanding of key physics principles such as mechanics, electromagnetism, and thermodynamics, and their relevance to technological advancements in fields like semiconductors and optical fibres.
2. To enable students to explore and interpret the interplay between physics and technology, highlighting the societal impacts of innovations and applications in various domains.
3. To equip students with the skills to practically apply physics concepts in computer science through coding exercises and simulations, fostering a deeper comprehension of physical phenomena and their digital representations.

Course outcomes:

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

1. Explain the basic principles of physics such as mechanics, electromagnetism and thermodynamics.
2. Interpret the relationship between physics and technology, especially in advancements such as semiconductors and optimal fibres for communication.
3. Explain the impact of physics and technology on society.
4. Apply concepts of physics practically in the domain of computer science.
5. Simulate concepts of physics in coding by writing programs to simulate concepts such as mechanics and motion.

Module-1:Introduction to Science and Technology

Definition and characteristics of science; Relationship between science and technology; Historical development of science and technology; Ethical considerations in science and technology

Module-2:Principles of Mechanics and Electromagnetism

Mechanics: Concepts of motion, forces, work, energy, momentum; Electromagnetism: electric fields, magnetic fields, electromagnetic waves

Module-3: Principles of Thermodynamics

Laws of thermodynamics, heat transfer, phase transitions

Module-4: Physics in Computer Science

Semiconductors: materials and working principle, Fibre optics and laser, Optical fibre as a dielectric waveguide, Undersea optical fibre networks, Losses associated with optical fibres, Applications of optical fibres

Module-5: Simulating Concepts of Physics

Writing programs to simulate mechanics and motion, latency/speed-of-light communication, Interplanetary communication, Deep-space networks (Voyager and other mission, moon and mars missions

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. Halliday & Resnick Principles of Physics, Extended, 12ed; Halliday, Resnick, and Walker; Wiley India

Reference Books

1. Interplanetary flight and communication Vol1- NA Rynin

Web links and Video Lectures (e-Resources):

- https://ocw.mit.edu/courses/8-012-physics-i-classical-mechanics-fall-2008/
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions

Course Title:	Problem Solving using Programming		
Course Code:	**BPLC1003**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:2:0	Exam Hours	2
Total Hours of Pedagogy	45 hours Theory + 30 hours Practical	Credits	04

Course objectives:

1. Explain fundamental programming concepts and constructs in C++ and Python.
2. Apply programming techniques to solve problems and develop algorithms effectively.
3. Analyze and evaluate the efficiency and correctness of algorithms and programs to address complex problems.

Course outcomes:

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

1. To explain fundamental programming concepts, including data types, control structures, and functions.
2. To apply programming constructs to solve simple problems and algorithms in C++ and Python.
3. To analyze and evaluate the efficiency and correctness of algorithms and programs.
4. To synthesize programming constructs to develop larger programs that solve complex problems.
5. To evaluate the strengths and weaknesses of different programming constructs and choose appropriate solutions for different problems.
6. To communicate programming solutions clearly and effectively, both orally and in writing.

Module-1:Getting started with Problem solving

Introduction to Problem Solving | Live Session, Extract second last digit - Pseudocoding, Print grades - Pseudocoding, Greatest of 4 numbers - Pseudocoding, Power digit Sum - Pseudocoding, Variables, Data types, Input and Output | Live Session, Take Input of string name, age and Print Output, Operators | Live Session, Extract last digit, Sum of extracted digits, Extract the first digit post decimal point, Print the 4th letter of the given name, Perimeter and Area of a Rectangle, Ternary Operator, Swapping two variables

Module-2: Control Structures

Introduction to Control Structures | Live Session, Greater among extracted digits post decimal point, Print grade based on scores, Greatest of 4 numbers, Temperature state message, Fizz buzz, Switch Statement | Live Session, Loops | Live Session, Print table of a number x using do while loop, Find the sum of n terms, Find the minimum number of moves, Working with Digits, Nested Loops | Live Session, Multiplication Table from 1 to N using Nested Loops, Print the given pattern

Module-3: Arrays & Strings

Introduction to Arrays | Live Session, Print the even elements in an array, Print sum of elements present at even index, Swap the largest and smallest element from the array, Swap the first and the last element mutually in the array, Count prime elements in an array, Introduction to Strings | Live Session, Concatenate and compare with the given string, Measure the length of the string, Find substring from given string, Insert space in the given string, Remove the special characters in the given string, Count the number of positions where lowercase follows the uppercase character, Remove 'b' and 'ac' from a given string, Equal number of 0, 1, and 2 from the given string.

Module-4: Program Development

Program Development | Live session, Number letter counts, Summation of primes, Kth prime number, Pentagon numbers, Greatest Common Divisor (GCD) of two numbers, Largest product in a series, Matrix operations, Armstrong number, Pandigital number, Move all hashes, Powerful digit counts, Possible right triangle, Ordered fractions, Fraction convergent.

Module-5: Data Structures & Algorithms

Introduction to DSA | Live Session, Find an element x in an array using Linear Search, Find an element x in an array using Binary Search, Sorting Algorithms | Live Session, Selection Sort, Insertion Sort, Bubble Sort, Merge Sort, Quick Sort, 2 sum, k difference, Remove duplicates from subarray, Maximum sum of subarray, Find maximum length sequence of continuous ones, Longest Substring Without Repeating Characters, Search in rotated array, Introduction to Recursion | Code along, Display Fibonacci series up to n terms, Introduction to Linked Lists, Insert and delete a node from the beginning of a Linked List, Insert and delete a node at a given position of a Linked List, Search a node in a Linked List, Reverse a Linked List, Check if a cycle exists, Introduction to Stacks & Queues, Stack Implementation using Arrays, Balanced parenthesis, Min stack, Queue Implementation using Arrays, Reversing the first K elements of a Queue.

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

Think Like a Programmer: An Introduction to Creative Problem Solving by V. Anton Spraul, Released August 2012, published by No Starch Press

Reference Books

1. Programming in Python 3: A Complete Introduction to the Python Language; Mark Summerfield; Pearson Education; Second edition
2. C++ Programming Language; Bjarne Stroustrup; Pearson Education; 4th edition

Web links and Video Lectures (e-Resources):

- https://ocw.mit.edu/collections/introductory-programming/
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Code-alongs

Course Title:	Basic Electronics		
Course Code:	**BESC1004A**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	2
Total Hours of Pedagogy	45 hours Theory	Credits	04

Course objectives:

1. To provide a foundational understanding of basic electronic principles and components, and their applications in computer systems and digital devices.
2. To enable students to analyze and design simple electronic circuits, focusing on real-world applications relevant to computing and technology.
3. To develop practical skills in using electronic tools and components for problem-solving and innovation in the domain of computer science.

Course outcomes:

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

1. Explain the fundamental concepts of electronic components, such as resistors, capacitors, diodes, and transistors.
2. Analyze the operation of basic electronic circuits and their applications in digital systems.
3. Apply knowledge of electronics to design simple circuits for computing applications.
4. Compare various semiconductor devices and their roles in digital and analog systems.
5. Design and simulate basic electronic circuits using simulation tools.
6. Evaluate the performance of electronic circuits and suggest improvements for specific computing applications.

Module-1:Basics of Electronics and Circuit Theory

Introduction to Electronics: Current, Voltage, and Resistance, Ohm's Law and Kirchhoff's Laws, Series and Parallel Circuits, Basic Components: Resistors, Capacitors, Inductors, Practical Applications in Computing (e.g., Power Supplies, Filters), Hands-on: Building Simple Circuits using Breadboards.

Module-2: Semiconductors and Diodes

Introduction to Semiconductors: PN Junction Theory, Types of Diodes: Rectifier, Zener, LED, Diode Characteristics and Applications, Voltage Regulation and Signal Rectification, Practical Demonstration: Using Diodes in Computer Circuits, Hands-on: Designing a Basic Power Supply Circuit

Module-3: Transistors and Amplifiers

Bipolar Junction Transistors (BJTs) and Field-Effect Transistors (FETs), Transistor Biasing and Configurations, Amplifiers: Types, Gain, and Frequency Response, Application of Transistors in Computing (e.g., Switching Circuits), Hands-on: Designing a Basic Amplifier Circuit, Simulation: Building Amplifiers Using Circuit Simulation Software.

Module-4: Digital Electronics and Logic Gates

Introduction to Digital Electronics: Binary System and Logic Levels, Basic Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Boolean Algebra and Simplification Techniques, Building Digital Circuits Using Logic Gates, Application: Designing Simple Adders and Counters, Hands-on: Constructing Logic Circuits on Breadboards and Simulators.

Module-5: Integrated Circuits and Microcontrollers

Introduction to Integrated Circuits (ICs), Basic Architecture and Applications of Microcontrollers, Interfacing Sensors and Actuators with Microcontrollers, Introduction to Embedded Systems in Computing, Hands-on: Programming a Basic Microcontroller for a Simple Task, Project: Building a Mini Embedded System Application.

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

Robert L. Boylestad, Louis Nashelsky; Electronic Devices and Circuit Theory; Pearson, 11th Edition, 2013

Reference Books

Thomas L. Floyd; Electronic Devices; Pearson, 10th Edition, 2018

Web links and Video Lectures (e-Resources):

- https://ocw.mit.edu/courses/6-002-circuits-and-electronics-spring-2007/
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions

Course Title:	Front-end Web Development Fundamentals		
Course Code:	**BETC1005***	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:2:0	Exam Hours	2
Total Hours of Pedagogy	45 hours Theory + 30 hours Practical	Credits	04

Course objectives:

1. Develop Proficiency in HTML, CSS, and JavaScript: Students will gain a strong understanding of HTML, CSS, and JavaScript and learn to apply these technologies to create interactive and responsive web pages.
2. Design Accessible and User-Friendly Web Pages: Students will learn to design and implement web pages that are accessible, user-friendly, and optimized for search engines.
3. Use Debugging Tools and Techniques: Students will utilize various debugging tools and techniques to identify and fix errors in web applications.
4. Collaborate Effectively in a Team Environment: Students will develop the ability to work collaboratively and effectively in a team on web development projects.

Course outcomes:

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

1. To develop proficiency in HTML, CSS, and JavaScript, and apply them to the development of interactive and responsive web pages.
2. To design and implement web pages that are accessible, user-friendly, and optimized for search engines.
3. To create and use reusable code components to improve productivity and maintainability.
4. To demonstrate an understanding of the principles of web design and user experience, and apply them to front-end development.
5. To use debugging tools and techniques to identify and fix errors in web applications.
6. To work collaboratively and effectively in a team environment on web development projects.

Module-1:HTML,CSS & JS Part I

Getting Started with Front-End Web Development, Installations Guide, Introduction to CLI, Introduction to GitHub, Assignment on Getting started with Git & GitHub, Introduction to HTML, Assignment on Introduction to HTML, HTML Block and Inline Elements, Assignment on HTML Element Types, Assignment on Getting Started with Front-End Web Development, Introduction to CSS, Assignment on CSS selectors, HTML List, Assignment on HTML List, HTML Tables, Assignment on HTML Tables, HTML Forms, Assignment on HTML Forms, Building a Questionnaire/Survey Form, Font & Text Properties in CSS, Assignment on Font and Text properties in CSS, CSS Inheritance, CSS Colours, Box Model, Assignment on CSS Box Model, CSS Positioning, Assignment on CSS Positioning, CSS Values & Sizing and CSS Overflow, Organizing your CSS, Styling static webpage, Miscellaneous styling, Assignment on Super Over - Static, Assignment creating blog post.

Module-2: HTML,CSS & JS Part II
JS Variables, Assignment on JS Variables, JS Datatypes, Assignment on JS Datatypes, JS Strings, Assignment on JS Strings, JS Operators, Assignment on JS Operators, JS Functions, Assignment on JS Functions, JS Conditional Statements, Assignment on JS Conditional Statements, JS Control Statements, Assignment on JS Control Statements, JS Arrays, Assignment on JS Arrays, JS Objects, Assignment on JS Objects, JS DOM, Assignment on JS DOM, Assignment on Super Over - Functional, CSS Flexbox, CSS Flexbox, Assignment on CSS Flexbox, Building a Calculator using Flexbox, Assignment | CricPro, Assignment | CricPro, CSS Grid, Assignment on CSS Grid, Designing a Product listing page, Responsive Design, Assignment 1 on Responsive Design, Form Validation using JS, Assignment 2 on Responsive Design.
Module-3: HTML, CSS & JS Deep Dive
Assignment | Superwars Stage 1, JS Events, Assignment on JS Events, Assignment | BRRGRR, JS Advanced Arrays, JS Advanced Objects, Assignment on Advanced Arrays and Objects, Building an Image Slider, Assignment on JS Advanced Arrays, Assignment | Superwars Stage 2 & 3, JS Storage, Assignment on JS Storage, Creating a modal Popup, Responsive Navbar with CSS flexbox, Assignment on Kidz World Functional, Assignment | Kalvium Premier League, Assignment | Kalvium Premier League, Assignment 1 on Game Development, Assignment 2.1 on Game Development & 2.2 on Game Development, Assignment 2.1 on Game Development & 2.2 on Game Development, Assignment 3 on Game Development, Assignment 3 on Game Development, Assignment 4 on Game Development, Assignment 5 on Game Development, Creating your first Game using HTML, CSS & JS.
Module-4: Javascript Hard Parts - I
Clean Coding, JS ES6 - Part 1, JS ES6 - Part 2, Functional Programming, Pure functions, First class functions, Higher order functions, Assignment on Special Calculator, Assignment on Chocolate Dispenser, Assignment on Higher Order Functions, JS Recursion, Assignment | Understanding Recursion, Creating a Quiz page using JS, Building a Countdown Timer, JS Anonymous Function & IIFE, JS Object Oriented Introduction, JS Prototypal Inheritance, Assignment | JS Smart Phone, Assignment | JS Blog, Assignment | Superwars Stage 4, Creating Website Clone using JS, Assignment | Superwars Stage 5, JS Closures & Scope.
Module-5: JS Hard Parts - II
JS | Assignment on Closures & Scope, JS Event Loops, JS Async & Callbacks, Assignment on JS Async & Callbacks, JS Promises, Assignment | Promises, JS | AJAX | Axios GET Request, JS APIs, Assignment | Movie Search App, JS | Assignment on APIs, JS AJAX | Axios POST & PUT, Assignment | Asynchronous Image Loader, Assignment | Fetch API, Assignment | Real Time Chat App, Assignment | Real Time Chat App.

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. Web development: This book includes: Web development for Beginners in HTML + Web design with CSS + Javascript basics for Beginners; Andy Vickler; Ladoo Publishing LLC (24 May 2021)

Reference Books

1. HTML, CSS, and JavaScript All in One; Julie C. Meloni & Jennifer Kyrnin; Pearson Education; Third edition

Web links and Video Lectures (e-Resources):

- https://www.freecodecamp.org/
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Code-alongs

Course Title:	Innovation and Design Thinking		
Course Code:	**BAEC1006A**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:0:0	Exam Hours	2
Total Hours of Pedagogy	30 hours theory	Credits	01

Course objectives:

1. To enable students to understand and apply the principles of innovation and design thinking in solving complex problems in technology and business.
2. To develop students' ability to use various tools and techniques for rapid prototyping, user-centered design, and collaborative innovation.
3. To equip students with the skills to critically evaluate and create sustainable and impactful business models and technological solutions.

Course outcomes:

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

1. Remember: Describe the fundamental concepts of innovation and different types of innovation.
2. Understand: Explain the stages of design thinking and their significance in technology development.
3. Apply: Use design thinking tools to create a basic prototype for a given problem scenario.
4. Analyze: Compare and contrast different case studies to identify key success factors in innovative projects.
5. Evaluate: Critically assess the effectiveness of a business model or technological solution in terms of innovation and sustainability.
6. Create: Design a comprehensive solution using design thinking principles to address a real-world problem in technology or business.

Module-1: Introduction to Innovation and Design Thinking

Understanding Innovation, Types of Innovation: Incremental, Disruptive, Radical, Role of Innovation in Technology and Business, Basics of Design Thinking, What is Design Thinking, Stages of Design Thinking: Empathize, Define, Ideate, Prototype, Test, Importance of Problem Identification, MVP and Prototyping in Software Development, Introduction to Prototyping Tools (e.g., Figma, Balsamiq), Case Study: Real-World Examples in Tech Startups, Group discussion on learnings from the case studies.

Module-2: Tools for Design Thinking in Digital Spaces

Design Interaction and Analysis, Tools for Collaborative Design (e.g., Miro, Google Jamboard), Real-Time Design Interaction in Agile Development, Empathy in User-Centric Design, Understanding User Personas and Needs, Storyboarding and Journey Mapping in Tech Products, Collaboration in Distributed Design, Managing Virtual Teams and Design Projects, Case Study: Open-Source Software Collaboration, Hands-on Activity: Building a Journey Map for a Software Solution.

Module-3: Design Thinking in Software Development

Design Thinking for IT Projects, Applying Design Thinking to Agile Development, Scenario-Based Prototyping for Software Solutions, Design Thinking in Business Process Modelling, Integrating Design Thinking in Business Process Automation (BPA), Case Study: Design Thinking in Enterprise Software Solutions, Prototyping for Software Development, Rapid Prototyping Techniques in Front-End and Back-End Systems, Introduction to Tools like Figma, ReactJS Prototyping, Group Activity: Creating a Prototype for a Simple App.
Module-4: Innovation for Strategic Solutions
Strategic Foresight and Change in Technology, Predicting Technological Changes and Market Trends, Value Proposition and Redefinition in Tech, Storytelling in Technology, The Role of Storytelling in Tech Branding and User Engagement, Case Study: How Apple and Microsoft use storytelling, Innovation in Business Model Design for Tech Startups, Creating Sustainable Business Models for Tech Products, Design Thinking for Rapid Prototyping and Strategic Planning, Group Project: Design a Business Model for a New Software Product.
Module-5: Emerging Trends and Innovations in Technology
Artificial Intelligence and Design Thinking, Applying AI in the Design Process, Case Studies: AI-Powered Prototyping Tools, Machine Learning for Design Optimization, Using ML to Improve User Experience (UX), AI-Driven Design Tools in Software Engineering, Designing for the Internet of Things (IoT), Human-Centered Design in IoT Solutions, Challenges in Prototyping IoT Devices, Blockchain and Its Impact on Design, Blockchain for Secure Digital Designs, Case Study: How Blockchain Changes the Way We Design for Security, Sustainability and Innovation in Tech, Sustainable Design in Software Development, Green Tech: Designing Solutions with Environmental Impact in Mind.

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School by Idris Mootee, Wiley, 2013.
2. Creative Confidence: Unleashing the Creative Potential Within Us All by Tom Kelley and David Kelley, Crown Business, 2013.

Reference Books

1. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation by Tim Brown, HarperBusiness, 2009.
2. The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail by Clayton M. Christensen, Harvard Business Review Press, 2016.
3. Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses by Eric Ries, Crown Business, 2011.

Web links and Video Lectures (e-Resources):

- https://www.coursera.org/learn/uva-darden-design-thinking-innovation
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions

Course Title:	Environmental Studies		
Course Code:	**BMNC1007A**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	-
		Total Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	0
Total Hours of Pedagogy	15 hours theory	Credits	01

Course objectives:

1. To understand the interrelationship between natural systems and human activities, focusing on the impact of technology and industrialization on the environment.
2. To develop critical thinking and problem-solving skills by exploring sustainable practices and solutions relevant to the IT industry.
3. To foster environmental awareness and ethical responsibility among students through interactive discussions and activities.

Course outcomes:

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

1. L1: Remembering - Identify and recall the basic concepts of ecosystems, biodiversity, and environmental pollution.
2. L2: Understanding - Explain the role of technology in environmental degradation and the significance of sustainable practices.
3. L3: Applying - Apply environmental management principles to propose solutions for reducing the ecological footprint of digital activities.
4. L4: Mastery - Analyze case studies of IT companies implementing green policies and evaluate their effectiveness.
5. L4: Mastery - Design a small-scale project or activity to promote environmental consciousness within a college or community setting.
6. L3: Applying - Implement environmental data analysis techniques using tools relevant to Computer Science.

Module-1: Introduction to Environmental Studies

Introduction to Environmental Studies, scope and importance, the need for public awareness, ecosystems: structure, function, and types, food chains, food webs, and ecological pyramids.

Module-2: Biodiversity

Biodiversity: concept and significance, threats to biodiversity, conservation of biodiversity, biogeographical classification of India, natural resources and their management.

Module-3: Pollution

Environmental Pollution: types, causes, effects, and control measures of air pollution, water pollution, soil pollution, noise pollution, and solid waste management, role of individuals in pollution control.

Module-4: Social issues and the environment

Social Issues and the Environment: climate change, global warming, acid rain, ozone layer depletion, nuclear hazards, environmental ethics, sustainable development and IT's role in environmental sustainability.

Module-5: Environmental Legislation and Policies

Environmental Legislation and Policies: environmental protection act, issues involved in enforcement of environmental legislation, case studies on green computing, sustainable IT infrastructure, data centers and energy efficiency.

Continuous Internal Exam (CIE):

- There will be a total of 5 internal assessments conducted during the semester - at the end of each unit.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. Environmental Studies by Benny Joseph, McGraw Hill Education, 3rd Edition.
2. Environmental Studies: From Crisis to Cure by R. Rajagopalan, Oxford University Press, 3rd Edition.

Reference Books

1. Environmental Science by Daniel B. Botkin and Edward A. Keller, Wiley India Pvt Ltd, 8th Edition.
2. Fundamentals of Ecology by Eugene P. Odum and Gary W. Barrett, Brooks/Cole, 5th Edition.

Web links and Video Lectures (e-Resources):

- https://www.coursera.org/learn/environmental-science
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions

Course Title:	Communicative English		
Course Code:	**BAEC1008A**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Practical	SEE Marks	-
		Total Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	Exam Hours	2
Total Hours of Pedagogy	30 hours practical	Credits	01

Course objectives:

1. Enhance Listening Skills: Students will demonstrate effective listening skills in professional settings.
2. Develop Clear Speaking Techniques: Students will use clear and concise speaking techniques for business communication.
3. Analyze Written Communications with Comprehension skills: Students will interpret and analyze written business documents and communications - with good comprehension skill.

Course outcomes:

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

1. To comprehend and interpret spoken and written English at the CEFR B2 level
2. To produce spoken and written English at the CEFR B2 level
3. To develop active listening and speaking skills in order to participate in discussions, debates, and presentations
4. To improve reading speed, comprehension, and critical analysis of texts related to business and technical domains
5. To hone writing skills and produce effective business and technical documents such as emails, reports, proposals, and presentations
6. To apply effective communication strategies in a professional setting, including cultural awareness and intercultural communication.

Module-1: Essential Grammar and Vocabulary

Essential Grammar - Part 1, Essential Grammar - Part 2, Essential Vocabulary - Part 1, Essential Vocabulary - Part 2, Vocabulary building techniques

Module-2: Reading

How to read effectively?, How to build a reading habit?, Reading Practice and Discussion - 1, Reading Practice and Discussion - 2, Reading Practice and Discussion - 3, Reading Practice and Discussion - 4
Module-3: Listening
What is Active Listening?, How to improve listening comprehension skills?, Listening Exercise-I, Listening Exercise-II, Listening Exercise-III, Listening Exercise-IV
Module-4: Speaking
How to improve your speaking skills? Part 1, How to improve your speaking skills? Part 2, Speaking Exercise-I, Speaking Exercise-II, Speaking Exercise-III, Speaking Exercise-IV
Module-5: Writing
How to improve your writing skills? : Part 1, How to improve your writing skills? : Part 2, Writing Exercise #1, Writing Exercise #2, Writing Exercise #3, Writing Exercise #4

Continuous Internal Exam (CIE):

- There will be a total of 5 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

Professional English: for AKTU, Meenakshir Raman and Sangeetha Sharma, Oxford Publication 1st edition

Reference Books

Word Power Made Easy; Norman Lewis; Penguin Random House India; Latest edition 2015

Web links and Video Lectures (e-Resources):

- https://onlinecourses.swayam2.ac.in/cec24_lg08/preview
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions

Semester 2

Course Title:	Computational Mathematics – II		
Course Code:	**BMAT2001**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:1:0:0	Exam Hours	2
Total Hours of Pedagogy	45 hours Theory + 15 hours Tutorial	Credits	04

Course objectives:

1. Understand Key Concepts: Students will understand the fundamental concepts of mathematical thinking and inquiry-based learning, and how to use precise language in mathematical contexts.
2. Analyze Logical Structures: Students will analyze and evaluate logical combinators, implications, logical equivalence, and quantifiers within language and mathematical arguments.
3. Apply Mathematical Proof Techniques: Students will apply various methods of mathematical proof, including proof by contradiction and proof by quantifiers, to solve problems and

construct rigorous mathematical arguments.

Course outcomes:

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

1. Define key concepts of mathematical thinking and inquiry-based learning.
2. Analyze logical combinators and implications in language.
3. Evaluate logical equivalence and quantifiers in language analysis.
4. Apply methods of mathematical proof, including proof by contradiction and proof by quantifiers.
5. Understand advanced mathematical topics such as number theory and real analysis.
6. Create well-structured mathematical arguments and proofs using the concepts learned in the course.

Module-1: What is Mathematical Thinking?

Live Session: What is Mathematical Thinking?, What is Inquiry based learning?, Introduction to Mathematical Thinking, How to get precise about language?

Module-2:Logical and Language Analysis-I

Live Session: Logical and Language Analysis-I, Analysis of language – the logical combinators, Assignment- the logical combinators, Analysis of language – implication, Assignment- implication

Module-3: Logical and Language Analysis-II

Live Session: Logical and Language Analysis-II, Analysis of language – Logical Equivalence, Assignment | Analysis of language – Logical Equivalence, Analysis of language – quantifiers, Assignment | Analysis of language – quantifiers

Module-4: Mathematical Proofs

Live Session: Mathematical Proofs, What is Proof by Contradiction?, Assignment | What is Proof by Contradiction?, What is Proof by Quantifiers?, Assignment: What is Proof by Quantifiers?

Module-5: Advanced Topics in Mathematical Thinking

Live Session: Advanced Topics in Mathematical Thinking, What is Number Theory?, Assignment: Number Theory, What is Real Analysis?, Assignment: Real Analysis

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

The Mathematical Experience; Philip J. Davis and Reuben Hersh; Harper Paperbacks; 1999 edition

Reference Books

Mathematics and the Imagination; Edward Kasner and James Newman; Dover Publications Inc; 2003 edition

Web links and Video Lectures (e-Resources):

- https://www.coursera.org/learn/mathematical-thinking
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions

Course Title:	Materials Chemistry for Computing Systems		
Course Code:	**BCHE2002**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:1:0:0	Exam Hours	2
Total Hours of Pedagogy	45 hours Theory + 15 hours Tutorial	Credits	04

Course objectives:

1. To understand the fundamental principles of materials chemistry and their applications in computing systems, focusing on the properties and functionalities of materials used in electronics and information storage.
2. To explore the chemical processes and reactions involved in the development and optimization of semiconductor materials and nanotechnology for computing purposes.
3. To foster analytical thinking and discussion-based learning on the impact of materials science in advancing computing technology and sustainable practices.

Course outcomes:

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

1. L1: Remembering - Identify key materials and their properties relevant to computing systems.
2. L2: Understanding - Explain the chemical principles underlying the synthesis and functionality of materials used in computing.
3. L3: Applying - Apply basic chemistry concepts to analyze the properties and potential uses of emerging materials in technology.
4. L4: Mastery - Evaluate the role of materials chemistry in the development of advanced computing systems and propose theoretical improvements.
5. L4: Mastery - Analyze the environmental and sustainability challenges associated with the use of various materials in computing devices.
6. L3: Applying - Utilize chemical knowledge to discuss and solve conceptual problems related to materials science in computing.

Module-1: Introduction to Materials Chemistry for Computing Systems

Overview of materials chemistry, classification of materials used in computing, basic chemical principles, electronic structure and bonding in materials, chemical properties of metals, semiconductors, and insulators, role of materials in information storage and processing.
Module-2: Semiconductor Materials and Chemistry
Introduction to semiconductors, intrinsic and extrinsic semiconductors, doping and its impact on electronic properties, chemical processes in semiconductor manufacturing, silicon and its compounds, advanced semiconductor materials like GaAs and graphene, applications in transistors and microprocessors.
Module-3: Nanotechnology in Computing
Basics of nanotechnology, chemical synthesis and characterization of nanomaterials, nanostructures and their properties, quantum dots and carbon nanotubes, nanomaterials in memory storage devices, implications of nanotechnology for future computing systems.
Module-4: Materials for Data Storage and Memory
Chemical properties of materials used in magnetic and optical data storage, ferroelectric and phase-change materials, chemistry of solid-state drives (SSD) and hard disk drives (HDD), advancements in memory technologies, chemical stability and performance, comparison of different materials for data storage.
Module-5: Sustainable Materials and Environmental Considerations
Environmental impact of materials used in computing, sustainable materials and green chemistry, recycling and reusability of electronic materials, life cycle analysis of computing devices, role of chemistry in developing eco-friendly materials, future directions for sustainable computing.

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. Materials Chemistry by Bradley D. Fahlman, Springer, 4th Edition.
2. Materials for Information Technology: Devices, Interconnects and Packaging by Ehrenfried Zschech, Caroline Whelan, Thomas Mikolajick, Springer, 2nd Edition.

Reference Books

1. Principles of Electronic Materials and Devices by Safa O. Kasap, McGraw-Hill Education, 4th Edition.
2. Introduction to Materials Science for Engineers by James F. Shackelford, Pearson, 8th Edition.

Web links and Video Lectures (e-Resources):

- https://ocw.mit.edu/courses/5-111sc-principles-of-chemical-science-fall-2014/
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions

Course Title:	Object Oriented Programming		
Course Code:	**BPLC2003**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	2:0:2:0	Exam Hours	2
Total Hours of Pedagogy	30 hours Theory +30 hours Practical	Credits	03

Course objectives:

1. Understand OOP Concepts: Students will explain the fundamental concepts and principles of Object-Oriented Programming, such as encapsulation, inheritance, and polymorphism.
2. Develop Basic Software Projects: Students will apply OOP concepts to develop simple software projects in an OOP language.
3. Collaborate on OOP Projects: Students will collaborate and communicate effectively in a team environment to develop and maintain OOP-based software projects.

Course outcomes:

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

1. To explain the fundamental concepts and principles of OOP, such as encapsulation, inheritance, and polymorphism.
2. To apply OOP concepts to develop software applications in C++ and Python.
3. To design and implement complex data structures and algorithms using OOP concepts.
4. To develop and manage large-scale software projects using OOP design patterns and software engineering practices.
5. To analyze and evaluate the performance and efficiency of OOP-based programs.
6. To collaborate and communicate effectively in a team environment to develop and maintain OOP-based software projects.

Module-1: Introduction to Object Oriented Programming

Introduction to OOP | Live Session, Basic Concept of Classes and Objects, Building blocks of OOP, This pointer & Array of Objects, Assignment | Student class- Encapsulation, Assignment | Rectangle class- Member functions, Milestone-1 | Classes and Objects, Milestone-1 | This pointer, Milestone-1 | Array of objects

Module-2: Key concepts in OOP

Key concepts in OOP | Live session, New and Delete, Static variables and Static Members of a class, Assignment | Creation of Objects in C++ (Static creation and dynamic creation), Assignment | Book class- Static member variables and static member functions, Assignment | Student class - static members and dynamic memory allocation, Milestone-2 | New and delete, Milestone-2 | Static Variables, Milestone-2 | Static Member functions

Module-3: Deep dive into OOP

Deep Dive into OOP | Live session, Encapsulation and Data Hiding, Assignment | Bank account class- Encapsulation and Data Hiding, Constructors and Destructors, Assignment | Student class- Constructors and Destructors, Assignment | Person class- Constructors and Destructors (Constructors, Parameterized constructors), Milestone-3 | Encapsulation, Milestone-3 | Abstraction, Milestone-3 | Constructors and Destructors

Module-4: Inheritance and Polymorphism

Inheritance and Polymorphism | Live session, Inheritance, Polymorphism, Assignment | Shape hierarchy, Assignment | Employee hierarchy, Abstract Classes and Virtual Functions, Milestone-4 | Inheritance, Milestone-4 | Polymorphism, Milestone-4 | Abstract class and Virtual Function

Module-5: Design Principles in OOP

Design principles in OOP | Live Session, Introduction to Design principles, SOLID Principles, Assignment | Online Banking System: Design Principles (SOLID), Assignment Problem | Library Management System - Design Principles (SOLID), Assignment Problem | Employee Information - Design Principles (SOLID), Milestone-5 | SOLID Principle 1, Milestone-5 | SOLID Principle 2, Milestone-5 | SOLID Principle 3

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. Object-Oriented Programming with C++; E Balagurusamy; McGraw Hill; Eighth edition
2. Python Object-Oriented Programming; Steven F. Lott & Dusty Phillips; Packt Publishing Limited; 4th edition
3. Java The Complete Reference; Herbert Schildt; McGraw Hill; Eleventh edition

Reference Books

1. Object Oriented Programming C++; Robert Lafore; Pearson Education India; 4th edition
2. OOPS with C++ and Java; Balagurusamy; McGraw Hill Education 2014 edition
3. Python 3 Object-Oriented Programming; Dusty Phillips; Packt 3rd edition

Web links and Video Lectures (e-Resources):

- https://ocw.mit.edu/courses/6-01sc-introduction-to-electrical-engineering-and-computer-science-i-spring-2011/pages/unit-1-software-engineering/object-oriented-programming/
- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions
- Code-alongs

Course Title:	Mechanical Engineering Sciences		
Course Code:	**BESC2004B**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	2
Total Hours of Pedagogy	45 hours theory	Credits	03

Course objectives:

1. To understand the fundamental principles of mechanical engineering and their relevance to computing and IT systems, focusing on the design, dynamics, and material properties used in computer hardware and related devices.
2. To explore the mechanical aspects of hardware development, such as heat dissipation, structural integrity, and ergonomics in the design of computing systems.
3. To develop a conceptual understanding of mechanical engineering principles to analyze and discuss their applications in the design and optimization of computing equipment and technology infrastructure.

Course outcomes:

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

1. L1: Remembering - Identify basic mechanical concepts such as force, motion, and energy and their relevance to computing hardware.
2. L2: Understanding - Explain the principles of thermodynamics and material science as they apply to the development and optimization of computer systems.
3. L3: Applying - Apply knowledge of mechanical engineering to analyze the thermal management and structural design of computing devices.
4. L4: Mastery - Analyze the mechanical challenges in the design and manufacturing of computing hardware, such as laptops, servers, and data centers.
5. L4: Mastery - Evaluate the role of mechanical systems in enhancing the performance and sustainability of IT infrastructure.
6. L3: Applying - Utilize mechanical engineering concepts to propose theoretical improvements in the design of computing devices, focusing on efficiency and durability

Module-1: Introduction to Mechanical Engineering Concepts for Computing

Fundamental principles of mechanics, force and motion, energy and work, basic properties of materials, stress and strain, mechanical properties relevant to computing hardware, introduction to mechanical design and analysis, role of mechanical engineering in computing.
Module-2: Thermodynamics and Heat Transfer in Computing Systems
Basic concepts of thermodynamics, laws of thermodynamics, heat transfer mechanisms: conduction, convection, and radiation, thermal management in electronic devices, heat sinks and cooling systems, thermal conductivity of materials used in computing, design considerations for thermal efficiency in computer hardware.
Module-3: Material Science and Selection for Computing Hardware
Introduction to materials science, classification of engineering materials, mechanical and thermal properties of metals, polymers, and composites, material selection criteria for computing devices, properties and applications of common materials in computer hardware, failure analysis and durability considerations.
Module-4: Dynamics and Vibrations in Computing Equipment
Basic principles of dynamics, types of motion, vibration analysis, impact of vibrations on computing systems, design for minimizing vibrations in hard drives and servers, dynamics of moving parts in printers and scanners, ergonomic considerations in device design, impact of mechanical stress on device lifespan.
Module-5: Mechanical Design for IT Infrastructure and Hardware
Principles of mechanical design, structural analysis of computer enclosures and frames, design for manufacturability and assembly, modular design and maintenance, mechanical aspects of data center design, structural integrity and load management, case studies on mechanical design innovations in computing

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. Engineering Mechanics: Dynamics by J. L. Meriam and L. G. Kraige, Wiley, 8th Edition.
2. Fundamentals of Thermodynamics by Richard E. Sonntag, Claus Borgnakke, and Gordon J. Van Wylen, Wiley, 9th Edition.

Reference Books

1. Materials Science and Engineering: An Introduction by William D. Callister Jr. and David G. Rethwisch, Wiley, 10th Edition.
2. Mechanical Design of Machine Elements and Machines by Jack A. Collins, Henry R. Busby, and George H. Staab, Wiley, 2nd Edition.

Web links and Video Lectures (e-Resources):

- www.kalvium.community/livebooks

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions

Course Title:	Front-end Web Development - Advanced		
Course Code:	**BETC2005***	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:2:0	Exam Hours	2
Total Hours of Pedagogy	45 hours theory + 30 hours practical	Credits	04

Course objectives:

1. Master Advanced React Concepts: Students will understand and explain the core and advanced features of React, including components and hooks.
2. Develop and Optimize Complex Interfaces: Students will develop complex user interfaces using React and implement performance optimization techniques.
3. Integrate and Manage State Effectively: Students will evaluate state management solutions, integrate them into React applications, and connect React with various APIs and backend services for full-stack development.

Course outcomes:

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

1. Explain the core concepts and advanced features of React.
2. Develop complex user interfaces using React components and hooks.
3. Evaluate the performance of React applications and implement optimization techniques.
4. Assess state management solutions and their integration in React applications.
5. Design and implement large-scale React applications with robust architectures.
6. Integrate React with various APIs and backend services for full-stack development.

Module-1: Getting started with React

Environment set up and installation, Introduction to React and its core concepts, Understanding the Virtual DOM, Creating your first React component, Props and State: managing and passing data within components, Understanding the structure and syntax of JSX, Using create-react-app to bootstrap a React project, Basic Component Lifecycle and its importance.

Module-2: Building Components and Managing State

Creating functional and class-based components, Managing state within components, Introduction to React Hooks: useState and useEffect, Handling events in React, Conditional rendering and dynamic UI updates, Rendering lists of data with .map(), Building a simple CRUD application, Component composition and reusability, Lifting state up and managing shared state.

Module-3:Advanced Component Patterns and Routing

Understanding and implementing additional hooks: useContext, useReducer, and useRef, Custom hooks: creating and using hooks to simplify component logic, Component Lifecycle methods in depth for class-based components, Higher Order Components (HOCs) and Render Props, Introduction to React Router: setting up routing in a React app, Route parameters and nested routing, Programmatic navigation and redirects, Building a multi-page application with React Router.
Module-4: State Management and Data Handling
Introduction to Redux: understanding the basics of state management, Setting up a Redux store and actions, React Redux: connecting React with Redux, Managing state with the Redux Toolkit, Fetching data from APIs: using Fetch and Axios, Handling asynchronous data with useEffect and Redux Thunk, Managing complex state with Redux: selectors and memoization, Error handling and data validation.
Module-5: Styling and enhancing user experience
Styling in React: CSS modules, styled-components, and inline styles, Using React CSS libraries: Bootstrap and Tailwind CSS, Introduction to Material-UI: setting up and using Material-UI components, Theming and custom styling with Material-UI, Implementing responsive design in React, Animations and transitions in React, Optimizing performance: React.memo and useCallback, Best practices for building scalable and maintainable React applications.

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

The Road to Learn React: Your Journey to Master Plain Yet Pragmatic React.Js; Robin Wieruch; Zaccheus Entertainment (1 January 2018)

Reference Books

React and React Native: A complete hands-on guide to modern web and mobile development with React.js; Adam Boduch & Roy Derks; Packt Publishing Limited; 3rd edition

Web links and Video Lectures (e-Resources):

- www.kalvium.community/livebooks
- https://www.freecodecamp.org/

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions
- Code-alongs
- Building a project

Course Title:	UI and UX Design for Developers		
Course Code:	**BAEC2006B**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:2:0	Exam Hours	2
Total Hours of Pedagogy	15 hours theory + 30 hours practical	Credits	02

Course objectives:

1. Understand User-Centered Design: Students will learn the basic principles of user-centered design and how they apply to software development.
2. Evaluate and Improve Software Design: Students will evaluate existing software applications to identify and suggest improvements for user experience and usability.
3. Apply Visual Design Principles: Students will apply visual design principles, including typography, color theory, and layout, to create effective and appealing user interfaces.

Course outcomes:

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

1. To explain the basic principles of user-centered design, and how they apply to software development.
2. To evaluate and critique the design of existing software applications, and identify areas for improvement in terms of user experience and usability.
3. To apply visual design principles and techniques, such as typography, color theory, and layout, to create effective user interfaces.
4. To conduct usability testing and other evaluation methods to measure the effectiveness and usability of software applications.
5. To synthesize different design concepts and techniques to create well-designed and user-friendly software interfaces.
6. To evaluate the accessibility of software applications and understand the importance of designing for users with diverse needs.

Module-1: How to approach design as a developer

Why design for developers, Getting started with design education, Getting started with Figma, Labs on Figma

Module-2: UX Design for Developers - I

Understanding design sprints, Understanding the user, Information architecture, and Accessibility in design.

Module-3: UX Design for Developers -II

How to build good digital products, Psychology in UX design, User research, User journey mapping, Wireframing, Prototyping

Module-4: UI Design for Developers -I

Visual design principles, Visual hierarchy, Working with text, Layouts and spacing

Module-5: UI Design for Developers -II

Working with colours, Working with images, Creating depth in design, Working with components

Continuous Internal Exam (CIE):

- There will be a total of 3 internal assessments conducted during the semester.
- The sum total scores of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40% in order to be eligible for SEE.

Semester End Examination(SEE):

The SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (**duration 2-3 hours)**

- The medium of the question paper shall be English. The duration of SEE is 2-3 hours.
- The SEE will be conducted digitally on a proctored online platform, in a university-designated classroom.
- The SEE will be scored for 50.
- Out of this, 40% will be considered passing mark.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

About Face; Alan Cooper, Robert Reimann, Christopher Noessel and David Cronin; Wiley Publishing, 2014

Reference Books

1. Hands-on UX design for developers; Elvis Canziba; Packt, 2018
2. Refactoring; Adam Wathan and Steve Shoger

Web links and Video Lectures (e-Resources):

- www.kalvium.community/livebooks
- https://www.interaction-design.org/

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions
- Code-alongs
- Building a project

Course Title:	Constitution of India		
Course Code:	**BMNC2007B**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	--
		Total Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	1
Total Hours of Pedagogy	15 hours theory	Credits	-

Course objectives:

1. To understand the historical context and evolution of the Indian Constitution by outlining its development and the foundational principles that guide the nation.
2. To illustrate the key constitutional provisions related to fundamental rights, duties, directive principles, and the functioning of the executive, legislature, and judiciary.
3. To analyse the federal structure and the amendment process by examining the distribution of powers between the Union and the States and the significance of constitutional amendments

Course outcomes:

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

1. Outline the historical background and development of the Indian Constitution.
2. Illustrate fundamental rights, duties, and directive principles enshrined in the Constitution.
3. Explain the structure and functions of the executive, legislature, and judiciary in India.
4. Analyse the federal structure and the distribution of powers between the Union and the States.
5. List the process and significance of constitutional amendments.

Module-1: Introduction to the Constitution of India

Historical background, Making of the Constitution, Preamble and its significance, Basic structure doctrine.

Module-2: Fundamental Rights and Duties

Fundamental rights, Fundamental duties, Directive principles of state policy, Case studies on landmark judgments

Module-3: Structure and Functions of the Executive, Legislature, and Judiciary

The President and Vice-President, Parliament, State Legislature, The Prime Minister and Council of Ministers, The Judiciary - Supreme Court, High Courts, Subordinate Courts
Module-4: Federal Structure and Distribution of Powers
Federalism in India, Division of powers: Union, State, and Concurrent lists, Inter-state relations, Emergency provisions
Module-5: Constitutional Amendments and Their Impact
Process of amendment, Significant amendments and their implications, Judicial review and interpretation, Role of the Constitution in shaping Indian governance

Continuous Internal Exam (CIE):

- There will be 1 internal assessment.
- The assessment's score will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40%.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. "Introduction to the Constitution of India" by Durga Das Basu, LexisNexis, 23rd Edition, 2018.
2. "Indian Polity" by M. Laxmikanth, McGraw Hill Education, 6th Edition, 2020

Reference Books

1. "The Constitution of India: A Contextual Analysis" by Arun K. Thiruvengadam, Bloomsbury Professional, 1st Edition, 2017.
2. "Granville Austin: The Indian Constitution - Cornerstone of a Nation" by Granville Austin, Oxford University Press, 2000.

Web links and Video Lectures (e-Resources):

- www.kalvium.community/livebooks
- https://onlinecourses.nptel.ac.in/noc20_lw03/preview

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions

Course Title:	Professional Writing Skills in English		
Course Code:	**BAEC2008B**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	--
		Total Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	1
Total Hours of Pedagogy	15 hours theory	Credits	-

Course objectives:

1. To develop effective professional writing skills for diverse business and academic contexts.
2. To enhance the ability to structure and present ideas coherently and persuasively in written communication.
3. To apply critical thinking and linguistic accuracy in crafting various professional documents.

Course outcomes:

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

1. Identify different types of professional writing styles and their appropriate contexts.
2. Summarize key elements of effective written communication in business and academic settings.
3. Apply grammatical rules and stylistic conventions in professional documents.
4. Analyze the structure and content of different professional documents such as reports, proposals, and emails.
5. Evaluate the effectiveness and clarity of written communication in professional scenarios.Create professional documents such as business letters, emails, and reports, demonstrating proficiency in writing.

Module-1: Fundamentals of Professional Writing

Overview of professional writing, differences between professional and academic writing, audience analysis and purpose identification, formal and informal language use, understanding tone and style, common grammatical and punctuation errors.

Module-2: Business Correspondence and Communication

Writing professional emails and letters, types of business correspondence, email etiquette and structure, persuasive and informative writing, writing business proposals and memos, communicating effectively with clients and colleagues.

Module-3: Reports and Technical Writing
Types of reports and their structures, writing research and technical reports, presenting data and information visually and textually, using headings, tables, and figures, writing executive summaries and abstracts, revising and editing technical content.
Module-4: Writing for Digital and Social Media
Crafting content for websites and blogs, writing for social media platforms, creating engaging content for diverse audiences, understanding SEO principles, digital communication ethics, writing and editing online articles and newsletters.
Module-5: Creative and Critical Writing
Exploring creative writing techniques in professional contexts, incorporating storytelling in business writing, writing persuasive arguments and critiques, developing clear and compelling narratives, reflective writing and professional portfolios, peer review and feedback.

Continuous Internal Exam (CIE):

- There will be 5 internal assessments.
- The aggregate score of the assessments will be scaled to 50 marks and considered for CIE.
- The minimum passing score on CIE must be 40%.

Suggested Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

Text Books

1. Gerson, Sharon, and Gerson, Steven. Technical Communication: Process and Product. Pearson Education, 8th edition.
2. Murphy, Herta A., and Hildebrandt, Herbert W. Effective Business Communications. McGraw-Hill, 7th edition.

Reference Books

1. Garner, Bryan A. Garner's Modern English Usage. Oxford University Press, 4th edition.
2. Lannon, John M., and Gurak, Laura J. Technical Communication. Pearson Education, 14th edition.
3. Bovee, Courtland L., and Thill, John V. Business Communication Today. Pearson Education, 14th edition.

Web links and Video Lectures (e-Resources):

- www.kalvium.community/livebooks
- https://www.coursera.org/specializations/academic-english

Activity-Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Quizzes
- Assignments
- Discussions