Vivekanand Education Society's

Institute of Technology

(An Autonomous Institute Affiliated to University of Mumbai, Approved by AICTE & Recognized by Govt. of Maharashtra)

Syllabus Approved By:

Academic Council of V.E.S. Institute of Technology

First year Bachelor of Technology

Preamble

Engineering education forms the cornerstone of technological innovation, industrial advancement, and societal transformation. As the world navigates an era of rapid change driven by automation, artificial intelligence, sustainable technologies, and global connectivity, VESIT positions itself as a catalyst for cultivating a dynamic learning ecosystem.

At VESIT, we strive to foster critical thinking, technical expertise, academic excellence, and holistic development among aspiring engineers. We are committed to shaping professionals who are adaptable, collaborative and are also deeply conscious of their social and environmental responsibilities.

Leveraging its autonomous status and affiliation with the University of Mumbai, VESIT designs a forward- thinking, outcome-based curriculum that emphasizes industry relevance and experiential learning.

The syllabus at VESIT has been structured in alignment with the principles of the National Education Policy (NEP) 2020, focusing on flexibility and multidisciplinary learning. The key thrust areas of education at VESIT include:-

Student-Centric Approach:

The programme is designed to offer students greater autonomy in shaping their academic journey. The syllabus comprises Core **(Major) and Minor courses** from Diverse Disciplines as well as a wide range of **Open Electives**. Students can tailor their learning paths based on their interests and career aspirations. The curriculum also integrates mentored field projects and on the job training, providing valuable hands- on experience. Additionally, students with a research inclination can also explore **research-based projects** or pursue **Honours by Research.**

First year Bachelor of Technology

Multidisciplinary Approach:

VESIT's curriculum reflects a strong interdisciplinary focus, incorporating emerging fields and cutting-edge technologies. Courses are designed to bridge various domains with offerings such as **Machine learning, Artificial Intelligence & Data Science, Cyber Security, Geographic Information Systems (GIS), Internet of Things (IoT), Register transfer level VLSI, Robotics, Quantum Technologies, Mobile application development, Industrial Automation, Edge Computing and Embedded Intelligence and Information Security.**

This approach encourages broader thinking and prepares students for diverse career paths.

Emphasis on Conceptual Clarity:

The curriculum lays stress also on a strong theoretical foundation, ensuring that students gain deep conceptual understanding, which is essential for mastering advanced topics and solving real-world problems.

Fostering Creativity and Critical Thinking:

Courses are designed to nurture a critical and creative mindset, promoting analytical reasoning, problem- solving, and innovation. Students are encouraged to question, explore, and think beyond conventional solutions.

Comprehensive Evaluation and Assessment:

Student performance is assessed through a number of assessment tools that includes the Mid-term Tests, Continuous Assessments, End-Semester Examinations. These evaluation tools are designed to measure the knowledge retention of students as well as their ability to apply concepts effectively in practical situations.

Guided by a vision of excellence and inclusivity, and supported by a passionate faculty, VESIT aspires to be a hub where ideas flourish, startups emerge, and industry-academia partnerships thrive. Our goal is to transform students into innovators, entrepreneurs, researchers and responsible leaders poised to drive sustainable growth and meaningful change in society.

Dr. J M Nair	Dr. M Vijayalakshmi	Dr. Mrs. Gresha S Bhatia
Principal, VESIT	Vice Principal, VESIT	Academic Coordinator, VESIT

VIVEKANAND EDUCATION SOCIETY'S
Institute of Technology
(An Autonomous Institute Affiliated to University of Mumbai, Approved by A.I.C.T.E & Recognized by Govt. of Maharashtra)

First year Bachelor of Technology

Summary

2026-27								
R26 (A.Y. 2026-27)	**Credit**	**Examination Marks**	**Credit**	**Examination Marks**	**Credit**	**Examination Marks**	**Credit**	**Examination Marks**
	Group A	**Group A**	**Group B**	**Group B**	**Group B**	**Group B**	**Group B**	**Group B**
	CMPN, INFT	**CMPN ,INFT**	**AI &DS**	**AI &DS**	**EXTC**	**EXTC**	**ECS & AURO**	**ECS & AURO**
Sem 1	**22**	**545**	**18**	**440**	**18**	**440**	**21**	**540**
Sem 2	**20**	**540**	**24**	**645**	**24**	**645**	**21**	**545**
Change/ Update in R26 syllabus (A.Y. 2026-27 Batch)	• **For A.Y 2026-27 , Mathematics syllabus is designed as per branch requirement and will be different for all branches.Credit for Mathematics course is increased from 3 Credit (2Th+1Tut) to 4 Credit (3Th+1Tut)** • **For A.Y 2026-27 ,"Engineering Physics"(3 Credit -2T+1P) and "Engineering Chemistry" (3 Credit-2T+1P) has been combined under the subject " Engineering Sciences" (5 Credit-4T+1P)** • **For A.Y 2026-27 ," Biology for Engineers" (2 credit-2T) subject has been removed from all the branches and some contents has been included in the subject" Engineering Sciences" for CMPN, INFT, AI & DS and AURO branches.** • **For A.Y 2026-27 ," Engineering Mechanics"(3 Credit-3T) has been removed from CMPN, INFT and AI &DS branches and will be replaced by subject " Programming in C" (3 Credit -2T+1P)(CMPN and INFT) and " Problem Solving with Python"(3 Credit -2T+1P) (AI & DS)and kept for EXTC, ECS and AURO Branches with 3Credit-3T.** • **For A.Y 2026-27 ," Fundamentals of Vedic Mathematics (FVM) which was taught to both groups in single semester , will be now taught in Sem 1 (Group B) and Sem 2 (Group A)** • **For A.Y 2026-27 ,"Engineering Drawing" (2 DH+2 AutoCAD) which was placed under the Engineering Sciences Course bucket has been changed to the Vocational/Skill**							

First year Bachelor of Technology

Enhancement Course bucket under the new name " Engineering Visualization Lab"(2 DH+2 AutoCAD).

- **Nomenclature has been changed for the following subjects :-**

Sem 1	**All Branches**	**Fundamentals of Engineering Mathematics-1 (FEM-1)**	**Mathematics-1 (M-1)**
Sem 2	**All Branches**	**Fundamentals of Engineering Mathematics-2 (FEM-2)**	**Mathematics-2 (M-2)**
Sem 1 & 2	**All Branches**	**Fundamentals of Programming(Java)**	**Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming**
Sem 1 & 2	**All Branches**	**Engineering Drawing**	**Engineering Visualization Lab**
Sem 1 & 2	**All Branches**	**Engineering Physics & Engineering Chemistry**	**Engineering Sciences**

2025-26				
R24 (A.Y. 2025-26)	**Credit**	**Credit**	**Examination Marks**	**Examination Marks**
	Group A	**Group B**	**Group A**	**Group B**
	CMPN, INFT	**EXTC,ETCS AU & RO,AI & DS**	**CMPN ,INFT**	**EXTC,ETCS, AU & RO,AI & DS**
Sem 1	**20**	**22**	**565**	**665**
Sem 2	**22**	**20**	**745**	**645**
Change/ Update in R24 syllabus (A.Y. 2025-26 Batch)	• **No change** • **Same syllabus and scheme of R24 is continued for A.Y. 2025-26 Batch**			
2024-25				
R24 (A.Y. 2024-25)	**Credit**	**Credit**	**Examination Marks**	**Examination Marks**
	Group A	**Group B**	**Group A**	**Group B**
	CMPN, INFT	**EXTC,ETCS AU & RO,AI & DS**	**CMPN ,INFT**	**EXTC,ETCS, AU & RO,AI & DS**
Sem 1	**20**	**22**	**565**	**665**
Sem 2	**22**	**20**	**745**	**645**
Change/ Update in R24 syllabus (	• **Syllabus updation for Vedic Mathematics (Sem 1), Biology for Engineers(Sem 1 & Sem 2), Mathematics(Sem1 & Sem 2), Physics (Sem 1 & Sem 2)**			

First year Bachelor of Technology

<table>
<tr>
<td>A.Y. 2024-25
Batch)</td>
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Nomenclature has been changed for the following subjects :-

<table>
<tr><td>Sem 1</td><td>Matrices and Differential Calculus (MDC)</td><td>Fundamentals of Engineering Mathematics-1 (FEM-1)</td></tr>
<tr><td>Sem 2</td><td>Integral Calculus and Complex Numbers(ICC)</td><td>Fundamentals of Engineering Mathematics-2 (FEM-2)</td></tr>
<tr><td>Sem 1 & 2</td><td>C-Programming</td><td>Fundamentals of Programming(C /Java)</td></tr>
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Programme Core course(PCC) scheme has been changed from (1Th+2 hr Pr) to (02+02*) with the same credit of 2 and Instructions should be conducted for the entire class.Due to this change, 25 marks of Teamwork of PCC from the total weightage of Group B (Sem 1) and Group A(Sem 2) will be deducted.
Python Programming Lab is shifted from first year to second year, due to this change 25 marks of Termwork of subject from the total weightage of Group B (Sem 1) and Group A(Sem 2) will be deducted.

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First Year Bachelor of Technology (F.Y. B. Tech) Syllabus

NEP Scheme

2026-27

Group B

Branch: Artificial Intelligence and Data Science

Semester: I & II

First year Bachelor of Technology

INDEX

First year Bachelor of Technology

Group B
Branch: Artificial Intelligence and Data Science(AI & DS)
Teaching & Credit Scheme for Autonomous Programme 2026-27

Semester I - Teaching Scheme									
Course Type	Course code	Course Name	Teaching Scheme (Contact hrs)			Credits Assigned			
			Th	Pr	Tut	Th	Pr	Tut	Total
Basic Science Course (BS)	26AIBS11	Mathematics-1	03	--	01	03	--	01	04*
Engineering Science Course (ES)	26AIES11	Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming	03	02	–	03	01	--	04*
Programme Core Course (PC)	26AIPC11	Programme Core Course DLCOA	02	–	–	02	–	–	02*
Indian Knowledge System (IK)	26AIIK11	Fundamentals of Vedic Mathematics	02	--	–	02	--	--	02
Value Education (VE)	26VE11	Universal Human Values-1	02	--	--	02	--	--	02
Vocational/Skill Enhancement course (VS)	26AIVS11	Basic Workshop Practice	–	04	–	–	02	–	02
Co curricular Activity (CC)	26CC11	Co curricular Course -I	--	04	--	–	02	--	02
Total Credit									18

26PC11-Programme Core Course for AI & DS - Digital logic and Computer Organization & Architecture (DLCOA)

Note: * indicates theory paper

Total credits sem I =18

Semester I -Examination Scheme								
Course Type	Course Code	Course Name	Theory			TW	Pr/Oral	Total
			MT	CA	ESE			
Basic Science Course (BS)	26AIBS11	Mathematics-1	20	20	60	–	–	100
Engineering Science Course (ES)	26AIES11	Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming	20	20	60	25	–	125
Programme Core Course (PC)	26AIPC11	Programme Core Course DLCOA	20	20	60	–	–	100
Indian Knowledge System (IK)	26AIIK11	Fundamentals of Vedic Mathematics	–	20	–	–	–	20
Value Education (VE)	26VE11	Universal Human Values-1	–	20	–	–	–	20
Vocational/Skill Enhancement course (VS)	26AIVS11	Basic Workshop Practice	–	–	–	50	–	50
Co curricular Activity (CC)	26CC11	Co curricular Course -I	–	–	–	–	25	25
Total								440

First year Bachelor of Technology

Detailed Syllabus

Semester I

First year Bachelor of Technology

Subject :Mathematics-I

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIBS11	Mathematics-I	3	-	1*	3	-	1*	4

Mathematics-I (Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIBS11	Mathematics-I	3	-	1*	3	-	1*	4

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIBS11	Mathematics-I	20	20	60	2	-	-	100

***Tutorial is conducted batch-wise**.

Course Objectives:

The course aims to develop mathematical and computational skills in linear algebra, calculus, discrete mathematics, numerical methods, differential equations, and graph theory for AI and Data Science applications. It enables students to apply these concepts in data representation, dimensionality reduction, optimization, machine learning, network analysis, and computational problem solving.

Course Outcomes:

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

CO 1 Apply matrix operations and solve systems of linear equations using linear algebra techniques.

CO 2 Analyze vector spaces and compute eigenvalues and eigenvectors for mathematical and data science applications.

CO 3 Use differential and multivariable calculus techniques for optimization and function analysis.

CO 4 Apply logic, set theory, and algebraic structures in computational problem solving.

CO 5 To understand logic, sets, functions, binary operations, semigroups, and groups and apply them to solve problems.

CO 6 Analyze relations, graphs, and recurrence models for discrete structures and algorithmic applications.

First year Bachelor of Technology

Module	Content	CO	No. Hrs.
Prerequisite:	Matrices and determinants, functions, limits, differentiation, vectors, trigonometry, coordinate geometry, and basic set theory. Familiarity with algebraic manipulation and logical reasoning		
1	**Linear Algebra Foundations**	**CO1**	**07**
	1.1 Matrix fundamentals and linear system solving techniques **1.2** Echelon form and row reduction methods **1.3** System of linear equations and consistency analysis		
2	**Vector Spaces and Eigen Analysis**	**CO2**	**10**
	2.1 Vector spaces and subspaces **2.2** Linear dependence and independence, span and basis **2.3** Linear transformations **2.4** Eigenvalues and Eigenvectors **2.5** Diagonalization		
3	**Calculus – Single Variable**	**CO 3**	**04**
	3.1 Limit, continuity, differentiability **3.2** Mean value theorems **3.3** Taylor and Maclaurin series		
4	**Calculus – Multivariable**	**CO 4**	**06**
	4.1 Partial derivatives, Total Derivative and Chain Rule **4.2** Gradients and directional derivatives **4.3** Maxima and minima of functions of two variables		
5	**Discrete Structures – Logic, Sets & Algebraic Structures**	**CO 5**	**06**
	5.1 Propositional and predicate logic **5.2** Set theory and functions **5.3** Binary operations **5.4** Semigroups and groups		
6	**Discrete Structures – Relations, Posets & Relation Algebra**	**CO 6**	**06**
	6.1 Relations and their properties **6.2** Equivalence relations **6.3** Partially ordered sets and Hasse diagrams **6.4** Basic recurrence relations		
	Total No. of Hours		**39**

First year Bachelor of Technology

Textbooks

1. David C. Lay, Steven R. Lay and Judi J. McDonald, Linear Algebra and Its Applications, 6th Edition, Pearson, 2021.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas' Calculus, 15th Edition, Pearson, 2023.
3. Bernard Kolman, Robert C. Busby and Sharon C. Ross, Discrete Mathematical Structures, 6th Edition, Pearson, 2018.

Reference Books

1. Kenneth H. Rosen and Kamala Krithivasan, Discrete Mathematics and Its Applications, 8th Edition, McGraw Hill Education, 2021.
2. Dennis G. Zill, Advanced Engineering Mathematics, 7th Edition, Jones & Bartlett Learning, 2022.
3. Gilbert Strang, Introduction to Linear Algebra, 6th Edition, Wellesley-Cambridge Press, 2023.
4. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, 5th Edition, Pearson, 2003.

Useful Links:

- NPTEL – Engineering Mathematics: for linear algebra, calculus, differential equations, discrete mathematics, and numerical methods.
  https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_ma37

  https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma39
- Coursera – Mathematics for Machine Learning specialization: for linear algebra, calculus, probability for AI/DS foundations).
  https://www.coursera.org/learn/machine-learning-linear-algebra?utm_source=

  https://www.coursera.org/learn/machine-learning-calculus?utm_source=

  https://www.coursera.org/learn/machine-learning-probability-and-statistics?utm_source=
- GeeksforGeeks: for discrete mathematics, graphs, recurrence relations, and algorithmic applications.
  https://www.geeksforgeeks.org/dsa/graph-theory-tutorial/?utm_source=

  https://www.geeksforgeeks.org/dsa/recurrence-relations-a-complete-guide/?utm_source=chatgpt.com

  https://www.geeksforgeeks.org/maths/discrete-mathematics-for-gate-cse-exam/?utm_source=chatgpt.com
- Paul's Online Math Notes: for calculus, differential equations, and algebra.
  https://tutorial.math.lamar.edu/index.aspx?utm_source

Internal Assessment: One Mid Term Test of 20 marks and Continuous Assessment of 20 marks.

Mid Term Test:

- The Mid Term Test is to be conducted when approximately 50% syllabus is completed.
- The duration of the Mid Term Test will be one hour.

Continuous Assessment: The assessment rubrics will be finalized with the approval of the subject teacher. Three rubrics will be selected from the list below, and the best two scores will be considered for the final assessment.

First year Bachelor of Technology

Sr.No	Rubrics	Marks
1	Multiple Choice Questions/ Quiz	5 Marks
2	Problem-solving assignments	10 Marks
3	Case Study / Presentation	10 Marks
4	Statistical Data Analysis	10 Marks
5	Tutorials/ Class tests	10 Marks
6	MOOC / NPTEL Certification	10 Marks
7	Peer Review and Participation	5/10 Marks
8	GATE Based Assignments / Tutorials	10 Marks
9	Group problem-solving activities	10 Marks

End Semester Theory Examination:

- The question paper will be of 60 marks.
- There will be a total of five questions.
- All questions have equal weightage and carry 20 marks each.
- Any three questions out of five need to be solved.
- The duration of the **ESE** will be **two hours**.

First year Bachelor of Technology

Subject : Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIES11	Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming	3	2	-	3	1	-	4

Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming (Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIES11	Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming	3	-	-	3	-	-	3

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIES11	Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming	20	20	60	2	-	-	100

Course Objectives:

1. Understand OOP concepts, program structure, I/O & control statements
2. Learn classes, constructors, arrays, strings & wrapper classes
3. Understand packages, access modifiers, inheritance, interfaces & collections
4. Learn exception types, handling mechanism & custom exceptions
5. Understand thread concepts & lifecycle
6. Learn GUI concepts, components & event-driven programming

Course Outcomes:

After successful completion of the course students will be able to:

CO 1 Understand the basic structure of Java programs and apply variables, operators, input/output operations, and control statements to solve simple programming problems.

CO 2 Develop programs using classes, constructors, arrays, strings, and wrapper classes to implement object-oriented programming concepts.

CO 3 Organize programs using packages and access modifiers and apply inheritance, interfaces, and collection classes such as ArrayList to build modular applications.

CO 4 Identify different types of exceptions and implement exception handling techniques, including try–catch blocks,

exception propagation, and user-defined exceptions.
CO 5 Demonstrate the use of multithreading by creating and managing threads and explaining the thread lifecycle in Java applications.
CO 6 Design and implement basic graphical user interface (GUI) applications using AWT and Swing components with event-driven programming.

Module	Contents	CO's	Hrs
Prereq uisite	Basic knowledge of programming fundamentals and Problem solving		
1	**Introduction to Java and Programming Fundamentals** 1.1. **Introduction to Object Oriented Programming (OOP):** Procedure Oriented Programming (POP) vs OOP, OOP Concepts 1.2. **Java Platform Overview:** Features, Java Program Structure, Development Environment, Compilation & Execution Process, JDK, JRE and JVM 1.3. **Console I/O:**Output using print() & println(), Input using Scanner class, Reading integer, floating & string values 1.4. **Basic Programming Constructs:** Variables, Data Types, Type Conversion & Type Casting, Operators (Arithmetic, Relational, Logical, Assignment, Bitwise), Special operators 1.5. **Expressions & Control Statements:** Conditional(if, if-else, switch, etc.), Looping (for, for each, while, do-while), break & continue	**CO 1**	**8**
2	**Classes, Objects & Core Structures** 2.1. **Classes & Objects:** Class, object, Data Members & Member Methods, Constructors (with types) and Method Overloading 2.2. **Static Members:** variables, methods & blocks 2.3. **Arrays:**1D arrays, Multidimensional arrays & operations 2.4. **String Handling:** String class, StringBuffer, StringBuilder & Common string methods 2.5. **Wrapper & Autoboxing:** Primitive data types vs Wrapper classes, Autoboxing & Unboxing	**CO 2**	**7**
3	**Packages, Access & Inheritance** 3.1. **Packages:** Built-in packages, Creating User-defined packages & Importing packages 3.2. **Access Modifiers:** public, private, protected & default access and their scope 3.3. **Inheritance:** Concept and need of inheritance, Types, Method overriding, dynamic method dispatch & super keyword 3.4. **Abstract:** Abstract Class & Abstract methods 3.5. **Interfaces:** Concept, Implementation, Multiple inheritance using interfaces & keywords (extends, implements & final)	**CO3**	**7**

First year Bachelor of Technology

	3.6. **Collections:** Limitations of arrays, Collections Framework, ArrayList class & ArrayList basic methods (add(), remove(), get(), size())		
4	**Exception Handling** 4.1. **Introduction:** Types of errors, Checked & Unchecked exceptions 4.2. **Exception Handling Mechanism:** try, catch(with multiple catch) & finally blocks 4.3. Working: Exception P**ropagation**(throw,throws keywords) 4.4. **User Defined:** Defining & Creating Custom Exception	**CO 4**	**6**
5	**Multithreading** 5.1. **Multithreading:** Process vs Thread & Benefits of Multithreading 5.2. **Thread Lifecycle:** Thread states & Lifecycle 5.3. **Thread Creation:** Creating threads by extending the Thread class & Implementing Runnable interface 5.4. **Thread Methods:** start(), sleep(), join() & yield()	**CO 5**	**6**
6	**Graphical User Interface (GUI) Programming in Java** 6.1. **GUI Basics:** Introduction to GUI & Event-driven programming concept 6.2. **Swing:** Swing components & Layout managers 6.3. **JavaFX Introduction:** Basic components (Button, Canvas) & Simple animation and charts	**CO 6**	**5**
Total			**39**

Textbooks:

1 Herbert Schildt, Java: The Complete Reference, 12th ed., New Delhi: McGraw-Hill Education (India) Pvt. Ltd., 2022.

2 Balagurusamy, E. Programming with Java, 7th ed., New Delhi: McGraw-Hill Education India, 2023.

Reference Books:

1 Horton, I. Beginning Java, Indian ed., New Delhi: Wiley India, 2011.

2 Deitel, P. J., & Deitel, H. M. Java: How to Program: An Objects-Natural Approach, 12th ed., Pearson, 2026.

3 DT Editorial Services. Java 8 Programming Black Book. New Delhi: Dreamtech Press, 2015.

4 Staredu Solutions. Learn to Master Java Programming, New Delhi: Staredu Solutions, 2023.

Access to software and virtual labs:

1 https://nptel.ac.in/courses/106105191
2 https://www.w3schools.com/java/default.asp
3 https://www.tutorialspoint.com/java/index.htm
4 https://www.codecademy.com/learn/learn-java

First year Bachelor of Technology

Internal Assessment:

1 Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.

2 Mid Term test is to be conducted when approx 50% syllabus is completed.

3 The duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 Marks
2	Wins in the event/competition/hackathon	10 marks
3	Content beyond syllabus presentation	10 marks
4	Creating Proof of concept	10 marks
5	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6	GATE Based Assignment test/Tutorials etc	10 marks
7	Participation in event/workshop/talk/competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
8.	Multiple Choice Questions (Quiz)	05 marks
9.	Peer Review and participation	05 Marks

End Semester Theory Examination:

1 Question paper will be of 60 marks

2 Question paper will have a total of five questions

3 All questions have equal weightage and carry 20 marks each

4 Any three questions out of five need to be solved.

First year Bachelor of Technology

Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming (Laboratory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIES11	Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming	-	2	-	-	1	-	1

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIES11	Fundamentals of Programming: Object Oriented Programming Methodology - Java Programming	-	-	-	-	25	-	25

Lab Objectives:

1 Understand OOP concepts, program structure, I/O & control statements
2 Learn classes, constructors, arrays, strings & wrapper classes
3 Understand packages, access modifiers, inheritance, interfaces & collections
4 Learn exception types, handling mechanism & custom exceptions
5 Understand thread concepts & lifecycle
6 Learn GUI concepts, components & event-driven programming

Lab Outcomes:

After successful completion of the Lab students will be able to:

LO1 Understand the basic structure of Java programs and apply variables, operators, input/output operations, and control statements to solve simple programming problems.

LO2 Develop programs using classes, constructors, arrays, strings, and wrapper classes to implement object-oriented programming concepts.

LO3 Organize programs using packages and access modifiers and apply inheritance, interfaces, and

First year Bachelor of Technology

collection classes such as ArrayList to build modular applications.

LO4 Identify different types of exceptions and implement exception handling techniques, including try–catch blocks, exception propagation, and user-defined exceptions.

LO5 Demonstrate the use of multithreading by creating and managing threads and explaining the thread lifecycle in Java applications.

LO6 Design and implement basic graphical user interface (GUI) applications using AWT and Swing components with event-driven programming.

Suggested Experiments: Students are required to complete at least 10 experiments.		
Sr. No.	**Experiment Topic**	**LO**
1	**Basic Programming Constructs** (Arithmetic operations, number problems such as prime, factorial, Fibonacci, palindrome, and simple logic-based programs.)	**LO1**
2	**Control Statements and Operators** (Switch statements, bitwise operators, loops, string counting operations, patterns.)	**LO1**
3	**Classes and Constructors** (Class design, object creation, constructors, encapsulation, and basic object-oriented programming concepts.)	**LO2**
4	**Static Members, Arrays and Wrapper Classes** (Static variables and methods, array operations, matrix operations, sorting algorithms, searching techniques, and wrapper classes.)	**LO1, LO2**
5	**String Handling** (String manipulation, string methods, palindrome checking, word operations, character frequency, and mutable strings using StringBuffer and StringBuilder.)	**LO1, LO2**
6	**Packages and Access Modifiers** (User-defined packages, importing packages, access control using public/private/protected/default modifiers, and modular program organization.)	**LO3**
7	**Inheritance** (Types of inheritance such as single, multilevel, and hierarchical inheritance, along with method overriding and dynamic method dispatch.)	**LO2, LO3**
8	**Abstract Classes and Interfaces** (Abstraction using abstract classes, interface implementation, multiple inheritance using interfaces, and use of the final keyword.)	**LO2, LO3**

First year Bachelor of Technology

9	**Collections (ArrayList)** (Dynamic data structures using ArrayList, collection methods, sorting, searching, and storing objects in collections.)	**LO2, LO3**
10	**Exception Handling** (Handling runtime errors using try–catch–finally, multiple catch blocks, throw/throws keywords, custom exceptions, and exception propagation.)	**LO4**
11	**Multithreading** Thread creation and management, thread methods	**LO5**
12	**Graphical User Interface (GUI) Programming** Development of GUI applications using Swing.)	**LO6**

Note: Suggested List of Experiments is indicative. However, flexibility lies with individual course instructors to design and introduce new, innovative, and challenging experiments (limited to a maximum 30% variation to the suggested list) from within the curriculum, so that the fundamentals and applications can be explored to give greater clarity to the students and they can be motivated to think differently.

Term Work:	
1	Term work should consist of experiments and mini projects covering all above mentioned topics.
2	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
3	Total 25 Marks based on assessment of laboratory work and mini project

First year Bachelor of Technology

Subject : Programme Core Course: Digital Logic & Computer Organization & Architecture

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIPC11	Digital Logic & Computer Organization & Architecture	2	-	-	2	-	-	2

Programme Core Course: Digital Logic & Computer Organization & Architecture (Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIPC11	Digital Logic & Computer Organization & Architecture	2	-	-	2	-	-	2

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIPC11	Digital Logic & Computer Organization & Architecture	20	20	60	2	-	-	100

Course Objectives

1 To have an understanding of the basic structure, operation of digital circuits and computer organization & architecture.

2 To discuss combinational and sequential circuits in digital systems.

3 To explore processor organization along with functions of the control unit.

4 To study memory organization.

Course Outcomes: Students will be able

CO 1 To understand the fundamentals of digital logic and number systems, and perform various arithmetic operations using binary number representations.

CO 2 To design combinational circuits using K-map.

CO 3 To analyze the operation of sequential circuits.

CO 4 To explore the basics of processor organization and architecture.

CO 5 To understand the concept of a control unit.

CO 6 To describe the memory organization.

First year Bachelor of Technology

Module		Content	CO's	Hrs
Prereq uisite:		Knowledge on number systems.		
1	**Basics of digital logic**		CO1	06
	1.1	Introduction to Binary, Decimal, Octal, and Hexadecimal number systems and conversion. Introduction to Codes: Grey, BCD.		
	1.2	Basic concepts of Boolean laws, basic gates and universal gates.		
	1.3	Sum of products and products of sum, minimization with Karnaugh Map (up to four variables).		
	1.4	Binary Arithmetic: Addition, subtraction, multiplication, and division, sign magnitude, 1's and 2's complement method of data representation, subtraction using 1's and 2's complement method.		
2	**Combinational Circuits**		CO2	03
	2.1	Introduction to combinational circuits, Half adder and Full adder implementation using K-map.		
	2.2	Introduction, block diagram and truth table of Multiplexer (2:1, 4:1), Demultiplexer (1:2, 1:4), Encoder (8:3) and Decoder (3:8), Implementation of 4:1 using 2:1 MUX.		
3	**Sequential Circuits**		CO3	05
	3.1	Introduction to sequential circuits, Flip-Flops.: SR, JK, D, T (Block diagram and truth table).		
	3.2	Basics of counters, 2 bit up counter and 2 bit down counter (only negative edge triggered counter) along with timing diagram. Block representation of 3-bit Shift registers using flip flops (SISO and SIPO).		
4	**Processor organization and architecture**		CO4	05
	4.1	Basics of computer organization and architecture, Von- Neumann model.		
	4.2	Basic bus structure, Types of buses: Address bus, data bus and control bus.		
	4.3	Register organization, Instruction formats, Addressing modes: immediate, register, direct, indirect, implied, Instruction cycle: fetch, decode, execute, interrupt.		
5	**Control unit**		CO5	03
	5.1	Introduction to control unit, its functions with block diagram representation.		
	5.2	Booth's multiplication algorithm with example.		
6	**Memory organization**		CO6	04
	6.1	Introduction to memory and memory characteristics and memory hierarchy.		

	6.2	Cache Memory: Concept, need of cache memory, locality of reference, cache mapping methods, design problems based on direct mapping technique.		
		Total		**26**

Textbooks

1 M. Morris Mano and Michael D. Ciletti, "Digital Design", Pearson Publications, 6th edition.
2 R. P. Jain, "Modern Digital Electronic", McGraw-Hill Publication, 4th Edition.
3 William Stalling, "Computer Organization and Architecture: Designing and Performance", Pearson Publication 10th Edition.
4 John P Hayes, "Computer Architecture and Organization", McGraw-Hill Publication, 3rd Edition.
5 Dr. M. Usha and T. S. Shrikanth, "Computer system Architecture and Organization", Wiley publication.

References

1 Andrew S. Tanenbaum, "Structured Computer Organization", Pearson Publication, 6th edition
2 B.Govindarajalu, "Computer Architecture and Organization", McGraw-Hill Publication, 2nd edition.
3 Malvino, "Digital Computer Electronics", McGraw-Hill Publication, 3rd edition.

Useful Links

Resources

1 https://www.classcentral.com/course/swayam-computer-organization-and-architecture-a-pedagogical-aspect-9824
2 https://nptel.ac.in/courses/106/103/106103068/
3 https://archive.nptel.ac.in/courses/108/105/108105132/
4 https://www.coursera.org/learn/comparch
5 Virtual Experiments on Digital Logic Circuits and computer organization using IIT Virtual Labs: https://vlab.co.in/

AI Tools

1 https://www.sifive.com/cores/intelligence
2 https://cloud.google.com/tpu?hl=en
3 https://shorturl.at/CTiPC

Industry Articles

1 https://shorturl.at/OllE9
2 https://rb.gy/m4mnki

Case Studies

1 https://shorturl.at/M2X0I
2 https://t.ly/Av51F

First year Bachelor of Technology

Internal Assessment		
Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks. The Mid Term test is to be conducted when approximately 50% syllabus is completed and its duration will be one hour.		
Continuous Assessment		
Continuous Assessment is of 20 marks. The rubrics for assessment will be considered upon approval by the subject teachers. It should be a minimum of 2 or a maximum of 4 from the following table		
Sr. No.	**Rubrics**	**Marks**
1	Multiple Choice Questions (Quiz)	5
2	Literature review of papers/journals	5
3	Participation in event/workshop/talk/competition followed by a small report and certificate of participation relevant to the subject	5
4	Wins in the event/competition/hackathon pertaining to the course	10
5	Case study, Presentation, group discussion, technical debate on recent trends in the said course	10
6	Project-based Learning and evaluation / Extra assignment / Question paper solution	10
7	NPTEL/ Coursera/ Udemy/any MOOC Certificate course for 4 weeks	10
8	Content beyond syllabus presentation	10
9	Creating Proof of Concept	10
10	Mini Project / Extra Experiments/ Virtual Lab	10
11	GATE Based on Assignment tests/Tutorials etc	10
12	Peer Review and participation	5/10
*For sr.no.7, the date of the certification exam should be within the term, and in case a student is unable to complete the certification, the grading has to be done accordingly.		
End Semester Theory Examination		
1	Question paper will be of 60 marks	
2	Question paper will have a total of five questions	
3	All questions have equal weightage and carry 20 marks each	
4	Any three questions out of five need to be solved.	

First year Bachelor of Technology

Subject : Fundamentals of Vedic Mathematics

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIIK11	Fundamentals of Vedic Mathematics	02	-	-	02	-	-	02

Fundamentals of Vedic Mathematics
(Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIIK11	Fundamentals of Vedic Mathematics	02	-	-	02	-	-	02

Examination Scheme								
Course Code	Course Name	Theory			Practical Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIIK11	Fundamentals of Vedic Mathematics	-	20	-	-	-	-	20

Course Objectives

1. Students will gain an understanding of the origins, history, and philosophy behind Vedic Mathematics, which is based on ancient Indian mathematical techniques found in the Vedas.
2. They will develop skills to perform arithmetic operations such as addition and subtraction quickly and efficiently.
3. They will learn various techniques to perform multiplication with any number of digits using Vedic Sutras and also learn to perform multiplication in algebra to solve equations.
4. They will learn various techniques to find squares and square roots of any number of digits using Vedic Sutras.
5. They will learn various techniques to find cubes, fourth powers, cube roots and fourth roots of any number of digits using Vedic Sutras.

Course Outcomes

CO 1 Students will develop the ability to perform mathematical calculations mentally and quickly using Vedic techniques.

CO 2 Students will enhance their mental math skills and perform arithmetic operations such as addition, subtraction, multiplication and division mentally.

CO 3 They will learn to apply Vedic Sutras and methods to solve a wide range of mathematical problems, including algebraic equations.

CO 4 They will be able to break down complex problems into simpler steps and apply Vedic techniques to arrive at solutions more easily.

CO 5 They will learn alternative approaches and multiple methods to solve mathematical problems, fostering creativity and adaptability in problem-solving.

First year Bachelor of Technology

Module		Content	CO's	Hrs
1		**History and evolution of Vedic Mathematics**	CO 1	1
	1.1	Historical facts about Vedic Mathematics		
	1.2	Sutras and sub sutras of Vedic Mathematics		
2		**Vedic sutras for addition and subtraction**	CO 2	4
	2.1	Addition using dot method **(Vedic sutras:Ekadhikenpurvena)**		
	2.2	Addition without carrying **(Vedic sutras: Purnapurnabhyam,sankalan vyavkalanabhyam)**		
	2.3	Subtractions using all from 9 last from 10 **(Vedic sutras:Nikhilam Navatascaramam dasatah, Vinculum method)**		
	2.4	Subtraction using digit separator method (general Method)		
3		**Vedic sutras for multiplication**	CO 3	9
	3.1	Multiplication by dot and stick method(General Method) **(Vedic sutras:Urdhva triyang [Vertically and crosswise])**		
	3.2	Multiplication when numbers are very close to base (all cases) **(Vedic sutras:Nikhilam Navatashcaramam dashatah)**		
	3.3	Multiplication based on **vedic sutra Antyayordashakepi and Antyayoshatakepi**		
	3.4	Multiplication when numbers are very far from the base (all cases) **(Vedic sutras:Anurupyena)**		
	3.5	Multiplication of three and four numbers		
	3.6	Multiplication by series of 9 and series of 1		
	3.7	Multiplication by observation		
	3.8	Multiplication of binomial equation		
	3.9	Multiplication of algebraic polynomials		
4		**Square and Square Root**	CO 4	6
	4.1	Vedic Methods of finding squares:- 1. Ekadhikena Purvena 2. Yavadunam Tavduni kritya vargena Yojayet 3. Urdhva Tiryagbhyam 4. Duplex method		
	4.2	Vilokanam and Duplex Vedic Method of finding square root		
5		**Cube ,Cube root, Fourth Power of a number and Fourth root of a number**	CO 5	6
	5.1	Vedic Methods of finding cubes:- Yavadunam,Anurupyena,Nikhilam		

First year Bachelor of Technology

	5.2	Vilokanam and Beejank for finding the cube root of any number		
	5.3	Pascal triangle, the method of finding the fourth power of a number		
	5.4	Vilokanam method for finding out the fourth root of a number .		
		Total		**26**

Text Books

1. Vedic Mathematics by Jagadguru Sankracharya Bharti Krishna Tirthaji Maharaj
2. The Essentials of Vedic Mathematics by Rajesh Kumar Thakur, Rupa Publication

Reference Books

- Advanced Vedic Mathematics by Rajesh Kumar Thakur, Rupa Publication
- Vedic Mathematics Made Easy by Dhaval Bhatia, Jaico Publishing House
- Vedic Mathematics: Sixteen Simple Mathematical Formulae from the Vedas by Bharti Krishna Tirthaji Maharaj, Motilal Banarsidass Publishers Pvt. Ltd.

Continuous Assessment:
Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1.	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2.	Mathematical Puzzle/Problem-Solving Activity – Use of observation and logical thinking	10 marks
3.	Content beyond syllabus presentation	10 marks
4.	Sutra Identification Activity – Selection of appropriate Sutra for a given problem	10 marks
5.	Sutra Based Assignment test/Tutorials etc	10 marks
6.	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	10 marks
7.	Multiple Choice Questions (Quiz)	10 marks
8.	Comparative Assignment – Vedic method versus conventional method	10 marks
9.	Sutra-Based Assignment – Application of Vedic Sutras	10 marks

First year Bachelor of Technology

Subject : Universal Human Values-I

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26VE11	Universal Human Values-1	02	---	---	02	---	---	02

Universal Human Values-I
(Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26VE11	Universal Human Values-1	02	---	---	02	---	---	02
Examination Scheme								
Course Code	Course Name	Theory			Practical Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26VE11	Universal Human Values-1	---	20	---	---	---	---	20

Course Objectives

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes

1. Understand self-exploration, natural acceptance, happiness, prosperity and human aspirations.
2. Understand the harmony between the Self ('I') and Body, including Sanyam, health and prosperity.
3. Understand the Constitution of India, Fundamental Rights, Directive Principles and constitutional remedies.

First year Bachelor of Technology

Module		Content	CO's	Hrs
1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**		CO 1	06
	1.1	Purpose and motivation for the course, recapitulation from Universal Human Values-I		
	1.2	Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' Continuous Happiness and Prosperity-Right understanding		
	1.3	Continuous Happiness and Prosperity-Right understanding		
	1.4	Relationship and Physical Facility		
	1.5	Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario		
	1.6	Method to fulfill the above human aspirations: understanding and living in harmony at various levels.		
2	**Understanding Harmony in the Human Being - Harmony in Myself!**		CO 2	04
	2.1	Understanding human being as a co-existence of the sentient 'I' and the material 'Body'		
	2.2	Understanding the needs of Self ('I') and 'Body' - happiness and physical facility		
	2.3	Understanding the Body as an instrument of 'I' ,Understanding the characteristics and activities of 'I' and harmony in 'I'		
	2.4	Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail		
3	**Introduction : The Constitution of India and Fundamental Rights (NPTEL Video Lecture)**		CO 3	06
	3.1	Introduction to Constitution and Constitutional Law Constitution, Constitutionalism and Constitutional Law Difference between Constitutional law and other laws Types of Constitution Salient Features of the Constitution of India Preamble to the Constitution of India: Its Role, Vision, Interpretation and Amendment		
	3.2	Fundamental Rights and Directive Principles of State Policy 1. Concept of Fundamental Rights vis a vis Directive Principles of State Policy 2. Definition of State and Instrumentalities of State 3. Enumerated Fundamental Rights 4. Enforceability of Fundamental Rights vis -a -vis Directive Principles of State Policy 5. Primacy of Fundamental Rights and Directive Principles of State Policy 6. Constitutional Remedies to derogation of Fundamental Rights		
		Total		**26**

First year Bachelor of Technology

Mode of Conduction

1. Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
2. practice sessions for analyzing and discussing the topic, help the students explore the important or critical elements.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1.	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2.	Case study analysis and presentation	10 marks
3.	Constitutional awareness programme	10 marks
4.	Group discussion/debate on social and ethical issues	10 marks
5.	Poster Presentation on UHV content theme	10 marks
6.	Book Review on UHV content theme	10 marks
7.	Community/social outreach activity with report	10 marks
8.	Case Study Analysis & Presentation	10 marks
9.	Survey/interview on values, happiness, prosperity or social harmony	10 marks

First year Bachelor of Technology

Subject : Basic Workshop Practice

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIVS11	Basic Workshop Practice	-	04	-	-	02	-	02

Basic Workshop Practice

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIVS11	Basic Workshop Practice	-	04	-	-	02	-	02
Examination Scheme								
Course Code	Course Name	Theory			Practical Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIVS11	Basic Workshop Practice	-	-	-	-	50	-	50

Lab Objectives:

1. To impart training to help the students develop engineering skill sets.
2. To inculcate respect for physical work and hard labor.
3. To get exposure to interdisciplinary engineering domain.

Lab Outcomes:

Students will be able to…

LO 1 Develop the necessary skill required to handle/use different fitting tools.

LO 2 Develop the necessary skill required to handle/use different carpentry tools.

LO 3 Develop skills required for hardware maintenance, able to install an operating system and system drives and able to identify the network components and perform basic networking and crimping.

LO 4 Identify and understand the safe practices to adopt in the electrical environment, demonstrate the wiring practices for the connection of simple electrical load/equipment and design, fabricate and assemble PCB.

First year Bachelor of Technology

Sr No.	Topic	LO's	Hrs.
Trade-1	**Fitting :** Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling, tapping. Term work to include one job involving following operations : filing to size, one simple male-female joint, drilling and tapping.	**LO1**	**14**
Trade-2	**Carpentry :** Use and setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints. Term work to include one carpentry job involving a joint.	**LO2**	**14**
Trade-3	**Basic Electrical workshop:** **House Wiring** Electrical safety in the workplace. Protective equipment and tools. Different types of cables, electrical wiring diagrams, types of circuits, types of switches. Different wiring methods: Godown wiring, Staircase wiring, House wiring, Extension board. **PCB** Design, Layout drawing, Positive and negative film making, PCB etching and drilling, Tinning and soldering technique, component mounting and circuit testing.	**LO3**	**12**
Trade-4	**Hardware and Networking :** Dismantling of a Personal Computer (PC), Identification of Components of a PC such as power supply, motherboard (Chipset), processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, Pen drives disk drives etc. Assembling a Personal Computer. Installation of Operating System (any one), Boot-up sequence and Device drivers. Installation of application software's, Basic Troubleshooting and Maintenance. Identification of network components LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables and rollover cables), Basic networking (LAN, WAN, configure IP address etc) and crimping.	**LO4**	**12**
	Total Engagement Hours		**52**

First year Bachelor of Technology

Text Books:

1 Engineering Workshop Practice, Dr. A.K. Sarathe, Khanna Book Publishing, 2021

Reference Books:

1 Elements Of Workshop Technology (Vol. 1: Manufacturing Processes), S. K. Hajra Choudhury, A. K. Hajra Choudhury, and Nirjhar Roy, 17th Edition, Media Promoters & Publishers, 2026

2 Electrical Wiring, Estimating and Costing, Dr. S. L. Uppal and G. C. Garg, Khanna Publishers, 2025

3 The Complete PC Upgrade and Maintenance Guide, Mark Minasi, 16th Edition, Wiley / SybexPublication Year, 2008

Assessment Tool	Rubrics with Marks	Total Marks
Term Work	**Mechanical Workshop:** Fitting Job Submission & Job Sheet Submission - 13 Marks Carpentry Job Submission & Job Sheet Submission - 13 Marks **Basic Electrical workshop:** PCB & House Wiring : 12 Marks **Hardware and Networking :** Oral along with journal submission - 12 Marks	**50 Marks**

First year Bachelor of Technology

Subject : Co-Curricular Course-I

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26CC11	Co-Curricular Course-I	---	04	---	---	02	---	02

Co-Curricular Course-I
(Practical Activity)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26CC11	Co-Curricular Course-I	---	04	---	---	02	---	02
Examination Scheme								
Course Code	Course Name	Theory			Practical Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26CC11	Co-Curricular Course-I	---	---	---	---	---	25	25

Social Responsibility, Community Engagement and Student Well-Being

As part of the **First Year curriculum**, students are allotted **25 marks in each semester** for participation in structured social responsibility and community engagement activities. The initiative is designed to extend learning beyond the classroom and encourage students to become responsible, empathetic and socially conscious citizens.

Students participate in a diverse range of activities, including **cleanliness drives on college premises, awareness rallies, tree plantation drives, beach-cleaning campaigns, environmental awareness initiatives, cultural programmes, community outreach activities and other socially relevant projects**. These activities provide students with opportunities to work collaboratively, engage with the community and contribute meaningfully to society.

The programme also incorporates **student well-being and personal development activities**, including courses and workshops on **Yoga, stress management, emotional well-being, mindfulness, self-awareness and healthy lifestyle practices**. Such activities enable students to develop effective coping strategies, emotional balance, self-discipline and a positive approach towards academic and personal challenges.

First year Bachelor of Technology

Through this integrated approach, the initiative promotes **social responsibility, civic engagement, environmental consciousness, teamwork, empathy, self-awareness and holistic well-being**. It supports the institution's commitment to developing well-rounded graduates who are not only technically competent but also socially responsible, emotionally resilient and actively engaged with their community.

Assessment Rubrics:

Sessions from eminent persons on important themes like cyber bullying, cancer awareness,organ donation etc. (5 Marks)

Yoga Course (15 Marks)

https://www.kdhamstudy.com/courses/cyp-course

Mental well being course(5 Marks)

https://www.skillindiadigital.gov.in/courses/detail/482c484d-b0fb-494a-bcfc-838b87abc948?utm

First year Bachelor of Technology

Group B
Branch: Artificial Intelligence and Data Science(AI & DS)
Teaching & Credit Scheme for Autonomous Programme 2026-27

Semester II - Teaching Scheme

Course Type	Course code	Course Name	Teaching Scheme (Contact hrs)			Credits Assigned			
			Th	Pr	Tut	Th	Pr	Tut	Total
Basic Science Course (BS)	26AIBS21	Mathematics-II	03	--	01	03	--	01	04*
Basic Science Course (BS)	26AIBS22	Engineering Science	04	02		04	01		05*
Engineering Science Course (ES)	26AIES21	Basic Electrical Engineering	03	02	–	03	01	--	04*
Engineering Science Course (ES)	26AIES22	Problem solving with Python	02	02	–	02	01	--	03*
Ability Enhancement Course (AE)	26AE21	Professional Communications and Ethics-I	01	02	--	01	01	--	02
Vocational and skill enhancement course (VSEC)	26AIVS21	Engineering visualization lab	–	02+ *02	–	–	02	--	02
Value Education (VE)	26VE21	Universal Human Values-2	02	--	--	02	--	--	02
Co curricular Activity (CC)	26CC21	Co curricular Course -II	--	04	--	–	02	--	02
Total Credits									24

For Engineering visualization lab 02 (DH)+ *02(AutoCAD) Batchwise
Note: * indicates theory paper
Total credits sem II =24

Semester II -Examination Scheme

Course Type	Course Code	Course Name	Theory			TW	Pr/Oral	Total
			MT	CA	ESE			
Basic Science Course (BS)	26AIBS21	Mathematics-II	20	20	60	–	–	100
Basic Science Course (BS)	26AIBS22	Engineering Science	20	20	60	25	–	125
Engineering Science Course (ES)	26AIES21	Basic Electrical Engineering	20	20	60	25	–	125
Engineering Science Course (ES)	26AIES22	Problem solving with Python	20	–	30	25	25	100
Ability Enhancement Course (AE)	26AE21	Professional Communications and Ethics-I	20	80	–	–	–	100
Vocational and skill enhancement course (VSEC)	26AIVS21	Engineering visualization lab	–	–	–	25	25	50
Value Education (VE)	26VE21	Universal Human Values-2	–	20	–	–	–	20
Co curricular Activity (CC)	26CC21	Co curricular Course -II	–	–	–	–	25	25

First year Bachelor of Technology

Total	**645**

Detailed Syllabus

Semester II

First year Bachelor of Technology

Subject : Mathematics-II

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIBS21	Mathematics-II	3	-	1*	3	-	1*	4

Mathematics-II
(Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIBS21	Mathematics-II	3	-	1*	3	-	1*	4

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIBS21	Mathematics-II	20	20	60	2	-	-	100

***Tutorial is conducted batch-wise.**

Course Objectives:

The course aims to develop students' understanding of differential equations, numerical methods, number theory, modular arithmetic, graph theory, and recurrence relations, with emphasis on computational problem solving, convergence analysis, mathematical modelling, and applications to engineering, networks, and real-world problems.

Course Outcomes:

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

CO 1 Solve first-order differential equations using standard analytical methods and apply them to practical problems.

CO 2 Apply numerical techniques for solving algebraic equations, integration, and differential equations with error estimation.

CO 3 Solve systems of linear equations using iterative numerical methods and examine convergence concepts.

CO 4 Apply concepts of divisibility, congruences, and fundamental theorems in modular arithmetic problems.

CO 5 Analyze graphs and apply graph-theoretic concepts in connectivity, traversal, and planar structures.

CO 6 Formulate and solve recurrence relations and apply discrete mathematical models to counting problems.

First year Bachelor of Technology

Module	Content	CO	No. Hrs.
Prerequisite:	Algebra, matrices, and elementary calculus including differentiation and integration. Familiarity with sets, functions, and logical reasoning from discrete mathematics, Basic problem-solving and computational skills.		
1	**Differential Equations of First Order and First Degree**	**CO1**	**07**
	1.1 Exact Differential Equation **1.2** Equation reducible to Exact Differential Equation by integrating Factor **1.3** Linear Differential Equation **1.4** Equation reducible to Linear, Bernoulli D. E.		
2	**Numerical Methods**	**CO2**	**06**
	2.1 Euler's method, Runge-Kutta methods of 2nd and 4th order to solve first order differential equations **2.2** Trapezoidal and Simpson's rule for numerical integration **2.3** Error analysis and estimation in numerical computations		
3	**Numerical Linear Systems**	**CO3**	**07**
	3.1 Numerical methods to solve transcendental equations, Regula-Falsi, Newton–Raphson methods **3.2** Jacobi iterative method for solving linear systems **3.3** Gauss–Seidel iterative method **3.3** Convergence criteria of iterative methods		
4	**Number Theory & Modular Arithmetic**	**CO4**	**06**
	4.1 Greatest Common Divisor (GCD) and its properties **4.2** Euclidean algorithm for finding GCD **4.3** Congruences and modular arithmetic operations **4.4** Euler's theorem and Fermat's theorem		
5	**Graph Theory**	**CO5**	**08**
	5.1 Types and representation of graphs **5.2** Subgraphs, paths, and circuits **5.3** Connectivity and graph isomorphism **5.4** Euler and Hamiltonian graphs **5.5** Planar graphs and their properties		
6	**Recurrence & Discrete Modelling**	**CO6**	**05**
	6.1 Recurrence relations and their solutions **6.2** Iterative models in discrete systems **6.3** Basic counting principles and techniques		
	Total No. of Hours		**39**

First year Bachelor of Technology

Textbooks

1. Bernard Kolman, Robert C. Busby and Sharon C. Ross, Discrete Mathematical Structures, 6th Ed., Pearson, 2021.
2. S. S. Sastry, Introductory Methods of Numerical Analysis, 5th Ed., PHI Learning, 2012.
3. R. K. Jain & S. R. K. Iyengar – Advanced Engineering Mathematics, 5th Edition, Narosa Publishing House.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 11th Ed., John Wiley & Sons, 2018.
2. Richard L. Burden, J. Douglas Faires and Annette M. Burden, Numerical Analysis, 10th Ed., Cengage Learning, 2015.
3. Kenneth H. Rosen and Kamala Krithivasan, Discrete Mathematics and Its Applications, 8th Ed., McGraw Hill Education, 2021.

Useful Links:

- NPTEL - Engineering Mathematics. Useful for Differential Equations, Numerical Methods, Linear Systems, and Discrete Mathematics concepts.
  https://onlinecourses.nptel.ac.in/e-learning/preview/noc20_ma37
  https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ma39
- Coursera - Covers linear algebra, calculus, probability, and computational mathematics useful for engineering applications.
  Coursera – Mathematics for Machine Learning Specialization
- Wolfram Demonstration Project - Provides interactive visualizations for differential equations, graph theory, numerical methods, and discrete models.
  Wolfram Demonstrations Project
- GeeksforGeeks-Helpful for graph theory, recurrence relations, modular arithmetic, and algorithmic problem solving.
  GeeksforGeeks – Discrete Mathematics and Algorithms
- Paul's Online Math Notes- Excellent notes and examples for calculus, differential equations, algebra, and numerical techniques.
  Paul's Online Math Notes
- MIT Open Course Ware - Free lecture notes and resources for advanced mathematics and engineering applications.
  MIT OpenCourseWare – Mathematics
- Khan Academy-Beginner-friendly explanations and practice exercises for core mathematical topics.
  Khan Academy – Differential Equations and Linear Algebra

First year Bachelor of Technology

Internal Assessment: One Mid Term Test of 20 marks and Continuous Assessment of 20 marks.

Mid Term Test:

- The Mid Term Test is to be conducted when approximately 50% syllabus is completed.
- The duration of the Mid Term Test will be one hour.

Continuous Assessment:

The assessment rubrics will be finalized with the approval of the subject teacher. Three rubrics will be selected from the list below, and the best two scores will be considered for the final assessment.

Sr.No	Rubrics	Marks
1	Multiple Choice Questions/ Quiz	5 Marks
2	Problem-solving assignments	10 Marks
3	Case Study / Presentation	10 Marks
4	Statistical Data Analysis	10 Marks
5	Tutorials/ Class tests	10 Marks
6	MOOC / NPTEL Certification	10 Marks
7	Peer Review and Participation	5/10 Marks
8	GATE Based Assignments / Tutorials	10 Marks
9	Group problem-solving activities	10 Marks

End Semester Theory Examination:

- The question paper will be of 60 marks.
- There will be a total of five questions.
- All questions have equal weightage and carry 20 marks each.
- Any three questions out of five need to be solved.
- The duration of the **ESE** will be **two hours**.

First year Bachelor of Technology

Subject :Engineering Science

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIBS22	Engineering Science	4	2	–	4	1	–	5

Engineering Sciences (Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIBS22	Engineering Science	4	–	–	4	–	–	4

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIBS22	Engineering Science	20	20	60	2	–	–	100

Course Objectives:

To enhance fundamental knowledge in Engineering Sciences for its applications relevant to various streams of Engineering and Technology for solving problems in the engineering field and venturing into the research field.

Course Outcomes:

CO 1 Learners will be able to understand the foundation of quantum mechanics and how to solve problems in different areas of modern technology

CO 2 Learners will be able to understand the basics and different applications of semiconductors along with its sensing properties.

CO 3 Learners will be able to understand the foundation of fiber optics and their applications in the areas of communication, medical science and instrumentation.

CO 4 Learners will be able to apply water chemistry and treatment methods & green computing. Determining fuel quality learners will be able to evaluate its energy content and environmental impact to ensure sustainability and efficient performance.

CO 5 Learners will be able to explain the concept of electrode potential and Nernst theory, relate it to electrochemical cells and identify different types of corrosion and suggest control measures in industry.

CO 6 Learners will be able to understand fundamentals of the human nervous system and its comparison with artificial neural networks. They will also understand new concepts of bioinformatics. Learners will be able to understand

different syntheses methods, and characterize nanomaterials and nano-biometerials, relating their unique quantum-driven properties to applications in electronics, energy, engineering and medicine.

Module	Content	CO	No. Hrs.
1	**Quantum Mechanics:**Inadequacy of classical theory; de Broglie hypothesis of matter waves and its experimental verification; Wave packet, group velocity and phase velocity; Heisenberg Uncertainty principle, Thought experiments and applications of HUP, Wave function and its physical interpretation; Probabilistic approach: Superposition principle Schrodinger's time dependent and time independent wave equation; Free particle, Infinite potential well, introduction to Quantum Computing Concepts, Qubits	**CO 1**	**10**
2	**Semiconductors:**Energy band formation, FD distribution function; Fermi energy level in conductors and semiconductor; Intrinsic semiconductors: Expression for Fermi level; Effective mass; Intrinsic carrier concentration, mobility & conductivity, Extrinsic semiconductors: Fermi energy level, Expression & position; Effect of impurity concentration & temperature on the Fermi level and carrier concentration; Law of mass action, minority charge carrier concentration. Magnetic sensor, Principle of Hall effect, Application. Optical sensors: Photodiode and solar cell. IoT sensors, MEMS sensors, wearable sensors, smartphone sensors	**CO 2**	**10**
3	**Fibre Optics:**Working principle, structure & material, advantage; Fiber optic communication system (In Data Centers and Internet Backbone); Critical angle; Acceptance angle; Numerical aperture; fractional change in RI	**CO 3**	**03**
4	**Water** Introduction-Impurities in water, hardness of water-units, types and numerical problems , determination of hardness of water by EDTA method and numericals, Softening of water by an Ion Exchange process and numericals, BOD, COD-definition, significance and numericals, Water purification-membrane technology- Electrodialysis, Reverse Osmosis and Ultrafiltration,Green computing, water cooling systems in servers and HPC systems **Fuel** Definition, classification, characteristics of a good fuel, units of heat, Calorific value-Definition, Gross or Higher calorific value and Net or lower calorific value, Dulong's formula and numericals for calculations of Gross and Net Calorific Values Liquid fuels-Petrol-knocking, Octane Number, Cetane number, Anti Knocking agents, unleaded petrol, oxygenates (MTBE), catalytic converter Combustion-calculation for requirement of oxygen and air (by weight and by volume only for given solid and gaseous fuels)	**CO 4**	**12**
5	**Corrosion** Concepts of Electrochemistry, Different types of electrochemical cell, Nernst Equation and related numericals Battery technology, Lithium ion battery, fuel cell for portable electronics	**CO 5**	**06**

First year Bachelor of Technology

	Definition, Mechanism of Corrosion-(i) Dry / Chemical Corrosion- (a) Due to Oxygen (b) Due to other gases, (ii) Wet/ Electrochemical Corrosion- Mechanism (a) Evolution of hydrogen (b) Absorption of oxygen gas Types of Corrosion- Galvanic Cell Corrosion, Concentration Cell Corrosion, Pitting Corrosion, Intergranular Corrosion, Stress Corrosion. Cathodic protection-(Sacrificial anodic protection, (ii) Impressed current method, (Metallic coatings-only cathodic coating (tinning) and anodic Coating (Galvanizing) Corrosion in electronic circuits PCB degradation		
6	**Fundamentals of Human nervous system** Nerve cell, neuronal communication, Central Nervous system, Peripheral nervous system, Brain and its lobes. **Artificial Neural Network:** Comparison of human neuron with artificial neuron, Evolution of Artificial Neural Networks, Neural Networks and Representation: Weights, Bias, Activation function and Learning in ANN, Applications of ANN: Environmental monitoring, healthcare analytics & diagnostics and medical imaging **Bioinformatics :-** Definition, scope, and importance of bioinformatics Role of bioinformatics in modern biology, medicine, agriculture, and sustainability **Advance materials and Nano technology** Polymers:-Types, Properties Synthetic methods of formation of Kevlar: Urea formaldehyde, PMMA,Phenol formaldehyde Conducting polymers, Definition, Types, Applications Nano materials:-Definition, Properties Synthetic methods Top down, Bottom up Applications:-Electronics, Medicine, Energy devices	**CO 6**	**11**
		Total No. of Hours	**52**

Textbooks

1. A text book of Engineering Physics-Avadhanulu & Kshirsagar, S. Chand, 11th Ed.
2. Engineering Physics- H. K. Malik, A. Singh, McGraw Hill, 2nd Ed.
3. Engineering Chemistry - Jain & Jain (DhanpatRai)

Reference Books

1. Concepts of Modern Physics- Arthur Beiser, Tata McGraw Hill, 8th Ed.
2. Engineering Physics- D. K. Bhattacharya and Poonam Tandon, OUP, 2nd Ed.
3. Introduction to Solid State Physics- C. Kittle, John Wiley& Sons, 8th Ed.
4. Engineering Chemistry – Dara &Dara (S Chand)
5. A Text Book of Engineering Chemistry – ShashiChawla (DhanpatRai)
6. Essentials of Physical Chemistry—B S BahlArunBahl G D Tuli.

First year Bachelor of Technology

7. Biology for Engineers - Thyagarajan S., Selvamurugan N., Rajesh M. P., Nazeer R. A., Thilagaraj W., Barathi S. and Jagannathan M. K., Tata McGraw Hill, New Delhi, 2012.
8. Principles of Soft Computing - S.N. Sivanandam & S.N. Deepa, Wiley, 3rd Ed.
9. Nanotechnology Fundamentals and Applications - Manasi Karkare, Wiley 1st Ed.

Proposed Assessment and evaluation scheme

Internal Assessment:

1.**Continuous assessments** will be conducted throughout the semester using different evaluation techniques.

2.**Mid Term test** is to be conducted when approx. 50% syllabus is completed. Duration of the midterm test shall be one hour

Continuous Assessment
Continuous Assessment is of 20 marks. The rubrics for assessment will be considered on approval by the subject teachers.

Sr.No	Rubrics	Marks
1	Multiple Choice Questions (Quiz)	5 Marks
2	Tutorial Assignments	10 Marks
3	Case Study / Presentation	10 Marks
4	Statistical Data Analysis	10 Marks
5	Mini Project / AI Mathematical Modeling	10 Marks
6	MOOC / NPTEL Certification	10 Marks
7	Peer Review and Participation	5/10 Marks
8	GATE Based Assignments / Tutorials	10 Marks

End Semester Theory Examination:

1. The question paper will be of 60 marks.
2. The question paper will have a total of five questions.
3. All questions have equal weightage and carry 20 marks each.
4. Any three questions out of five need to be solved.

First year Bachelor of Technology

Subject :Engineering Sciences Laboratory

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIBS22	Engineering Science	–	2	–	–	1	–	1

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIBS22	Engineering Science	-	-	-	-	25	–	25

Course Objectives

1 To get practical knowledge of the theory learnt and develop experimental skills.
2 To comprehend the importance of precision, accuracy, errors and analyze experimental results.

Course Outcomes:

CO 1 Learners will be able to understand the foundation of quantum mechanics and how to solve problems in different areas of modern technology
CO 2 Learners will be able to understand the basics and different applications of semiconductors along with its sensing properties.
CO 3 Learners will be able to understand the foundation of fiber optics and their applications in the areas of communication, medical science and instrumentation.
CO 4 Learners will study water treatment and green computing principles, and also evaluate fuel quality, energy content, environmental impact of fuel and sustainability.
CO 5 Learners will explain electrode potential and Nernst theory, apply them to electrochemical cells, and identify and control industrial corrosion.
CO 6 Learners will understand the fundamentals of the human nervous system, artificial neural networks, bioinformatics, and the synthesis, characterization, properties, and applications of nanomaterials and polymers

Experiments: Minimum of 6 experiments to be conducted		**COs**
1	Determination of 'h' using Photo cell.	CO1
2	Determination of energy band gap of a given semiconductor	CO2
3	Determination of Hall coefficient and charge carrier density of a given semiconductor	CO2
4	Determination of Numerical Aperture of a given optical fibre.	CO3

First year Bachelor of Technology

5	Study of variation of reverse current with changing light intensity of given photo diode.	CO2
6	Determination of Chloride content of water by Mohr's Method.	CO4
7	Determination of total, temporary and permanent hardness of water sample by EDTA.	CO4
8	Determination of metal ion concentration using a colorimeter.	CO5
9	Synthesis of PF polymers.	CO6
10	Determination of the moisture content of the coal.	CO5
11	Construction and determination of EMF of an electrochemical cell.	CO6

Term Work:

1 Term work should consist of a minimum of 6 experiments.

2 The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.

First year Bachelor of Technology

Subject :Basic Electrical Engineering

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIES21	Basic Electrical Engineering	3	2	–	3	1	–	4

Basic Electrical Engineering (Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIES21	Basic Electrical Engineering	3	–	–	3	–	–	3

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIES21	Basic Electrical Engineering	20	20	60	2	–	–	100

Course Objectives:

1 To provide knowledge on fundamentals of DC circuits and single phase AC circuits and its applications.
2 To inculcate knowledge on the basic operation and performance of 1-Φ transformers.
3 To provide knowledge on fundamentals of DC and AC machines and batteries.

Course Outcomes:

CO 1 Apply various network theorems to determine the circuit response / behaviour.

CO 2 Evaluate and analyse 1-Φ circuits.

CO 3 Understand the constructional features and operation of 1-Φ transformer

CO 4 Illustrate the working principle of a DC machine.

CO 5 Illustrate the working principles and applications of AC machines and stepper motors.

CO 6 Explain the types, construction, working and applications of batteries, including lead-acid batteries

First year Bachelor of Technology

Module		Contents	CO's	Hrs.
Prerequisite		Resistance, inductance, capacitance, series and parallel connections of resistance, concepts of voltage, current, power and energy and its units. Working of wattmeter, Magnetic circuits, MMF, Magnetic field strength, reluctance, series and parallel magnetic circuits, BH Curve, Time domain analysis of first order RL and RC circuits		
1		**DC Circuits**	**CO 1**	**08**
	1.1	Ideal and Practical Sources: Independent voltage and current sources; source transformation; Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL); Star-Delta and Delta-Star transformations.		
	1.2	Network Theorems:: Superposition, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem.		
2		**AC Circuits**	**CO 2**	**08**
	2.1	Alternating Quantities: Generation of alternating voltage; sinusoidal waveform; average value; RMS value; form factor; crest factor; AC circuits containing pure resistance, inductance and capacitance.		
	2.2	Single-Phase AC Circuits: R-L, R-C and R-L-C series and parallel circuits; impedance and admittance; real (active), reactive and apparent power; power factor; series and parallel resonance; resonant frequency; Q-factor and bandwidth.		
3		**Transformers**	**CO 3**	**09**
	3.1	Single-Phase Transformer: Working principle of single-phase transformer, EMF equation of a transformer, Transformer losses Construction and working principle; electromagnetic induction; EMF equation of a transformer; transformer losses — core losses and copper losses.		
	3.2	Performance of Transformer: Ideal and practical transformer; phasor diagrams for resistive, inductive and capacitive loads considering winding resistance and magnetic leakage; equivalent circuit; voltage regulation.		
	3.3	Testing and Efficiency: Open-circuit (no-load) test; short-circuit test; determination of equivalent circuit parameters; transformer efficiency and condition for maximum efficiency.		
4		**DC Machines**	**CO 4**	**05**
	4.1	Principle of operation of DC motors and DC generators, constructional details, and classification of DC machines, emf equation of motor/ generator, applications. Principle of operation of DC generator and DC motor; constructional details and classification of DC machines; EMF equation of DC generator; back EMF and torque equation of DC motor; applications of DC motors and generators.		
5		**AC Machines**	**CO 5**	**05**
	5.1	Single phase induction motor: Construction and working principle; double revolving field theory; starting of single-phase induction motors; split-phase induction motor and other types of single-phase induction motors; applications.		
	5.2	Stepper Motor: Construction, working principle, types of stepper motors and applications.		

First year Bachelor of Technology

6		**Batteries and Electrical Safety**	**CO 6**	**04**
	6.1	Batteries: Introduction and types of batteries; primary and secondary batteries; battery rating and capacity; charging and discharging of batteries; battery efficiency; series and parallel connection of batteries.		
	6.2	Lead-Acid and Lithium-Ion Batteries: Construction, working principle and characteristics of lead-acid battery; basic construction and working principle of lithium-ion battery; comparison and applications of lead-acid and lithium-ion batteries.		
	6.3	Applications and Electrical Safety: Applications of batteries in automotive, UPS, inverter, portable and renewable-energy systems; basic electrical safety practices; electrical hazards; importance of earthing and its applications.		
			Total	**39**

Textbooks:

1 V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill, (Revised Edition)
2 Vincent Del Toro "Electrical Engineering Fundamentals", PHI Second edition, 2011
3 Edward Hughes "Hughes Electrical and Electronic Technology", Pearson Education (Tenth edition)
4 D P Kothari and I J Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI 13th edition 2011.
5 M. Naidu, S. Kamakshaiah "Introduction to Electrical Engineering" McGraw-Hill Education, 2004
6 B.R Patil "Basic Electrical Engineering" Oxford Higher Education

Reference Books:

1 B. L. Theraja "Electrical Engineering " Vol-I and II.
2 S. N. Singh, "Basic Electrical Engineering" PHI , 2011Book
3 I. J. Nagrath and D. P. Kothari, *Electrical Machines*, McGraw-Hill Education.
4 David Linden and Thomas B. Reddy, *Handbook of Batteries*, McGraw-Hill

Internal Assessment:

Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 20 marks.
Mid Term test is to be conducted when approx. 50% syllabus is completed Duration of the midterm test shall be one hour.

Continuous Assessment:-

Continuous Assessment **is of 20 marks.** The rubrics for assessment will be considered on approval by the subject teachers.

Sr.no	Rubrics	Marks
1.	*Certificate course for 4 weeks or more:- NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2.	Wins in the event/competition/hackathon	10 marks
3.	Content beyond syllabus presentation	10 marks

First year Bachelor of Technology

4.	Creating Proof of concept	10 marks
5.	Mini Project / Extra Experiments/ Virtual Lab	10 marks
6.	GATE Based Assignment test/Tutorials etc	10 marks
7.	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject(in other institutes)	5 marks
8.	Multiple Choice Questions (Quiz)	5 marks

End Semester Theory Examination:

1 Question paper will be of 60 marks
2 Question paper will have a total of five questions
3 All questions have equal weightage and carry 20 marks each
4 Any three questions out of five need to be solved.

Subject :Basic Electrical Engineering Laboratory

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIES21	Basic Electrical Engineering	-	2	–	-	1	–	1

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIES21	Basic Electrical Engineering	-	-	-	-	25	–	25

Lab Objectives:

1 To impart the basic concept of network analysis and its application.
2 To provide the basic concept of ac circuits analysis and its application.
3 To illustrate the operation of machines and transformers.

Lab Outcomes:

LO 1 Interpret and analyze the behavior of DC circuits using network theorems.
LO 2 Perform and infer experiment on single phase AC circuits.
LO 3 Demonstrate experiment on three phase AC circuits.
LO 4 Illustrate the performance of single-phase transformers and machines.

First year Bachelor of Technology

Suggested Experiments: Students are required to complete at least 8 experiments.		
Sr. No.	**Name of the Experiment**	**LO's**
1	Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Resistors, capacitors, and inductors.	LO1,2,3, 4
2	Verification of Superposition Theorem.	LO1
3	Verification of Thevenin's Theorem.	LO1
4	Verification of Norton's Theorem.	LO1
5	Verification of Maximum Power Transfer Theorem.	LO1
6	To find resonance conditions in a R-L-C series resonance circuit	LO2
7	To find resonance conditions in a R-L-C parallel resonance circuit.	LO2
8	To find the equivalent circuit parameters by conducting OC and SC tests on single phase transformers.	LO3
9	To determine the efficiency of a single-phase transformer at different loads.	LO3
10	To demonstrate cut-out sections of the DC machine.	LO4
11	To examine the characteristics of AC machines.	LO4
12	To investigate the construction and working of primary and secondary batteries.	LO4

Term Work:

1 Term work should consist of 8 experiments.

2 Journal must include at least 2 assignments.

3 The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.

4 Term Work – 25 Marks.
Term work will be assessed based on the students' performance in the laboratory.

Continuous assessment exam

1 Based on the BEE theory and related lab.

First year Bachelor of Technology

Subject : Problem Solving with Python

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIES22	Problem Solving with Python	02	02	-	02	01	-	03

Problem Solving with Python (Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIES22	Problem Solving with Python	02	-	-	02	-	-	02

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIES22	Problem Solving with Python	20	-	30	01	-	-	50

Course Objectives:The course aims:

1 Apply computational thinking to analyze and formulate solutions to real-world problems.

2 Design algorithms using appropriate problem-solving strategies (decomposition, pattern recognition, abstraction).

3 Implement and test algorithms using Python programming constructs.

4 Develop logical reasoning through iterative and recursive problem solving.

5 Apply algorithmic paradigms such as divide-and-conquer, backtracking, greedy methods, and graph-based search.

6 Analyze and compare alternative solutions for correctness and time/space efficiency

Course Outcomes:Students will be to

CO 1 Set up a Python environment and solve basic numerical/text problems using Python syntax and REPL

CO 2 Use control structures and modular functions to build correct iterative solutions

CO 3 Recognize and implement pattern-based solutions and simple recursive formulations.

CO 4 Apply recursion and divide-and-conquer methods (binary search, merge/quick sort) with correctness proofs and complexity reasoning.

First year Bachelor of Technology

CO 5 Formulate and solve backtracking/search/optimization problems (N-Queens, Rat-in-a-Maze, knapsack/coin change concepts).

CO 6 Use basic data structures and graph abstractions for traversal, BFS shortest-path ideas and small matrix/graph computations (PageRank simulation, word frequency).

Module	Detailed Content	CO's	Hrs
Prerequisite:	Fundamentals of programming language		
1	**Computational Thinking & Python Fundamentals** Problem analysis, algorithms, flowcharts, pseudocode, Python env, variables, I/O, operators, basic debugging; representative small calculators and converters	**CO1**	**4**
2	**Algorithmic Thinking using Control Structures** Decision making, nested conditions, loops, functions, parameter passing, modular programming; iterative problems (prime, gcd, fib, number guessing)	**CO2**	**5**
3	**Pattern-Based Problem Solving** Nested loops, pattern decomposition, matrix representations, introduction to recursion; pattern printing, matrix rotation, visualization	**CO3**	**4**
4	**Recursive & Divide-and-Conquer Problem Solving** Recursion fundamentals, stack concept, divide-and-conquer paradigms; Tower of Hanoi, recursive factorial/fibonacci, binary search, merge/quick sort (concept + implement)	**CO4**	**4**
5	**Search, Backtracking & Optimization** State-space representation, backtracking methods, greedy idea, constraints; N-Queens, Rat-in-a-Maze, Sudoku, Knight's tour, coin change intro	**CO5**	**5**
6	**Data Structures & Graph-Based Problem Solving** Lists/dicts, matrix ops, intro to NumPy (very basic), graph representation (adjacency matrix/list), graph traversal (BFS), PageRank intro, word-frequency & matrix multiplication examples	**CO6**	**4**
		TOTAL	**26**

Textbooks:

1 Peter D. Kazarinoff, Problem Solving with Python 3.7 Edition: A Beginner's Guide to Python & Open-Source Programming Tools, Independently Published, 2019.

2 Jeri R. Hanly and Elliot B. Koffman, *Problem Solving and Program Design in C*, 8th Edition, Pearson, 2016.

References:

1 Think Python: How to Think Like a Computer Scientist — Allen B. Downey — 3rd Edition, O'Reilly Media, 2024.

2 Introduction to Algorithms — Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein — 4th Edition, The MIT Press, 2022.

3 Python Cookbook — David Beazley & Brian K. Jones — 3rd Edition, O'Reilly Media, 2013.

Weblinks

First year Bachelor of Technology

1 Problem Solving with Python — Kazarinoff (primary)
2 Python Official Documentation
3 Real Python — Tutorials & Guides
4 Runestone — Problem Solving & Data Structures (interactive)
5 Kaggle Learn — Python micro-course (hands-on)

Internal Assessment:
Assessment consists of one Mid Term Test of 20 marks. Mid Term test is to be conducted when approximately 50% syllabus is completed. Duration of the midterm test shall be one hour.

End Semester Theory Examination:
1 Question paper will be of 30 marks
2 Question paper will have a total of five questions
3 All questions have equal weightage and carry 10 marks each
4 Any three questions out of five need to be solved.

Problem Solving with Python (Laboratory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIES22	Problem Solving with Python	-	02	-	-	01	-	01

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AIES22	Problem Solving with Python	-	-	-	-	25	25	50

Prerequisite: Fundamentals of programming language	
Lab Objectives: The course aims:	
1	To set up and use the Python programming environment (REPL/Jupyter) to write, run and document programs that solve basic numerical and text-based problems.
2	To design and implement iterative solutions to problems using control structures (conditionals, loops) and modular, reusable functions.
3	To recognize patterns in problems and translate them into program logic, including simple recursive formulations.

First year Bachelor of Technology

4	To implement recursive and divide-and-conquer algorithms (e.g., binary search, merge/quick sort) and reason about their correctness and efficiency.
5	To formulate and solve search, backtracking and optimization problems (e.g., N-Queens, Rat-in-a-Maze, Sudoku, coin change) through hands-on experimentation.
6	To apply basic data structures and graph abstractions to implement traversal, shortest-path and simple matrix/graph computations.
Lab Outcomes: Students will be to	
LO 1	Set up a Python environment and solve basic numerical/text problems using Python syntax and REPL.
LO 2	Use control structures and modular functions to build correct iterative solutions.
LO 3	Recognize and implement pattern-based solutions and simple recursive formulations.
LO 4	Apply recursion and divide-and-conquer methods (binary search, merge/quick sort) with correctness proofs and complexity reasoning.
LO 5	Formulate and solve backtracking/search/optimization problems (N-Queens, Rat-in-a-Maze, knapsack/coin change concepts).
LO 6	Use basic data structures and graph abstractions for traversal, BFS shortest-path ideas and small matrix/graph computations (PageRank simulation, word frequency).

Suggested Experiments Students are required to complete at least 10 experiments.

Sr. No.	Name of the Experiment	LO's
1	Python Setup & REPL / Jupyter: write first scripts, run and document simple arithmetic programs.	LO1
2	Simple calculators & converters: interest, temperature, unit converter, largest of three numbers.	LO1
3	Data types & string tasks: parsing, formatting, string methods, simple text parsing problems.	LO1
4	Control structures: implement prime, palindrome, Armstrong, GCD/LCM, and a number-guessing interactive program.	LO2
5	Functions & modularization: refactor earlier solutions into functions, parameter passing, and simple unit tests.	LO2
6	Pattern problems: star/number/alphabet patterns, Pascal triangle, spiral matrix generation.	LO3
7	Matrix operations: implement matrix multiplication and rotation; represent matrices as lists/dicts (small sizes).	LO3
8	Recursion labs: recursive factorial, recursive Fibonacci, Tower of Hanoi demonstration with recursive trace.	LO4

First year Bachelor of Technology

9	Divide-and-conquer sorting & search: implement and compare binary search, merge sort (implement & time small inputs).	LO4
10	Backtracking: implement Rat-in-a-Maze and N-Queens solver (print solutions & count) with state-space backtracking.	LO5
11	Search & optimization problems: Sudoku solver (backtracking), simple coin-change DP demo / activity-selection greedy sketch.	LO5
12	Graph basics & traversals: adjacency matrix/list, BFS traversal, shortest-path concept demonstration on small graphs.	LO6
13	Applied mini-project: Word frequency analysis + small PageRank simulation or social-network metric on tiny sample; basic NumPy demo for matrix ops and simple plotting of results.	LO6

Note: Suggested List of Experiments is indicative. However, flexibility lies with individual course instructors to design and introduce new, innovative and challenging experiments, (limited to maximum 30% variation to the suggested list) from within the curriculum, so that the fundamentals and applications can be explored to give greater clarity to the students and they can be motivated to think differently.

Term Work:	
1	Term work should consist of 8 -10 experiments.
2	The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.
3	**Total 25 Marks based on assessment of laboratory work and mini project**

Evaluation Exam	
1	Practical Exam based on the entire syllabus

First year Bachelor of Technology

Subject : Professional Communication and Ethics-I

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AE21	Professional Communication and Ethics-I	1	-	2*	1	-	1*	2

Professional Communication and Ethics-I (Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AE21	Professional Communication and Ethics-I	1	-	2*	1	-	1*	2

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26AE21	Professional Communication and Ethics-I	20	80	-	-	-	-	100

***The two-hour tutorial is divided into batches of 20 - 30 students.**

Course Objectives:

1 To demonstrate the fundamental concepts of interpersonal and professional communication.

2 To encourage active listening with focus on content, purpose, ideas and tone.

3 To facilitate fluent speaking skills in social, academic and professional situations

4 To train in reading strategies for comprehending academic and business correspondence.

5 To promote effective writing skills in business, technology and academic arenas.

6 To inculcate confident personality traits along with grooming and social etiquettes.

Course Outcomes:

CO1 Eliminate barriers and use verbal/non-verbal cues at social and workplace situations.

CO2 Employ listening strategies to comprehend wide-ranging vocabulary, grammatical structures, tone and pronunciation.

CO3 Prepare effectively for speaking at social, academic and business situations.

First year Bachelor of Technology

CO4 Use reading strategies for faster comprehension, summarization and evaluation of texts.

CO5 Acquire effective writing skills for drafting academic, business and technical documents.

CO6 Successfully interact in all kinds of settings, displaying refined grooming and social skills

Module	Content	CO	Hrs.
1	**Fundamentals of Communication: -**	**CO1**	**04**
	1.1 Introduction to Theory of Communication • Definition • Objectives • The Process of Communication • Organizational Communication **1.2**. Methods of Communication		
2	**Vocabulary Building**	**CO2**	**02**
	2.1 Vocabulary Building ■ Meaning of Words in Context ■ Synonyms & Antonyms ■ Collocations ■ Prefixes & Suffixes **2.2**. Grammar Identifying Common Errors ● Subject - Verb Agreement ● Misplaced Modifiers ● Articles ● Prepositions ● Tautologies ● Pleonasms (Redundancies) ● Idioms		
3	**Business Correspondence**	**CO3**	**03**
	3.1 Seven Cs of Business Correspondence ■ Completeness ■ Conciseness ■ Consideration ■ Concreteness ■ Clarity ■ Courtesy ■ Correctness **3.2**. Parts of a Formal Letter and Formats ● Parts/Elements of a Formal Letter ● Letterheads and/or Sender's Address		

First year Bachelor of Technology

	• Dateline • Inside Address • Reference Line (Optional) • Attention Line (Optional) • Salutation • Subject Line • Body • Complimentary Close • Signature Block • Enclosures/Attachments • Complete/Full Block Format **3.3**. Emails • Format of Emails • Features of Effective Emails • Language and style of Emails **3.4.** Types of Letters in Both Formal Letter Format and Emails • Claim and Adjustment Letters • Request/Permission Letters • Sales Letters		
4	**Personality Development and Social Etiquettes**	**CO4**	**02**
	4.1 Personality Development • Introducing Self and/or a Classmate • Formal Dress Code **4.2**. Social Étiquettes • Formal Dining Étiquettes • Cubicle Étiquettes • Responsibility in Using Social Media • Showing Empathy and Respect • Learning Accountability and Accepting Criticism • Demonstrating Flexibility and Cooperation • Selecting Effective Communication Channels		
5	**Book Review**	**CO5**	**02**
	• Review of a book.: Students have to read and analyze the book given and should be able to write a two page review on it. • Book review presentation		
	Total Engagement Hours		**13**

List of Tutorials:

First year Bachelor of Technology

S.No	Details of Assignment	Details of Activity	Hours	Marks
1	Personal Branding & SWOT Analysis	Written SWOT analysis along with a 2-minute elevator pitch video recording.	2	5
2	Transcription of the public speech along with on the spot writing of speech/Extempore	Public speech/On-the-spot 1-minute Extempore presentation.	2	10
3	Case Studies/Role plays on types of communication, Barriers to effective Communication and its consequences.	Role Play/Case Study	4	10
4	Written record of reading activities/	Advanced level reading comprehension with MCQs/Video analysis, structured note-taking (Cornell Method), comprehension assessment, and oral reflection.	2	5
5	Listening Skill Activity TED Talk Active Listening & Speech Analysis	Video analysis, structured note-taking (Cornell Method), comprehension assessment, and oral reflection.	2	5
6	Aptitude test	Aptitude test on vocabulary and grammar for Engineers	4	5
7	2 types of letters in complete block format/Email	Request/ Permission; Adjustment / claim; Sales letters	4	10
8	Understanding of Social Etiquettes	Mini Project	2	10
9	Presentation on Book Review	Exploration and Analysis of perception related to global environment presented in the Book	4	20
10	Wins in the event/competition related to soft skills /language/literature	Providing certificate as proof/Geo Tagged Photographs	During the current semester	10
11	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	Providing certificate as proof/Geo Tagged Photographs	During the current semester	5

First year Bachelor of Technology

12	Beyond the Headlines: 15-Day Newspaper Analysis Project	Background research → multiple perspectives → evidence → ideation → critical analysis → personal position → conclusion. Report plus presentation.	Self Paced	10
13	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	Any course related to soft skills and personality development	During the current semester	10
(List of books for book review will be scrutinised by the respective teachers.)				

Textbooks:

1 Sanjay Kumar & Pushp Lata (2018). Communication Skills with CD. New Delhi:Oxford University Press.

2 Hemphill, P.D., McCormick, D. W., & Hemphill, R. D. (2001). Business Communication with writing improvement exercises. Upper Saddle River, NJ:Prentice Hall.

3 Locker, Kitty O. Kaczmarek, Stephen Kyo. (2019). Business Communication: Building Critical Skills. Place of publication not identified: Mcgraw-hill.

4 Murphy, H. (1999). Effective Business Communication. Place of publication not identified: Mcgraw-Hill.

5 Raman, M., & amp; Sharma, S. (2016). Technical Communication: Principles and practice. New Delhi:Oxford University Press.University of Mumbai, First Year Engineering, (Common for all Branches of Engineering) REV2019 'C' Scheme 51/61

6 Kaul, A. (2015). Effective Business Communication. Place of publication not identified: Prentice-Hall of India.

7 Rizvi, A. M. (2010). Effective Technical Communication: A guide for Scientists and Engineers. New Delhi: Tata McGraw Hill.

8 Lewis, N. (2014). Word power made it easy. Random House USA.

Internal Assessment:

1) Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 80 marks.
2) Mid Term test is to be conducted when approx. 60% syllabus is completed.
3) Duration of the midterm test shall be one hour.

Continuous Assessment:

Continuous Assessment is of **80 marks**. The rubrics for assessment will be considered on approval by the subject teachers.

First year Bachelor of Technology

Sr. No	Rubrics	Marks
1.	Evaluation of self-awareness, establishes a distinctive professional identity, and communicates personal strengths with confidence and clarity.	5 Marks
2.	Accurate transcription, clear structure of ideas, relevant content, fluent expression, appropriate vocabulary, and confident extempore delivery.	10 marks
3.	Conceptual Understanding – Case Analysis – Communication Effectiveness – Role Play – Problem Resolution	10 marks
4.	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
5.	Wins in the event/competition/hackathon	10 marks
6.	Content beyond syllabus presentation	10 marks
7.	Creating Proof of concept	10 marks
8.	Mini Project	10 marks
9.	Participation in event/workshop/talk / competition followed by small report and certificate of participation relevant to the subject (in other institutes)	05 marks
10.	Multiple Choice Questions (Quiz)	15 marks
11.	Examination of correct format, clarity of content, professional tone, language accuracy, and appropriate vocabulary.	10 marks
12.	Evaluation of understanding of the book, critical analysis, interpretation of themes, independent perspective, and effective presentation.	20 marks

First year Bachelor of Technology

Subject :Engineering Visualization Lab

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIVS21	Engineering Visualization Lab	-	02+*02	-	-	2	-	2

Engineering Visualization Lab
(Drawing Hall)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26AIVS21	Engineering Visualization Lab	-	2	-	-	2	-	2

2 Hrs Drawing Hall & 2 Hrs AutoCAD Practical Batchwise

Lab Objectives:

1 To impart and inculcate proper understanding of the theory of projection, the knowledge of reading a drawing and to improve the visualization skill.

Lab Outcomes

LO1 Apply the basic principles of projections in converting 3-D view to 2-D drawing with and without section.

LO2 Read a given drawing and visualize a 3-D object from the given two or three views.

Sr No.	Topic	CO's	Hrs.
1	**Orthographic Projections:** Fundamentals of orthographic projections. Different views of a simple machine part as per the first angle projection method recommended by I.S.	LO 1	08
2	**Sectional Orthographic Projections:** Basic concept and significance of sectional orthographic projections. Full sectional view of simple machine parts (Excluding half section).	LO 1	08
3	**Isometric Views:** Isometric Views, Conversion of Orthographic Views to Isometric Views (Excluding Sphere and circle on an inclined plane).	LO 2	08
	Total Hours		24

First year Bachelor of Technology

Engineering Visualization Lab
Auto CAD (Lab)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26ITVS21	Engineering Visualization Lab	-	2	-	-	2	-	2

Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26ITVS21	Engineering Visualization Lab	-	-	-	-	25	25	50

Lab Objectives:

1 To inculcate the skill of drawing with the basic concepts.

2 To Use AutoCAD for daily working processes.

3 To teach basic utility of Computer Aided drafting (CAD) tool

Lab Outcomes: Students will be able to...

LO 1 Apply the basic principles of projections in 2D drawings using CAD software.

LO 2 Create, Annotate, Edit and Plot drawings using basic AutoCAD commands and features.

LO 3 Apply basic AutoCAD skills to draw different views of a 3D object.

LO 4 Apply basic AutoCAD skills to draw the isometric view and 3-D models from the given two views.

Sr No.	Topic	LO's	Hrs.
1	**Overview of Computer Graphics Covering:** Listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.	LO 1,2,3	08

First year Bachelor of Technology

2	**Customization & CAD Drawing:** Consisting of set up of the drawing page and the printer including scale settings, Setting up of units and drawing limits, ISO and ANSI standards for coordinate dimensioning.	**LO 2,3,4**	**08**
3	**Annotations and other Functions Covering:** Applying dimensions to objects, applying annotations to drawings, Changing line lengths through modifying existing lines (extend/lengthen), Printing documents to paper using the print command, orthographic projection techniques, Drawing sectional views of objects (simple machine parts), Drawing isometric views by using Isometric drafting. Visualizing and drawing 3-D models by using AutoCAD 3-D software.	**LO 2,3,4**	**08** **04**
	Total Practical Hours		**28**

Text Books:

1. N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt. Ltd. 5 th Edition, 2025
2. N.D. Bhatt & V.M. Panchal, "Machine Drawing", Charotar Publishing House Pvt. Ltd., 20 th edition 2025

Reference Books:

1. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publisher, 4 th edition 2020
2. Prof. Sham Tickoo (Purdue University) Gaurav Verma, "(CAD Soft Technologies) :Auto CAD 2024/2025 (For engineers and Designers)", Dreamtech Press NewDelhi.
3. Dhananjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 1 st edition 2007

Examination Scheme :		
Assessment Tool	**Way to Conduct**	**Marks**
Term Work	1. Engineering Drawing A3 size Assignment Sheets -**10 Marks** 2. AutoCAD assignments to be printed on A4 size sheets - **15 Marks**	**25 Marks**
Practical Examination	1. Solve 2 compulsory questions. 2.Question on Orthographic Projection / Sectional Orthographic Projection - 15 Marks 3. Question on Isometric Projection- 10 Marks 4. Should be conducted for 2 Hours.	**25 Marks**

First year Bachelor of Technology

Subject : Universal Human Values-II

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26VE21	Universal Human Values-II	02	-	-	02	-	-	02

Universal Human Values-II
(Theory)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26VE21	Universal Human Values-II	02	---	---	02	---	---	02
Examination Scheme								
Course Code	Course Name	Theory			Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26VE21	Universal Human Values-II	-	20	-	-	-	-	20

Course Objectives

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding of the harmony in the human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes:

CO 1 Understand values, trust, respect and mutual happiness in human relationships and family.

CO 2 Understand harmony in society, comprehensive human goals and the concept of universal human order.

CO 3 Understand harmony in nature, coexistence and the interconnectedness of all existence.

CO 4 Develop understanding of human values, ethical conduct and professional ethics for a harmonious society.

First year Bachelor of Technology

Module		Content	CO's	Hrs
1		**Understanding Harmony in the Family - Harmony in Human-Human Relationship**	CO 1	06
	1.1	Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and its fulfillment to ensure mutual happiness		
	1.2	Understanding the meaning of Trust; Difference between intention and competence		
	1.3	Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship		
2		**Understanding Harmony in Society**	CO 2	05
	2.1	Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals		
	2.2	Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family		
3		**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**	CO 3	06
	3.1	Understanding the harmony in the Nature		
	3.2	Understanding Existence as Coexistence of mutually interacting units in all-pervasive space		
	3.3	Holistic perception of harmony at all levels of existence.		
4		**Implications of the above Holistic Understanding of Harmony on Professional Ethics**	CO 4	09
	4.1	Natural acceptance of human values		
	4.2	Definitiveness of Ethical Human Conduct		
	4.3	Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order		
	4.4	Competence in professional ethics		
			Total	**26**

First year Bachelor of Technology

Mode of Conduction

1. Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
2. practice sessions for analyzing and discussing the topic, help the students explore the important or critical elements.

Continuous Assessment:

Continuous Assessment is of **20 marks**. The rubrics for assessment will be considered on approval by the subject teachers. The rubrics can be any 2 or max 4 of the following:

Sr. No	Rubrics	Marks
1.	Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC	10 marks
2.	Case study analysis and presentation	10 marks
3.	Constitutional awareness programme	10 marks
4.	Group discussion/debate on social and ethical issues	10 marks
5.	Poster Presentation on UHV content theme	10 marks
6.	Book Review on UHV content theme	10 marks
7.	Community/social outreach activity with report	10 marks
8.	Case Study Analysis & Presentation	10 marks
9.	Survey/interview on values, happiness, prosperity or social harmony	10 marks

First year Bachelor of Technology

Subject : Co-Curricular Course-II

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26CC21	Co-Curricular Course-II	---	04	---	---	02	---	02

Co-Curricular Course-II
(Practical Activity)

Teaching Scheme								
Course Code	Course Name	(Teaching Hours)			Credits Assigned			
		Th	Pr	Tut	Th	Pr	Tut	Total
26CC21	Co-Curricular Course-II	---	04	---	---	02	---	02
Examination Scheme								
Course Code	Course Name	Theory			Practical Exam Duration (in Hrs)	Term Work	Practical & Oral	Total
		Internal Assessment		ESE				
		MT	CA					
26CC21	Co-Curricular Course-II	---	---	---	---	---	25	25

Social Responsibility, Community Engagement and Student Well-Being

As part of the **First Year curriculum**, students are allotted **25 marks in each semester** for participation in structured social responsibility and community engagement activities. The initiative is designed to extend learning beyond the classroom and encourage students to become responsible, empathetic and socially conscious citizens.

Students participate in a diverse range of activities, including **cleanliness drives on college premises, awareness rallies, tree plantation drives, beach-cleaning campaigns, environmental awareness initiatives, cultural programmes, community outreach activities and other socially relevant projects**. These activities provide students with opportunities to work collaboratively, engage with the community and contribute meaningfully to society.

The programme also incorporates **student well-being and personal development activities**, including courses and workshops on **Yoga, stress management, emotional well-being, mindfulness, self-awareness and healthy lifestyle practices**. Such activities enable students to develop effective coping strategies, emotional balance, self-discipline and a positive approach towards academic and personal challenges.

First year Bachelor of Technology

Through this integrated approach, the initiative promotes **social responsibility, civic engagement, environmental consciousness, teamwork, empathy, self-awareness and holistic well-being**. It supports the institution's commitment to developing well-rounded graduates who are not only technically competent but also socially responsible, emotionally resilient and actively engaged with their community.

Assessment Rubrics:

Sessions from eminent persons on important themes like cyber bullying, cancer awareness,organ donation etc. (5 Marks)

MYCA Course (15 Marks)

https://www.mahayouthnet.in/courses/English-MYCA-Climate-Change-Water-Management-6400473ce4b097c33f49d542

Open University Courses

https://www.open.edu/openlearn/health-sports-psychology/health/emotions-and-emotional-disorders/content-section-0?active-tab=description-tab