# 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.**

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**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

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| | |
|---|---|
| | **Enhancement Course bucket under the new name " Engineering Visualization Lab"(2 DH+2 AutoCAD).**<br>• **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**<br>• **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)** | | | |

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**A.Y. 2024-25 Batch)**

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

| | | |
|---|---|---|
| **Sem 1** | **Matrices and Differential Calculus (MDC)** | **Fundamentals of Engineering Mathematics-1 (FEM-1)** |
| **Sem 2** | **Integral Calculus and Complex Numbers(ICC)** | **Fundamentals of Engineering Mathematics-2 (FEM-2)** |
| **Sem 1 & 2** | **C-Programming** | **Fundamentals of Programming(C /Java)** |

- **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.**

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

NEP Scheme

2026-27

Group B

Branch: Automation and Robotics

Semester: I & II

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# First year Bachelor of Technology

**Group B**
**Branch: Automation and Robotics(AURO)**
**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) | 26ARBS11 | Mathematics-1 | 03 | -- | 01 | 03 | -- | 01 | 04* |
| Engineering Science Course (ES) | 26ARES11 | Fundamentals of Programming -C | 03 | 02 | – | 03 | 01 | -- | 04* |
| Engineering Science Course (ES) | 26ARES12 | Engineering Mechanics | 03 | – | – | 03 | – | -- | 03* |
| Programme Core Course (PC) | 26ARPC11 | Programme Core Course-EMI | 02 | – | – | 02 | – | – | 02* |
| Indian Knowledge System (IK) | 26ARIK11 | Fundamentals of Vedic Mathematics | 02 | -- | – | 02 | -- | -- | 02 |
| Value Education (VE) | 26VE11 | Universal Human Values-1 | 02 | -- | -- | 02 | -- | -- | 02 |
| Vocational/Skill Enhancement course (VS) | 26ARVS11 | Basic Workshop Practice | – | 04 | – | – | 02 | – | 02 |
| Co curricular Activity (CC) | 26CC11 | Co curricular Course -I | -- | 04 | -- | – | 02 | -- | 02 |
| Total Credit | | | | | | | | | 21 |

26ARPC14- Programme Core Course for AURO-Electronic Measurement and Instrumentation(EMI)

**Note: * indicates theory paper**

**Total credits sem I =21**

**Semester I -Examination Scheme**

| Course Type | Course Code | Course Name | Theory | | | TW | Pr/Oral | Total |
|---|---|---|---|---|---|---|---|---|
| | | | MT | CA | ESE | | | |
| Basic Science Course (BS) | 26ARBS11 | Mathematics-1 | 20 | 20 | 60 | – | – | 100 |
| Engineering Science Course (ES) | 26ARES11 | Fundamentals of Programming -C | 20 | 20 | 60 | 25 | – | 125 |
| Engineering Science Course (ES) | 26ARES12 | Engineering Mechanics | 20 | 20 | 60 | – | – | 100 |
| Programme Core Course (PC) | 26ARPC11 | Programme Core Course-EMI | 20 | 20 | 60 | – | – | 100 |
| Indian Knowledge System (IK) | 26ARIK11 | Fundamentals of Vedic Mathematics | – | 20 | – | – | – | 20 |
| Value Education (VE) | 26VE11 | Universal Human Values-1 | – | 20 | – | – | – | 20 |
| Vocational/Skill Enhancement course (VS) | 26ARVS11 | Basic Workshop Practice | – | – | – | 50 | – | 50 |
| Co curricular Activity (CC) | 26CC11 | Co curricular Course -I | – | – | – | – | 25 | 25 |
| Total | | | | | | | | 540 |

**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 |
| 26ARBS11 | 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 |
| 26ARBS11 | 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 | | | | | |
| 26ARBS11 | Mathematics-I | 20 | 20 | 60 | 2 | - | - | 100 |

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

**Course Objectives:**

To develop student's understanding of mathematical concepts such as matrices, eigenvalues, complex variables, partial differentiation, and differential equations, enabling them to analyze, model, and solve problems relevant to Automation and Robotics Engineering.

**Course Outcomes:**

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

**CO1.** Determine the rank of matrices and solve homogeneous and non-homogeneous systems of linear equations using matrix methods.

**CO2.** Compute eigenvalues and eigenvectors, apply the Cayley–Hamilton theorem, and analyze covariance matrices and matrix diagonalization.

**CO3.** Apply partial differentiation, the chain rule, and Euler's theorem to functions of several variables.

**CO4.** Apply complex number representations, De Moivre's theorem, and complex functions to solve mathematical problems.

**CO5.** Analyze complex variable functions using limits, continuity, analyticity, harmonic functions, and Cauchy–Riemann equations.

**CO6.** Solve exact and linear first-order differential equations and higher-order homogeneous differential equations using appropriate mathematical techniques and integrating factors.

# First year Bachelor of Technology

| Module | Content | CO | Hrs. |
|---|---|---|---|
| **Prerequisite:** | Basic Algebra, Trigonometry, Coordinate Geometry, Differential Calculus, and Fundamental Concepts of Matrices. | | |
| **1** | **Matrices and Linear Algebra** | **CO1** | **06** |
| | **1.1** Elementary matrices, rank of a matrix using echelon form and normal form.<br>**1.2** Introduction to homogeneous and non-homogeneous systems of linear equations, including consistency and solutions. | | |
| **2** | **Eigen values and Eigen vectors** | **CO2** | **08** |
| | **2.1** Characteristic equation, eigenvalues, eigenvectors and their properties, Cayley Hamilton theorem, verification and reduction of higher degree polynomials.<br>**2.2** Function of a matrix, Similarity of matrices, diagonalizable and non-diagonalizable matrices. | | |
| **3** | **Partial Differentiation** | **CO 3** | **06** |
| | **3.1** Functions of several variables, partial derivatives, chain rule, Maxima and Minima of Function of two variables<br>**3.2** Euler's theorem on homogeneous functions of two independent variables, deduction from Euler's theorem | | |
| **4** | **Complex Number** | **CO 4** | **07** |
| | **4.1** Representation of complex numbers in Cartesian, polar and exponential form, Demovire's theorem and related problems, Power and Roots of complex numbers.<br>**4.2** Elementary functions of complex variables, exponential, hyperbolic, circular, logarithmic and inverse. | | |
| **5** | **Complex Variable** | **CO 5** | **05** |
| | **5.1** Function of Complex Variable, limit and continuity of a function<br>**5.2** Analytic and Harmonic Function, Cauchy Riemann Equation, Necessary and sufficient condition for analytic function | | |
| **6** | **Differential Equations** | **CO 6** | **07** |
| | **6.1** Exact differential equations, equations reducible to exact equations using integrating factors.<br>**6.2** Linear differential equations and equations reducible to linear form.<br>**6.3** Homogeneous differential equations with constant coefficients, complementary functions and solution of differential equations of the type $f(D)y = 0$. | | |
| | **Total No. of Hours** | | **39** |

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**Text Books:**

1. B. S. Grewal, *Higher Engineering Mathematics*, 45th Edition, Khanna Publishers, New Delhi, 2023.
2. David C. Lay, Steven R. Lay and Judi J. McDonald, *Linear Algebra and Its Applications*, 6th Edition, Global Edition, Pearson, 2024.
3. Dennis G. Zill, *Advanced Engineering Mathematics*, 7th Edition, Jones & Bartlett Learning, 2022.

**Reference Books:**

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 11th International Adaptation Edition, Wiley, 2025.
2. H. K. Dass, *Advanced Engineering Mathematics*, 23rd Edition, S. Chand Publishing, New Delhi, 2024.
3. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, 5th Edition, Narosa Publishing House, New Delhi, 2016 (Reprint 2019)
4. Stephen Andrilli and David Hecker, *Elementary Linear Algebra*, 5th Edition, Academic Press, 2016
5. James Ward Brown and Ruel V. Churchill, *Complex Variables and Applications*, 9th Edition, McGraw-Hill Education, 2014
6. William E. Boyce, Richard C. DiPrima and Douglas B. Meade, *Elementary Differential Equations and Boundary Value Problems*, 12th Edition, Wiley, 2021.

**Useful Links**

**NPTEL Courses**

- https://nptel.ac.in/courses/111105122?utm_source=
- https://nptel.ac.in/courses/111106051?utm_source=
- https://nptel.ac.in/courses/111107105?utm_source=

**MIT OpenCourseWare**

- https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/?utm_source=
- https://ocw.mit.edu/courses/18-03sc-differential-equations-fall-2011/?utm_source=

**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:**

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.

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| 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: C

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARES11 | Fundamentals of Programming: C | 3 | 2 | - | 3 | 1 | - | 4 |

## Fundamentals of Programming: C (Theory)

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARES11 | Fundamentals of Programming: C | 3 | - | - | 3 | - | - | 3 |

| Examination Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | Theory | | | Exam Duration (in Hrs) | Term Work | Practical & Oral | Total |
| | | Internal Assessment | | ESE | | | | |
| | | MT | CA | | | | | |
| 26ARES11 | Fundamentals of Programming: C | 20 | 20 | 60 | 2 | - | - | 100 |

**Course Objectives:**

1. To learn the fundamentals of computers and algorithms.
2. To understand various steps in program development and control structures.
3. To understand the concept of functions in C programming.
4. To understand usage of arrays and strings in C language.
5. To understand usage of Structures and Union in C language.
6. To understand the concept of pointers and dynamic memory allocation

**Course Outcomes:**

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

**CO1** To formulate simple algorithms for arithmetic and logical problems and translate them into programs in C language.

**CO2** To implement conditional branching and iteration

**CO3** To decompose problem into functions and synthesize complete program

**CO4** To implement usage of arrays and strings in C language.

**CO5** To implement usage of Structures and Union in C language.

**CO6** To comprehend pointer concepts and dynamic memory allocation

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| Module | Contents | CO's | Hrs |
|---|---|---|---|
| **Prerequisite** | Fundamentals of programming language | | |
| **1** | **Introduction, Fundamental of C Programming.**<br>Introduction to components of a Computer System. Introduction to Algorithm and Flowchart<br>● Keywords, Identifiers, Constants and Variables.<br>● Expression and In-built functions.<br>● Datatype and Operators in C.<br>● Expressions and Precedence of Operators.<br>● In- built Functions, Pre-processor Directives, library, Header Files. | **CO 1** | **6** |
| **2** | **Control Structure, Branching and looping structures.**<br>Introduction to Control Structures.<br>● If statement, If-else statement, Nested if-else, else-if Ladder.<br>● Switch statement<br>● For loop, while loop, do while loop<br>● Break, continue and go to statements | **CO 2** | **7** |
| **3** | **Functions**<br>● Introduction to functions.<br>● Function prototype, Function definition, accessing a function and parameter passing: Call by Value and Call by reference.<br>● Recursive function. | **CO3** | **5** |
| **4** | **Array and Strings**<br>● Introduction to Arrays.<br>● Declaration and initialization of one. dimensional and two- dimensional arrays.<br>● Definition and initialization of String.<br>● String functions. | **CO 4** | **7** |
| **5** | **Structure and Union**<br>● Concept of Structure and Union.<br>● Declaration and Initialization of structure and union.<br>● Nested structures.<br>● Array of Structures . | **CO 5** | **6** |
| **6** | **Pointers**<br>● Fundamentals of pointers<br>● Declaration, initialization and dereferencing of pointers.<br>● Concept of dynamic memory allocation. | **CO 6** | **8** |
| **Total** | | | **39** |

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**Textbooks**

- E. Balaguruswamy, Programming in ANSI C, McGraw-Hill - 9th Edition
- Kernighan , Ritchie, "The C programming Language", Prentice Hall of India- 2nd Edition
- Sumitabha Das, Computer Fundamentals and C Programming, McGraw-Hill - 1st Edition
- Pradeep Day and ManasGosh ,"Programming in C", Oxford University Press. - 2nd Edition

**Reference books**

- Byron Gottfried, "Programming with C", McGraw Hill (Schaum"s outline series)
- KanetkarYashwant," "Let Us C", BPB Publication.

**Internal Assessment:**
Assessment consists of one Mid Term Test 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 |
| 4 | Creating Proof of concept | 10 marks |
| 5 | Mini Project / Extra Experiments/ Virtual Lab | 10 marks |
| 6 | Certificate course for 4 weeks or more: NPTEL/ Coursera/ Udemy/any MOOC | 10 marks |
| 7 | Wins in the event/competition/hackathon | 10 marks |
| 8 | GATE Based Assignment test/Tutorials etc | 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) | 05 marks |
| 11 | Peer Review and participation the marks can be left blank (with discretion of faculty) | 05 Marks |

**End Semester Theory Examination**

- The question paper will be of 60 marks.
- The question paper will have 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.

# First year Bachelor of Technology

## Fundamentals of Programming: C (Laboratory)

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARES11 | Fundamentals of Programming: C | - | 2 | - | - | 1 | - | 1 |

| Examination Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | Theory | | | Exam Duration (in Hrs) | Term Work | Practical & Oral | Total |
| | | Internal Assessment | | ESE | | | | |
| | | MT | CA | | | | | |
| 26ARES11 | Fundamentals of Programming: C | - | - | - | - | 25 | - | 25 |

**Lab Objectives: The course aims:**

1 To learn the fundamentals of computers and algorithms.
2 To understand various steps in program development and control structures.
3 To understand the concept of functions in C programming.
4 To understand usage of arrays and strings in C language.
5 To understand usage of Structures and Union in C language.
6 To understand the concept of pointers and dynamic memory allocation

**Lab Outcomes:** Students will be to

**LO1** To formulate simple algorithms for arithmetic and logical problems and translate them into programs in C language.
**LO2** To implement conditional branching and iteration
**LO3** To decompose problem into functions and synthesize complete program
**LO4** To implement usage of arrays and strings in C language.
**LO5** To implement usage of Structures and Union in C language.
**LO6** To comprehend pointer concepts and dynamic memory allocation

| Suggested Experiments Students are required to complete at least 10 experiments. | | LO's |
|---|---|---|
| Sr.No. | Name of the Experiment | |
| 1 | Implementation of Basic C Programs using Data Types, Operators and Expressions | LO 1 |
| 2 | implementation of C Programs using Standard Input/Output and In-built Functions . | LO 1 |
| 3 | Implementation of Decision-Making Programs using if, if-else, Nested if and else-if Ladder | LO 2 |
| 4 | Implementation of Menu-Driven Programs using switch-case | LO 2 |

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| | | |
|---|---|---|
| 5 | Implementation of Iterative Programs using for, while and do-while Loops | **LO 2** |
| 6 | Implementation of Programs using break, continue and goto Statements | **LO 2** |
| 7 | Implementation of User-Defined Functions with Different Parameter Passing Techniques | **LO 3** |
| 8 | Implementation of Recursive Functions for Solving Computational Problems | **LO 3** |
| 9 | Implementation of One-Dimensional and Two-Dimensional Array Operations | **LO 4** |
| 10 | Implementation of String Manipulation Programs using Standard String Functions | **LO 4** |
| 11 | Implementation of Programs using Structures and Array of Structure | **LO 5** |
| 12 | Implementation of Programs using Union and Comparison with Structure | **LO 5** |
| 13 | Implementation of Programs using Pointers and Pointer Arithmetic | **LO 6** |
| 14 | Implementation of Dynamic Memory Allocation using Pointers | **LO 6** |

**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 at least 10 experiments.(targeting all CO's)

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**

- 15 Marks- Program Execution
  - The Program must be successfully executed and demonstrated on the scheduled laboratory day.
  - If the program is *** not demonstrated on the scheduled day, it will be evaluated in the next lab session for a maximum of 10 marks.**
- Write-up Quality and Content - 4 Marks
- Timely Submission - 2 Marks
- Viva- 4 Marks

# First year Bachelor of Technology

## Subject : Engineering Mechanics

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARES12 | Engineering Mechanics | 03 | --- | --- | 03 | --- | --- | 03 |

## Engineering Mechanics (Theory)

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARES12 | Engineering Mechanics | 3 | – | – | 3 | – | – | 3 |

| Examination Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | Theory | | | Exam Duration (in Hrs) | Term Work | Practical & Oral | Total |
| | | Internal Assessment | | ESE | | | | |
| | | MT | CA | | | | | |
| 26ARES12 | Engineering Mechanics | 20 | 20 | 60 | 2 | – | – | 100 |

**Course Objectives:**

1 To create a strong foundation in basic principles of statics and to apply the knowledge to analyze and solve engineering problems involving different systems of forces, static equilibrium etc.

2 To understand the principles and methods used to analyze the motion and behavior of particles and rigid bodies without the influence of forces.

**Course Outcomes:**

**CO 1** Understand and analyze the behavior of multiple forces acting in a single plane.

**CO 2** Understand the conditions for a body to be in a state of equilibrium and to analyze and solve problems related to the equilibrium.

**CO 3** Understand and predict motion, analyze velocity and acceleration, characterize different types of motion without consideration of mass of the body.

**CO 4** Do kinematic analysis of linkages and mechanisms by locating instantaneous center of rotation.

# First year Bachelor of Technology

| Module | Content | COs | Hrs |
|---|---|---|---|
| 1 | **System of Coplanar Forces:** Classification of force systems, Principle of transmissibility, composition and resolution of forces. Resultant of coplanar force system (Concurrent forces, parallel forces and non-concurrent Non-parallel system of forces). Moment of force about a point, Couples, Varignon's Theorem. Force couple system. Distributed Forces in plane. | CO1 | 06 |
| 2 | **Equilibrium of System of Coplanar Forces:** Equilibrium concept, Conditions of equilibrium for concurrent forces, parallel forces and non-concurrent non- parallel general forces and Couples. Free body diagrams. Equilibrium of rigid bodies. Types of beams, simple and compound beams, type of supports and reaction. Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges) | CO2 | 08 |
| 3 | **Kinematics of Particle:** Motion of particles with variable acceleration. Motion curves. Application of concepts of projectile motion and related numerical. Motion under gravity. | CO3 | 06 |
| 4 | **Kinematics of Rigid Body (Instantaneous center of rotation):** Translation, Rotation and General Plane motion of Rigid body. The concept of Instantaneous center of rotation (ICR) for the velocity. Location of ICR for up to 3 links mechanisms. Velocity analysis of rigid bodies using ICR. | CO4 | 04 |
| | **Total** | | 24 |

**Text Books:**

1 Engineering Mechanics by M.D. Dayal, 18 th edition2025

**Reference Books:**

1 Engineering Mechanics by R. C.Hibbeler, Pearson Education, 15 th edition 2024

2 Engineering Mechanics by Beer &Johnston, Tata McGrawHill, 12 th edition 2019

3 Engineering Mechanics by E W Nelson, Charles L Best, Merle C Poller, Mc-Graw Hill, 7 th edition 2022

4 Engineering Mechanics by A K Tayal, UmeshPublication 14th edition, 2025

**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. The rubrics can be any 2 or max 4 of the following:

# First year Bachelor of Technology

| 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 the marks can be left blank (with discretion of faculty) | 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

## Subject : Program Core Course: Electronic Measurement and Instrumentation

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARPC11 | Electronic Measurement and Instrumentation | 02 | --- | --- | 02 | --- | --- | 02 |

## Electronic Measurement andInstrumentation (Theory)

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARPC11 | Electronic Measurement and Instrumentation | 02 | – | – | 02 | – | – | 02 |

| Examination Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | Theory | | | Exam Duration (in Hrs) | Term Work | Practical & Oral | Total |
| | | Internal Assessment | | ESE | | | | |
| | | MT | CA | | | | | |
| 26ARPC11 | Electronic Measurement and Instrumentation | 20 | 20 | 60 | 2 | – | – | 100 |

**Course Objectives:**

1 Foster an understanding of the fundamental principles of measurement.

2 Cultivate a comprehension of electronic indicating instruments..

3 To develop the understanding of DC and AC bridges and their applications.

4 To introduce the working principles and applications of oscilloscopes and signal generators.

**Course Outcomes:** Upon successful completion of this course, students will acquire the following abilities,

**CO1** Assess the quality of instruments based on static characteristics and perform statistical analysis of measurement errors.

**CO2** Grasp the principles governing the functionality of electronic indicating instruments

**CO3** Recognize and formulate bridge circuits for both DC and AC measurements.

**CO4** Use oscilloscopes and signal generators to measure and analyze electrical waveforms.

# First year Bachelor of Technology

| Module | | Content | CO | Hrs. |
|---|---|---|---|---|
| 1 | | **MEASUREMENT AND ERROR** | CO1 | 07 |
| | 1.1 | Definitions: Instrument, Accuracy, Precision, Sensitivity, Resolution, Significant Figures.. | | |
| | 1.2 | Types of Error: Gross errors, Systematic error and random error.. | | |
| | 1.3 | Statistical Analysis: Arithmetic Mean, Deviation from the Mean, Average Deviation and Standard Deviation. | | |
| | 1.4 | Probability of Errors: Normal Distribution of Errors, Probable Error. | | |
| | 1.5 | Limiting Errors. | | |
| 2 | | **INDICATING INSTRUMENTS** | CO2 | 07 |
| | 2.1 | DC Ammeter and Voltmeters: Basic and multirange, Voltmeter Sensitivity, Ohms-per-volt Rating and Loading Effect, Voltmeter-Ammeter Method of Measuring Resistance. | | |
| | 2.2 | Ohmmeters: Series and Shunt-Type Ohmmeters. Calibration of DC Instruments, Multimeter. | | |
| 3 | | **BRIDGES AND THEIR APPLICATIONS** | CO3 | 07 |
| | 3.1 | Introduction | | |
| | 3.2 | DC Bridges: Wheatstone Bridge, Kelvin Bridge | | |
| | 3.3 | AC Bridges and Their Application, Comparison Bridges, Maxwell Bridge, Schering Bridge, Unbalance condition, Wien Bridge. | | |
| 4 | | **ELECTRONIC TEST EQUIPMENTS** | CO4 | 05 |
| | 4.1 | Oscilloscope: Introduction, Oscilloscope Block Diagram, Cathode Ray Tube (CRT), CRT circuits, Introduction to Digital Storage Oscilloscope (DSO),. | | |
| | 4.2 | Signal Generators: Introduction and Applications, Block Diagram and working of Signal Generator, Types of Signal Generators: Sinusoidal Signal Generator; Function Generator. | | |
| | | **Total Hrs** | | **26** |

**Textbooks:**

1 Modern Electronic Instrumentation and Measurement Techniques by A. D. Helfrick and W. D. Cooper, PHI Learning Private Ltd.2023.

2 Electronic Instrumentation by H. S. Kalsi, Fourth Ed., McGraw Hill, 2019

**References:**

1 Instrumentation: Devices and Systems by C. S. Rangan, G. S. Sarma, and V.S.V. Mani, McGraw Hill Education- 2nd Edition, 2017

2 Measurement Systems: Application and Design by Ernest O. Doebelin, McGraw Hill Education-Sixth Edition-2017

# First year Bachelor of Technology

**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. 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 the marks can be left blank (with discretion of faculty) | 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

## Subject : Fundamentals of Vedic Mathematics

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARIK11 | 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 |
| 26ARIK11 | 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 | | | | | |
| 26ARIK11 | 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 (Theory) | 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 (Theory) | 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 (Theory) | --- | 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<br>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<br>1. Concept of Fundamental Rights vis a vis Directive Principles of State Policy<br>2. Definition of State and Instrumentalities of State<br>3. Enumerated Fundamental Rights<br>4. Enforceability of Fundamental Rights vis -a -vis Directive Principles of State Policy<br>5. Primacy of Fundamental Rights and Directive Principles of State Policy<br>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 |
| 26ARVS11 | 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 |
| 26ARVS11 | 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 | | | | | |
| 26ARVS11 | 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 :**<br>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 :**<br>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:**<br>**House Wiring**<br>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.<br>**PCB**<br>Design, Layout drawing, Positive and negative film making, PCB etching and drilling,<br>Tinning and soldering technique, component mounting and circuit testing. | **LO3** | **12** |
| **Trade-4** | **Hardware and Networking :**<br>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:**<br>Fitting Job Submission & Job Sheet Submission - 13 Marks<br>Carpentry Job Submission & Job Sheet Submission - 13 Marks<br><br>**Basic Electrical workshop:**<br>PCB & House Wiring : 12 Marks<br><br>**Hardware and Networking :**<br>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

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**Group B**
**Branch: Automation and Robotics(AURO)**
**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) | 26ARBS21 | Mathematics-II | 03 | -- | 01 | 03 | -- | 01 | 04* |
| Engineering Science Course (ES) | 26ARBS22 | Fundamentals of Programming -C | 03 | 02 | – | 03 | 01 | -- | 04* |
| Engineering Science Course (ES) | 26ARES21 | Engineering Mechanics | 03 | – | – | 03 | – | -- | 03* |
| Programme Core Course (PC) | 26AE21 | Programme Core Course-EMI | 02 | – | – | 02 | – | – | 02* |
| Indian Knowledge System (IK) | 26ARVS21 | Fundamentals of Vedic Mathematics | 02 | -- | – | 02 | -- | -- | 02 |
| Value Education (VE) | 26VE21 | Universal Human Values-II | 02 | -- | -- | 02 | -- | -- | 02 |
| Vocational/Skill Enhancement course (VS) | 26CC21 | Basic Workshop Practice | – | 04 | – | – | 02 | – | 02 |
| Co curricular Activity (CC) | 26ARBS21 | Co curricular Course -I | -- | 04 | -- | – | 02 | -- | 02 |
| Total Credit | | | | | | | | | 21 |

For Engineering visualization lab 02 (DH)+ *02(AutoCAD) Batchwise
Note: * indicates theory paper
Total credits sem II =21

**Semester II -Examination Scheme**

| Course Type | Course Code | Course Name | Theory | | | TW | Pr/Oral | Total |
|---|---|---|---|---|---|---|---|---|
| | | | MT | CA | ESE | | | |
| Basic Science Course (BS) | 26ARBS21 | Mathematics-II | 20 | 20 | 60 | – | – | 100 |
| Basic Science Course (BS) | 26ARBS22 | Engineering Sciences | 20 | 20 | 60 | 25 | – | 125 |
| Engineering Science Course (ES) | 26ARES21 | Basic Electrical Engineering | 20 | 20 | 60 | 25 | – | 125 |
| Ability Enhancement Course (AE) | 26AE21 | Professional Communications and Ethics-I | 20 | 80 | – | – | – | 100 |
| Vocational and skill enhancement course (VSEC) | 26ARVS21 | Engineering visualization lab | – | – | – | 25 | 25 | 50 |
| Value Education (VE) | 26VE21 | Universal Human Values-II | – | 20 | – | – | – | 20 |
| Co curricular Activity (CC) | 26CC21 | Co curricular Course -II | – | – | – | – | 25 | 25 |
| Total | | | | | | | | 545 |

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# Detailed Syllabus

# Semester II

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## Subject : Mathematics-II

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARBS21 | 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 |
| 26ARBS21 | 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 | | | | | |
| 26ARBS21 | Mathematics-II | 20 | 20 | 60 | 2 | - | - | 100 |

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

**Course Objectives:**

To develop mathematical proficiency in double integrals, Laplace transforms, Fourier series and transforms, and Z-transforms, enabling students to apply these analytical techniques and their properties to model, analyze, and solve problems related to automation, robotics, control systems, and engineering applications.

**Course Outcomes**

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

**CO1.** Evaluate double integrals using Cartesian and polar coordinates, including change of order, coordinate transformation, and Jacobian.

**CO2.** Apply Laplace transform techniques and their properties to solve mathematical problems.

**CO3.** To develop the ability to find inverse Laplace transforms using standard functions, partial fractions, and the convolution theorem.

**CO4.** To develop the ability to obtain Fourier series expansions of periodic, even, and odd functions, including half-range sine and cosine series.

**CO5.**To introduce Fourier transform techniques and develop the ability to evaluate Fourier integrals, sine and cosine transforms, and apply their properties.

**CO6.** Apply Z-transform techniques, including standard transforms, properties, convolution theorem, and inverse Z-transforms using partial fractions.

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| Module | Content | COs | Hrs. |
|---|---|---|---|
| Prerequisite | Basic Calculus, Integration, Differential Equations, Matrices, and Complex Numbers. | | |
| 1 | **Double Integrals** | CO1 | 06 |
| | **1.1** Evaluation of Double integral in cartesian and polar coordinates, Double integral in rectangular and non rectangular region<br>**1.2** Change of order of integration, Change of coordinates from Cartesian to Polar coordinates, Jacobian. | | |
| 2 | **Laplace Transform** | CO2 | 08 |
| | **2.1** Definition and conditions for the existence of Laplace transforms, Laplace transforms of standard functions such as $e^{at}$, $sin(at)$, $cos(at)$, $sinh(at)$, $cosh(at)$ and $t^n$, $n \geq 0$.<br>**2.2** Properties Laplace transforms, including linearity, first shifting theorem, second shifting theorem, change of scale, multiplication by t and division by t. | | |
| 3 | **Inverse Laplace transform and convolution theorem** | CO3 | 07 |
| | **3.1** Definition, basic properties, and inverse Laplace transform of standard functions<br>**3.2** Inverse Laplace transforms using partial fractions and the convolution theorem. | | |
| 4 | **Fourier Series** | CO4 | 06 |
| | **4.1** Dirichlet's conditions, Euler's formulae, Fourier series expansions of periodic functions with period $2\pi$.<br>**4.2** Fourier series of even and odd functions, change of interval, and half-range sine and cosine series | | |
| 5 | **Fourier Transform** | CO5 | 05 |
| | **5.1** Fourier integrals, Fourier cosine and sine integrals<br>**5.2** Fourier transforms, Fourier sine and cosine transform, and properties of Fourier transforms. | | |
| 6 | **Z-Transform Techniques** | CO6 | 07 |
| | **6.1** Definition and region of convergence of Z-transforms, Z-transforms of standard functions such as $\{k^n a^k\}, \{a^{\lvert k \rvert}\}, \{k + nC_n a^k\}, \{c^k sin(\alpha k + \beta)\}, \{c^k sinh\alpha k\}, \{c^k cosh\alpha k\}$.<br>**6.2** Properties of Z-transforms including change of scale,shifting property, multiplication and division by k, Convolution theorem.<br>**6.3** Inverse Z-transforms using the partial fraction method. | | |
| | **Total No. of Hrs.** | | 39 |

**Textbooks:**

1. B. S. Grewal, *Higher Engineering Mathematics*, 45th Edition, Khanna Publishers, 2024.
2. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, 5th Edition, Narosa Publishing House, 2016.

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**Reference Books:**

1. N. P. Bali and Manish Goyal, *A Textbook of Engineering Mathematics*, 10th Edition, Laxmi Publications, 2019.
2. H. K. Dass, Rajnish Verma and Rama Verma, *Advanced Engineering Mathematics*, 23rd Edition, S. Chand Publishing, 2024.
3. B. S. Grewal, *Higher Engineering Mathematics*, 45th Edition, Khanna Publishers, 2024.
4. Michael D. Greenberg, *Advanced Engineering Mathematics*, 2nd Edition, Pearson Education, 1998. The 2nd edition is the latest edition identified for this title; the Indian edition was subsequently issued by Pearson.
5. S. D. Sharma and Himanshu Sharma, *Operations Research: Theory, Methods and Applications*, 15th Edition, Kedar Nath Ram Nath, 2020.
6. Murray R. Spiegel, *Schaum's Outline of Laplace Transforms*, 1st Edition, McGraw-Hill, 1965. This title does not appear to have a newer edition; the original edition remains the latest identified edition.
7. Ronald E. Mickens, *Difference Equations: Theory, Applications and Advanced Topics*, 3rd Edition, CRC Press, 2015.

**Useful Links**

**NPTEL Courses**

- https://nptel.ac.in/courses/111105041?utm_source=
- https://nptel.ac.in/courses/111106111?utm_source=
- https://nptel.ac.in/courses/111106050?utm_source=

**MIT OpenCourseWare**

- https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/?utm_source=
- https://ocw.mit.edu/courses/6-041sc-probabilistic-systems-analysis-and-applied-probability-fall-2013/?utm_source=

**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:**

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 |

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| | | |
|---|---|---|
| **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**.

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## Subject :Engineering Science

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARBS22 | 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 |
| 26ARBS22 | 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 | | | | | |
| 26ARBS22 | 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

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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**<br>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<br>**Fuel**<br>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<br>Liquid fuels-Petrol-knocking, Octane Number, Cetane number, Anti Knocking agents, unleaded petrol, oxygenates (MTBE), catalytic converter<br>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**<br>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** |

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| | | | |
|---|---|---|---|
| | 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<br>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)<br>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.<br><br>**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<br><br>**Bioinformatics :-**<br><br>Definition, scope, and importance of bioinformatics Role of bioinformatics in modern biology, medicine, agriculture, and sustainability<br><br>**Advance materials and Nano technology**<br><br>Polymers:-Types, Properties Synthetic methods of formation of Kevlar: Urea formaldehyde, PMMA,Phenol formaldehyde Conducting polymers, Definition, Types, Applications<br><br>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.

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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.

**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.

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## Subject :Engineering Sciences Laboratory

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARBS22 | 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 | | | | | |
| 26ARBS22 | Engineering Science | - | - | - | - | 25 | – | 25 |

**Lab 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.

**Lab 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:** | | **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 |
| 5 | Study of variation of reverse current with changing light intensity of given photo diode. | CO2 |

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| | | |
|---|---|---|
| 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.

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## Subject :Basic Electrical Engineering

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARES21 | 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 |
| 26ARES21 | 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 | | | | | |
| 26ARES21 | 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

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| 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** | CO1 | 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** | CO2 | 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** | CO3 | 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** | CO4 | 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** | CO5 | 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. | | |

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| | | | | |
|---|---|---|---|---|
| 6 | | **Batteries and Electrical Safety** | CO6 | 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 |

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| | | |
|---|---|---|
| 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) | 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 |
| 26ARES21 | 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 | | | | | |
| 26ARES21 | 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.

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| Suggested Experiments: Students are required to complete at least 8 experiments. | | |
|---|---|---|
| **Sr. No.** | **Name of the Experiment** | **LOs** |
| 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.<br>Term work will be assessed based on the students' performance in the laboratory. |
| **Continuous assessment exam** | |
| | Based on the subject and related lab |

# 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.

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

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| | | | |
|---|---|---|---|
| | • Dateline<br>• Inside Address<br>• Reference Line (Optional)<br>• Attention Line (Optional)<br>• Salutation<br>• Subject Line<br>• Body<br>• Complimentary Close<br>• Signature Block<br>• Enclosures/Attachments<br>• Complete/Full Block Format<br>**3.3**. Emails<br>• Format of Emails<br>• Features of Effective Emails<br>• Language and style of Emails<br>**3.4.** Types of Letters in Both Formal Letter Format and Emails<br>• Claim and Adjustment Letters<br>• Request/Permission Letters<br>• Sales Letters | | |
| **4** | **Personality Development and Social Etiquettes** | **CO4** | **02** |
| | **4.1** Personality Development<br>• Introducing Self and/or a Classmate<br>• Formal Dress Code<br>**4.2**. Social Étiquettes<br>• Formal Dining Étiquettes<br>• Cubicle Étiquettes<br>• Responsibility in Using Social Media<br>• Showing Empathy and Respect<br>• Learning Accountability and Accepting Criticism<br>• Demonstrating Flexibility and Cooperation<br>• 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.<br>• Book review presentation | | |
| | **Total Engagement Hours** | | **13** |

# First year Bachelor of Technology

**List of Tutorials:**

| Sr.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<br>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 |

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| | | | | |
|---|---|---|---|---|
| **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:**

- Assessment consists of one Mid Term Test of 20 marks and Continuous Assessment of 80 marks.
- Mid Term test is to be conducted when approx. 60% syllabus is completed.
- 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.

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| 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 |
| 26ARVS21 | 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 |
| 26ARVS21 | 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**

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

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

| Sr No. | Topic | LO'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. | LO1 | 08 |
| 2 | **Sectional Orthographic Projections:** Basic concept and significance of sectional orthographic projections. Full sectional view of simple machine parts (Excluding half section). | LO1 | 08 |
| 3 | **Isometric Views:** Isometric Views, Conversion of Orthographic Views to Isometric Views (Excluding Sphere and circle on an inclined plane). | LO2 | 08 |
| | **Total Hours** | | 24 |

# First year Bachelor of Technology

## Engineering Visualization Lab
## Auto CAD (Laboratory)

| Teaching Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | (Teaching Hours) | | | Credits Assigned | | | |
| | | Th | Pr | Tut | Th | Pr | Tut | Total |
| 26ARVS21 | Engineering Visualization Lab | - | 2 | - | - | 2 | - | 2 |

| Examination Scheme | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Course Code | Course Name | Theory | | | Practical Exam Duration (in Hrs) | Term Work | Practical & Oral | Total |
| | | Internal Assessment | | ESE | | | | |
| | | MT | CA | | | | | |
| 26ARVS21 | Engineering Visualization Lab | - | - | - | 2 | 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.

**LO41** 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. | LO1,3,4 | 08 |
| 2 | **Customization & CAD Drawing:** | LO2,3,4 | 08 |

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| | | | |
|---|---|---|---|
| | 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. | | |
| **3** | **Annotations and other Functions Covering:**<br>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.<br>Visualizing and drawing 3-D models by using AutoCAD 3-D software. | **LO2,3,4** | **08**<br><br>**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**<br>2. AutoCAD assignments to be printed on A4 size sheets - **15 Marks** | **25 Marks** |
| **Practical Examination** | 1. Solve 2 compulsory questions.<br>2.Question on Orthographic Projection / Sectional Orthographic Projection - 15 Marks<br>3. Question on Isometric Projection- 10 Marks<br>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** |

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**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.

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(5 Marks)**

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