AC: 01/02
Item no. 02

# The Bombay Salesian Society's

# Don Bosco Institute of Technology, Mumbai

(An Autonomous Institute affiliated to University of Mumbai)

**Department of Basic Science and Humanities**

**CURRICULUM STRUCTURE FOR FIRST YEAR ENGINEERING**
**SEM I**

**(As Per NEP 2020)**

## (Scheme: DB25-V1)
## Effective from Academic Year 2025-2026

# 1. Preamble

Don Bosco Institute of Technology, Kurla, Mumbai, proudly celebrates the achievement of autonomous status—an academic milestone that reaffirms our steadfast commitment to excellence, holistic development, and student-centric learning. This autonomy empowers us to craft and implement a curriculum that is forward-looking, contextually relevant, and deeply rooted in our institutional values and the aspirations of our nation.

As an autonomous institution affiliated with the University of Mumbai, DBIT embraces the opportunity to restructure its academic framework in alignment with the University Grants Commission (UGC) guidelines and the National Education Policy (NEP) 2020. This curriculum framework outlines the undergraduate engineering programs for the EXTC, COMP, IT, and MECH branches. It reflects NEP's emphasis on multidisciplinary learning, flexibility, and outcome-based education, while staying true to the Don Bosco educational philosophy.

The curriculum adopts a top-down approach, beginning with the institutional Vision and Mission, which guides the definition of Program Educational Objectives (PEOs) and Program Outcomes (POs). These outcomes are used to shape Course Outcomes (COs) and the content and assessment methods of each course. This ensures that all academic efforts remain aligned with the broader goals of transforming learners into technically sound, ethically responsible and socially aware citizens. Importantly, this curriculum has been shaped through extensive consultations with stakeholders, including industry experts, academic peers, alumni, and students—to ensure that it remains aligned with contemporary industry requirements and societal expectations. Their inputs have been instrumental in designing a framework that bridges the gap between academic learning and practical applicability.

**Key Objectives in developing syllabus are:**

1. **Develop Strong Technical Foundations:** Equip students with robust knowledge and skills in core engineering domains to solve real-world problems through design, analysis, and innovation.

2. **Foster Research, Innovation, and Entrepreneurship:** Cultivate a spirit of inquiry, critical thinking, and entrepreneurial mind-set to promote research-based problem-solving and start-up culture.

3. **Enhance Interdisciplinary and Industry-Ready Competencies:** Integrate emerging technologies, multidisciplinary learning, and practical exposure to prepare

Students for dynamic industry requirements and lifelong learning.

4. **Promote Ethical, Sustainable, and Socially Responsible Engineering Practice:** Inculcate ethics, human values, and environmental consciousness to enable students to contribute meaningfully to society and sustainable development.

5. **Empower Communication, Leadership, and Teamwork Abilities:** Strengthen students' soft skills, collaboration, and leadership to perform effectively in diverse professional and global environments.

**Academic design includes:**

- A Choice-Based Credit System (CBCS) for flexibility
- A range of Minor and Honors options to encourage specialization and research
- Opportunities for field engagement, internships, and experiential learning
- Emphasis on skill enhancement and future workforce needs
- Integration of ethical reasoning, social awareness, and environmental consciousness

As an institution inspired by the values of Saint John Bosco, we strive to create a joyful and inclusive learning environment that fosters creativity, curiosity, and compassion. Through this curriculum framework, we renew our pledge to produce graduates who are not only professionally competent but also committed to the greater good of society.

## 2. Vision and Mission

**Vision:**

DBIT will be known to have an innovative, enjoyable, and holistic learning environment that transforms individuals into socially conscious citizens the Don Bosco way, and will lead in research and entrepreneurship in the area of sustainable technologies.

**Mission:**

1. To create future engineers who work with honesty and integrity and excel in the use of technology for the benefit of the underprivileged.

2. To train engineers to be innovative problem-solvers and entrepreneurs who engage in research and lifelong learning.

3. To provide a diverse and stimulating environment for staff and students to grow holistically.

## 3. Curriculum Design Philosophy

The curriculum is structured in alignment with the National Education Policy (NEP) 2020 and UGC guidelines. It follows a top-down approach wherein the institutional Vision and Mission guide the Program Educational Objectives (PEOs) and Program Outcomes (POs). These shapes the Course Outcomes (COs) and form the foundation for the course structure, the delivery, and the assessments.

**Key design principles include:**

- Emphasis on Outcome-Based Education (OBE) with clear mappings of COs to POs
- Integration of core technical knowledge with interdisciplinary electives
- Inclusion of vocational skills, internships, and community engagement
- Development of entrepreneurship and research aptitude through minor and honors pathways
- Encouragement of ethical, sustainable, and socially responsible engineering practices

This approach ensures that the curriculum remains academically rigorous, industry-relevant, and value-driven.

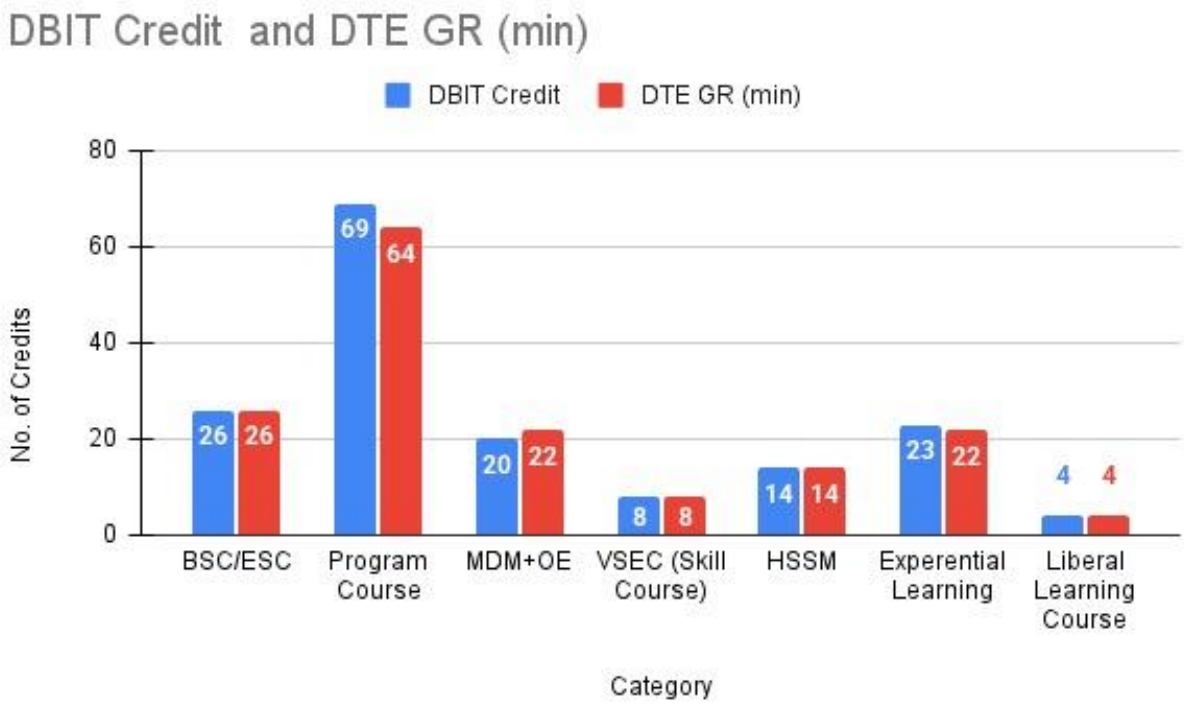
## 4. Credit Guidelines and Allocation

The curriculum is delivered through a structured credit system as follows:

| Activity Type | Credit Definition |
|---|---|
| Theory Course | 1 Credit = 15 Contact Hours |
| Laboratory / Studio / Workshop | 1 Credit = 30 Contact Hours |
| Internship / Field Work | 1 Credit = 40 Hours or 02 weeks |
| Seminar / Group Discussions | 1 Credit = 15 Hours |
| Community Engagement / Field Project | 1 Credit = 30 Hours |

## DBIT Overall Curriculum Credit Structure

| Semester | | I | II | III | IV | V | VI | VII | VIII | Total Credits | DTE Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic Science Course | BSC/ESC | 9 | 6 | | | | | | | 15 | 14-18 |
| Engineering Science Course | | 7 | 4 | | | | | | | 11 | 12 - 16 |
| Programme Core Course (PCC) | Program Courses | | 3 | 16 | 14 | 6 | 6 | 6 | | 51 | 44-56 |
| Programme Elective Course (PEC) | | | | | | 3 | 3 | 6 | 6 | 18 | 20 |
| Multidisciplinary Minor (MD M) | Multidisciplinary Courses | | | | 3 | 4 | 4 | 3 | | 14 | 14 |
| Open Elective (OE) Other than a particular program | | | | | 2 | 2 | | 2 | | 6 | 8 |
| Vocational and Skill Enhancement Course (VSEC) | Skill Courses | 3 | 3 | 2 | | | | | | 8 | 8 |
| Ability Enhancement Course (AEC -01, AEC-02) | Humanities Social Science and Management (HSSM) | | 2 | | | 2 | | | | 4 | 4 |
| Entrepreneurship/Economics/ Management Courses | | | | | 2 | | 2 | | | 4 | 4 |
| Indian Knowledge System (IKS) | | | 2 | | | | | | | 2 | 2 |
| Value Education Course (VEC) | | 2 | | 2 | | | | | | 4 | 4 |
| Research Methodology | Experiential Learning Courses | | | | | 2 | | | | 2 | 4 |
| Community. Engagement. Project (CEP)/ Field Project (FP) (Mini - Project) | | | | 1 | 1 | 1 | | | | 3 | 2 |
| Project | | | | | | | 3 | 3 | | 6 | 4 |
| Internship/ OJT | | | | | | | | | 12 | 12 | 12 |
| Co-curricular Courses (CC) | Liberal Learning Courses | | 1 | | 1 | | 1 | | 1 | 4 | 4 |
| **Total Credits (Major)** | | **21** | **21** | **21** | **23** | **20** | **19** | **20** | **19** | **164** | **160- 176** |



## 5. Degree Options and Exit Pathways

Students are offered flexible learning pathways through the following options:

**Undergraduate Degree Options:**

- B.E with MDM – Minimum 164 credits
- B.E with Double Minor/ Honors – 182 credits
- B.E Research with Research – 182 credits

**Multiple Entry-Exit Options (Aligned with NEP 2020):**

| Exit Options | Credits Structure |
|---|---|
| Certificate after Year 1: | 42 Credits + 08 credits (04 credit Exit Course + 04 Summer internship). |
| Diploma after Year 2: | 86 credits + 08 credits (04 credit Exit Course + 04 Summer internship). |
| B. Vocational Degree after Year 3: | 125 credits + 08 credits (04 credit Exit Course + 04 Summer internship). |

Credits earned are banked in the Academic Bank of Credits (ABC) for lifelong learning flexibility.

## Abbreviations Used:

| | |
|---|---|
| AEC | Ability Enhancement Course |
| AEL | Ability Enhancement Laboratory |
| BSC | Basic Science Course |
| BSL | Basic Science Laboratory |
| CEP | Community Engagement Project |
| CC | Co-curricular Courses |
| CIE | Continuous Internal Evaluation |
| EEM | Entrepreneurship, Economics and Management |
| ELC | Experiential Learning Courses |
| ESC | Engineering Science Course |
| ESE | End Semester Examination |
| ESL | Engineering Science Laboratory |
| FP | Field Project |
| HSSM | Humanities Social Science and Management |
| IKS | Indian Knowledge System |
| L | Lecture |
| LLC | Liberal Learning Courses |
| MDM | Multidisciplinary Minor |
| MSE | Mid Semester Exam |
| OE | Open Elective |

| | |
|---|---|
| OJT | On Job Training |
| P | Practical |
| PCC | Program Core Course |
| PCL | Program Core Laboratory |
| PEC | Program Elective Course |
| T | Tutorial |
| VEC | Value Education Course |
| VSEC | Vocational and Skill Enhancement Course |

# Curriculum Scheme and Structure: Semester I

| Semester I | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Vertical** | **Course Name** | **Teaching Scheme (Contact Hours)** | | | **Credits Assigned** | | | |
| | | | **L** | **P** | **T** | **L** | **P** | **T** | **TOTAL** |
| 25FE1BSC01 | BSC | Fundamentals of Engineering Mathematics –I | 3 | - | 1 | 3 | - | 1 | **4** |
| 25FE1BSC02 | BSC | Applied Physics | 2 | 1 | - | 2 | 0.5 | - | **2.5** |
| 25FE1BSC03 | BSC | Engineering Chemistry | 2 | 1 | - | 2 | 0.5 | - | **2.5** |
| 25FE1ESC01 | ESC | Engineering Graphics | 2 | 2 | - | 2 | 1 | - | **3** |
| 25FE1ESC02 | ESC | Basic Electrical and Digital Electronics | 3 | 2 | - | 3 | 1 | - | **4** |
| 25FE1VSEC01 | VSEC | Workshop – I | - | 2 | - | - | 1 | - | **1** |
| 25FE1VSEC02 | VSEC | Problem Solving using C programming | - | 2*+ 2 | - | - | 2 | - | **2** |
| 25FE1VEC01 | VEC | Universal Human Values | 2 | - | - | 2 | - | - | **2** |
| | | **Total** | **14** | **12** | **1** | **13** | **6** | **1** | **21** |

* Two hours of demo/discussion for entire class

# Examination Marking Scheme: Semester I

| Semester I | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Vertical** | **Course Name** | **Examination Mark** | | | | | |
| | | | **CA** | **MSE** | **ESE** | **TW** | **OR/PR** | **Total** |
| 25FE1BSC01 | BSC | Fundamentals of Engineering Mathematics –I | 20 | 30 | 50 | 25 | - | **125** |
| 25FE1BSC02 | BSC | Applied Physics | 20 | 30 | 50 | 25 | - | **125** |
| 25FE1BSC03 | BSC | Engineering Chemistry | 20 | 30 | 50 | 25 | - | **125** |
| 25FE1ESC01 | ESC | Engineering Graphics | 20 | 30 | 50 | 25 | - | **125** |
| 25FE1ESC02 | ESC | Basic Electrical and Digital Electronics | 20 | 30 | 50 | 25 | 25 | **150** |
| 25FE1VSEC01 | VSEC | Workshop-I | 50 | - | - | - | - | **50** |
| 25FE1VSEC02 | VSEC | Problem Solving using C Programming | 25 | - | - | - | 25 | **50** |
| 25FE1VEC01 | VEC | Universal Human Values | 50 | - | - | - | - | **50** |
| **Total** | | | **225** | **150** | **250** | **125** | **50** | **800** |

# Assessment Methodology

| Types of Courses | Assessment Tools | Marks Distribution |
|---|---|---|
| **Theory** | **CA-20** | Certification: NPTEL (20 Marks) (Approved by instructor)<br>OR<br>Any two Pedagogies (10 marks each)<br>MCQ /Class Test<br>Case study/Assignment<br>GATE based Tutorial<br>MOOCs Certification (Approved by instructor)<br>Open Book Test<br>Working model/simulation of a course-based concept. |
| **Theory** | **CA-25** | Certification: NPTEL (20 Marks) (Approved by instructor)<br>Active Participation and Timely Submission of Laboratory and Programming Assignments ( 5 Marks)<br>OR<br>Any two Pedagogies (10 marks each) and Active Participation and Timely Submission of Laboratory and Programming Assignments (5 Marks)<br>• MCQ /Class Test<br>• Case study/Assignment<br>• GATE based Tutorial<br>• MOOCs Certification (Approved by instructor)<br>• Open Book Test<br>• Working model / simulation of a course-based concept. |
| **Theory (VEC)** | **CA-50** | • Active Participation = 5 marks<br>• MCQ /Class Test= 10 marks<br>• Instructor Assessment of the Activity carried out by student for 25 marks<br>• Assignment = 10 marks |
| **Workshop** | **CA-50** | • Active Participation = 5 marks<br>• Trade 1# = 15 marks<br>• Trade 2# = 15 marks<br>• Trade 3# = 15 marks<br># Based on the performance and satisfactory completion of trade wise tasks. |

| | | |
|---|---|---|
| **Liberal Learning Courses (LLC)** | **CA-50** | • Active Participation = 5 marks<br>• Assessment of the Activity carried out by student = 25 marks<br>• Cultural Event Participation = 10 marks<br>• Technical Event Participation = 10 marks |
| **Theory** | **MSE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• MSE should be based on 50% syllabus.<br>• Time: 90 minutes (1 hour 30 minutes)<br>• Total Marks: 30 |
| **Theory** | **ESE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• Q4 A or B - 10 marks<br>• Q5 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• ESE should be based on 30% syllabus of MSE and 70% syllabus after MSE.<br>• Time: 120 minutes (2 hours)<br>• Total Marks: 50 |
| **Course - Laboratory** | **TW- 25** | • Active Participation (Lab) = 5 marks<br>• Laboratory Report = 10 marks<br>• Laboratory performance = 10 marks<br>Based on the performance and satisfactory completion of assigned laboratory work |
| **Tutorial** | **TW-25** | Active Participation = 5 marks<br>Tutorial Submission = 20 marks<br>• Tutorial based on the entire Syllabus |
| **Laboratory** | **OR-25** | Oral examination will be based on the entire syllabus. |
| **Laboratory** | **PR-25** | Practical examination will be based on the experiments performed by the students during laboratory sessions. |
| | | |

## Weightage of COs across all Assessments:

| Course Outcomes | Percentage |
|---|---|
| **CO-1, CO-2** | **20-30** |
| **CO-3, CO-4** | **40-50** |
| **CO-5, CO-6** | **20-30** |

*Note: Total Weightage of All CO's should be 100%

## Heads of Passing

a. Passing Criteria for Theory Course: 40% maximum marks in CA, MSE, ESE taken together
b. Passing Criteria for Laboratory/Tutorial (Term Work): 40% of maximum marks
c. Passing Criteria for Oral/Practical (Term Work): 40% of maximum marks

1. **Course Vertical-BSC-Fundamentals of Engineering Mathematics-I**

| Course Code | Course Name | Teaching Scheme (Hrs. / Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| 25FE1BSC01 | Fundamentals of Engineering Mathematics -I | **L** | **P** | **T** | **L** | **P** | **T** | **Total** |
| | | 3 | - | 1 | 3 | - | 1 | 4 |
| | | **Examination Scheme** | | | | | | |
| | | | **CA** | **MSE** | **ESE** | **TW** | **OR** | **PR** | **Total** |
| | | **Theory** | 20 | 30 | 50 | - | - | - | 100 |
| | | **Lab/Tut** | **-** | **-** | **-** | **25** | **-** | **-** | **25** |
| | | **Total** | **125** | | | | | | |

**Course Objectives:**

1. To develop a strong foundation in complex numbers and successive differentiation for engineering applications.

2. To be able to apply the principles of partial differentiation & vector calculus for modelling physical phenomena

3. To use matrix algebra for solving systems of linear equations and understand their applications in engineering.

4. To evaluate and implement numerical methods for obtaining more precise approximate solutions to equations and systems.

| | | |
|---|---|---|
| **Course Outcomes** | After successful completion of the course, the students will be able to | |
| | CO1 | Recall key definitions and properties of complex numbers, functions, matrices, and differentiation, scalar and vector fields. |
| | CO2 | Explain the physical meaning of complex functions, partial and higher derivatives, and gradients, system of Linear Equations, divergence and curl. |
| | CO3 | Use De Moivre's for roots, Chain Rule for partials, Leibnitz for nth derivatives, separation of real & imaginary parts for deductions, irrational fields for work, Taylor for expansions, partials for extrema, matrix forms for rank and numerical methods.(Applying) |
| | CO4 | Analyze Euler's Theorem for deductions, higher-derivative patterns, solutions of linear systems, and polynomial roots via De Moivre's theorem. (Analyzing) |
| | CO5 | Assess, Compare and Identify methods for nth derivatives, matrix inverses, numerical algorithms (bisection, Newton–Raphson, Regula–Falsi, Gauss–Seidel, and Gauss–Jacobi) for convergence, accuracy and efficiency (Evaluating). |
| | CO6 | Design and implement mathematical models and numerical algorithms in SCILAB/Python/ C to simulate and validate engineering solutions. |

**Syllabus:**

| Module | Unit No. | Topics | Hours |
|---|---|---|---|
| **1** | | **Complex Numbers and its Functions** | |
| | 1.1 | Review of Complex Numbers-Algebra of Complex Numbers, Cartesian, polar and exponential form of complex number, Statement of De Moivre's Theorem. | 12 |
| | 1.2 | Expansion of sin ^n θ, cos^n θ in terms of sines and cosines of multiples of θ and Expansion of sin(nθ), cos(nθ) in powers of sin(θ), cos(θ). | |
| | 1.3 | Powers and Roots of a complex number. | |
| | 1.4 | Complex functions: Circular, Hyperbolic, Inverse Hyperbolic Functions, Logarithm of Complex Number. Separation of real and imaginary parts of all types of Functions | |
| | Self-Learning Topics | Representing roots of complex numbers on Argand's plane | |
| **2** | | **Successive differentiation and Expansion of functions** | |
| | 2.1 | Successive differentiation: nth derivative of standard functions. Leibnitz's Theorem | 6 |
| | 2.2 | Taylor's Theorem and Taylor's series, Maclaurin's series.<br>Expansion of exp(x), sin(x), cos(x), tan(x), sinh(x), cosh(x),tanh(x), log(1+x). | |
| | Self-Learning Topics | Indeterminate forms, L- Hospital Rule. | |
| **3** | | **Partial Differentiation and its Application** | |
| | 3.1 | Partial Differentiation: Functions of two and three variables, Partial derivatives of first and higher orders. Differentiation of composite functions (Chain rule) | 8 |
| | 3.2 | Euler's Theorem on Homogeneous functions for 2 and 3 variables (without proof); Deductions from Euler's Theorem (without proof) | |
| | 3.3 | Maxima and Minima of a function of two independent variables | |
| | Self-Learning Topics | Applications of partial differentiation in weather modeling, wave equation, sensitivity analysis | |
| **4** | | **Matrices** | |
| | 4.1 | Types of Matrices (Hermitian, Skew Hermitian, Unitary, Orthogonal Matrices) | 8 |

| | | | |
|---|---|---|---|
| | 4.2 | Rank of a Matrix: using Echelon form, reduction to normal form, and PAQ form | |
| | 4.3 | System of homogeneous and non - homogeneous equations, their consistency, and solutions | |
| | 4.4 | Solutions of Systems of Linear Equations using Gauss elimination and Gauss-Jordan methods | |
| | Self-Learning Topics | Properties of matrices, Applications of matrices in Coding theory, Circuit analysis, signal processing, computer graphics, data transformation | |
| **5** | | **Introduction to Vector Calculus**<br>**Prerequisite:** Dot and Cross products of vectors | |
| | 5.1 | Scalar and Vector Fields; Gradient of a scalar field | 6 |
| | 5.2 | Directional Derivative of a scalar point function and its maximum rate of change | |
| | 5.3 | Divergence and Curl of a vector field, Solenoidal and irrotational (conservative) vector fields. | |
| | 5.4 | Physical significance of vector calculus in Engineering | |
| | Self-Learning Topics | Applications in Fluid flow, Electromagnetic waves, Control systems, Signal Processing and Machine Learning | |
| **6** | | **Numerical Methods** | |
| | 6.1 | Solution of Transcendental Equations: Solutions by Bisection, Newton Raphson and Regula –Falsi methods | 5 |
| | 6.2 | Gauss Jacobi and Gauss Seidel methods to solve System of Linear Equations | |
| | 6.3 | Engineering Applications of numerical methods | |
| | Self-Learning Topics | Applications in structural engineering, work done and energy calculations | |
| | | **TOTAL** | 45 |

**Text Books:**


1. B S Grewal [2017] *Higher Engineering Mathematics*, Khanna Publishers.
2. B V Ramana [2009] *Higher Engineering Mathematics*, Mc Graw Hill Publications
3. N.P. Bali [2007] *Engineering Mathematics*, Laxmi Publication 8th edition.

**Reference Books:**

1. Kreyszig, Erwin 10thEd [2011] *Advanced Engineering Mathematics*, New Delhi Wiley Eastern Limited.

2. D.G. Zill and M.R. Cullen, III ed. 3rd reprint [2009] *Advanced Engineering Mathematics*, Narosa Publications

3. Spiegel, Murray R [C1974] *Theory And Problems Of Vector Analysis And An Introduction to Tensor Analysis*, McGraw-Hill Book Company

**Useful Links:**

1. **https:**//nptel.ac.in/courses/111105121 (**Engineering Mathematics - I, IIT Kharagpur**)
2. https://nptel.ac.in/courses/111105167 (**Advanced Engineering Mathematics, IIT Kharagpur**)

**Tutorials:** Students are expected to complete a minimum of 08 to 12 tutorials conducted batch-wise. Active participation, initiative, and creative engagement in all tutorials are expected.

| **Tut. No.** | **Suggested Tutorial Topics** |
|---|---|
| 1 | Complex Numbers |
| 2 | Hyperbolic and circular Functions |
| 3 | Logarithmic and Inverse Functions |
| 4 | Successive Differentiation & Taylor's Series |
| 5 | Partial Differentiation |
| 6 | Euler's Theorem and application of Partial differentiation |
| 7 | Rank of a Matrix using Echelon form, reduction to Normal form, and PAQ form |
| 8 | Solving System of Linear Equations using Matrices |
| 9 | Directional Derivative, Solenoidal and irrotational fields |
| 10 | Solving System of Linear Equations using Numerical Methods |
| 11 | **SCILAB/Python/C**:<br>(i) Basic operations and in-built functions on matrices, defining functions and understanding loops<br>(ii) Gauss Elimination Method<br>(iii) Gauss Seidal Iteration method<br>(iv) Gauss Jacobi Iteration Method |
| 12 | **SCILAB/Python/C**:<br>(i)Newton Raphson Method<br>(ii) Regula –Falsi method |

| | |
|---|---|
| | (iii) Bisection Method. |

**Assessment Methodology:**

| Type of Course | Assessment Tool | Marks Distribution |
|---|---|---|
| **Theory** | **CA-20** | Certification: NPTEL (20 Marks) (Approved by instructor)<br>OR<br>Any two Pedagogies (10 marks each)<br>MCQ /Class Test<br>Case study/Assignment<br>GATE based Tutorial<br>MOOCs Certification (Approved by instructor)<br>Open Book Test<br>Working model/simulation of a course-based concept. |
| **Theory** | **MSE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• MSE should be based on 50% syllabus.<br>• Time: 90 minutes (1 hour 30 minutes)<br>• Total Marks: 30 |
| **Theory** | **ESE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• Q4 A or B - 10 marks<br>• Q5 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• ESE should be based on 30% syllabus of MSE and 70% syllabus after MSE.<br>• Time: 120 minutes (2 hours)<br>• Total Marks: 50 |
| **Tutorial** | **TW-25** | • Active Participation = 5 marks<br>• Tutorial Submission = 20 marks<br>Tutorial based on the entire syllabus |

## 2. Course Vertical -BSC- Applied Physics

<table>
<tr><th>Course Code</th><th>Course Name</th><th colspan="4">Teaching Scheme (Hrs. / Week)</th><th colspan="4">Credits Assigned</th></tr>
<tr><td rowspan="8">25FE1BSC02</td><td rowspan="8">Applied Physics</td><td colspan="2">L</td><td>P</td><td>T</td><td colspan="2">L</td><td>P</td><td>T</td><td>TOTAL</td></tr>
<tr><td colspan="2">2</td><td>1</td><td>-</td><td colspan="2">2</td><td>0.5</td><td>-</td><td>2.5</td></tr>
<tr><td colspan="9">Evaluation Scheme</td></tr>
<tr><td></td><td>CA</td><td>MSE</td><td>ESE</td><td>TW</td><td>OR</td><td>PR</td><td colspan="2">Total</td></tr>
<tr><td>Theory</td><td>20</td><td>30</td><td>50</td><td>-</td><td>-</td><td>-</td><td colspan="2">100</td></tr>
<tr><td>Lab/Tut</td><td>-</td><td>-</td><td>-</td><td>25</td><td>-</td><td>-</td><td colspan="2">25</td></tr>
<tr><td>Total</td><td colspan="8">125</td></tr>
</table>

**Course Objectives:**

1. To introduce the principles of modern optics, including lasers and optical fibers, and their applications in communication and sensing technologies.
2. To develop an understanding of wave optics and quantum physics concepts, enabling analysis of interference, diffraction, and quantum behavior of particles.
3. To provide knowledge of semiconductor physics and the operation of basic electronic devices such as diodes and transistors, essential for electronics and instrumentation.
4. To familiarize students with electromagnetic theory using vector calculus and Maxwell's equations, and to explore the fundamentals and applications of various sensors in real-world systems.

| | | |
|---|---|---|
| **Course Outcomes** | **After successful completion, the students will be able to** | |
| | CO1 | Identify and describe fundamental principles of wave optics, lasers & fiber optics, quantum, semiconductor, sensors and electrodynamics. (Remembering) |
| | CO2 | Explain the physical laws and mechanisms governing wave optics, lasers & fiber optics, quantum, semiconductor, sensors and electrodynamics. (Understanding) |
| | CO3 | Use physics to calculate solutions for engineering problems in optics, quantum mechanics, and semiconductors. (Applying) |
| | CO4 | Analyze physical systems, identifying key components, relationships, in the context of wave optics, lasers, fiber optics, quantum mechanics, semiconductor physics, sensors, and electrodynamics. (Analyzing) |
| | CO5 | Assess and justify the best physics-based solutions for engineering problems, considering their limitations and impacts within optics, quantum mechanics, semiconductors, and sensing. (Evaluating) |
| | CO6 | Design a simple experiment or model to demonstrate a basic physics principle related to optics, quantum mechanics, or sensors. (Creating) |

**Syllabus:**

| Module No. | Unit No. | Topics | Hours |
|---|---|---|---|
| **1** | | **Lasers & Fiber optics** | |
| | 1.1 | Laser: Einstein's coefficients, spontaneous and stimulated emission, types of pumping, population inversion. | 5 |
| | 1.2 | Resonant cavity and amplification of light, 3 & 4 level lasers. | |
| | 1.3 | Helium Neon (He-Ne) laser. | |
| | 1.4 | Optical fiber: Types of fibres and materials used, modes in fiber, expression for acceptance angle and numerical aperture. | |
| | 1.5 | Normalized frequency (‘V’ number), optical communication system. | |
| | Self-Learning Topics: Properties of laser, applications of laser, semiconductor laser, total internal reflection (TIR), and construction of an optical fiber. | | |
| **2** | | **Wave Optics** | |
| | 2.1 | Interference: Parallel thin film (reflected system). | 5 |
| | 2.2 | Fringe width by wedge shaped film. | |
| | 2.3 | Newton’s rings and applications, anti-reflection coating. | |
| | 2.4 | Diffraction: Fraunhofer diffraction at single slit. | |
| | 2.5 | Resolving power of a grating, determination of wavelength of laser light using plane transmission grating. | |
| | Self-Learning Topics: Parallel thin film (transmitted system), polarization, Fresnel & Fraunhofer diffraction, diffraction grating. | | |
| **3** | | **Quantum Physics** | |
| | 3.1 | Concept of wave function and probability density, physical significance of wave function. | 5 |
| | 3.2 | Eigenfunction and Eigenvalue, Heisenberg’s Uncertainty Principle (HUP). | |
| | 3.3 | Schrodinger’s wave equation in 1D: Time dependent equation (TDSWE) and time independent equation (TISWE). | |
| | 3.4 | Particle in a 1D potential well (rigid box). | |
| | 3.5 | Basics of quantum computing. | |
| | Self-Learning Topics: Wave particle duality, de Broglie wavelength, matter waves. | | |
| **4** | | **Semiconductor Physics** | |
| | 4.1 | Fermi Dirac statistics, Fermi level in intrinsic & extrinsic semiconductors, variation of Fermi level with doping (concentration) and temperature. | 6 |
| | 4.2 | Hall Effect and its applications. | |
| | 4.3 | Fermi Level in P-N Junction in biased and unbiased conditions, Zener diode and its application as voltage regulator. | |
| | 4.4 | BJT, common emitter configuration and characteristics. | |
| | 4.5 | Transistor as a switch, introduction to FET & MOSFET. | |

| | | | |
|---|---|---|---|
| | Self-Learning Topics: Types of semiconductors, P-N Junction diode, LED, solar cell, diodes. | | |
| **5** | | **Electrodynamics** | |
| | 5.1 | Operator 'del', Physical significance of gradient & divergence in Cartesian coordinate system. | |
| | 5.2 | Physical significance of Curl. | |
| | 5.3 | Fundamental theorems for gradient & divergence. | 5 |
| | 5.4 | Fundamental theorems for curl (Stoke's theorem), displacement current, continuity equation. | |
| | 5.5 | Maxwell's equations in free space (differential and integral forms). | |
| | Self-Learning Topics: Scalar and Vector fields, Gauss's law for electrostatics, Faraday's Law and Ampere's law. | | |
| **6** | | **Physics of Sensors** | |
| | 6.1 | Resistive sensors: PT100 (temperature), strain gauge (deformation); | 4 |
| | 6.2 | Temperature sensor: Thermocouple (J-type and K-type); Humidity sensor (hygrometer). | |
| | 6.3 | Pressure sensor: Concept of pressure sensing by capacitive, flex (bending) and inductive method. Piezoelectric transducers and its use as ultrasonic generators. | |
| | 6.4 | Optical sensor: Photodiode; Pyroelectric sensor for IR; Thermal radiation sensor: Bolometer. | |
| | Self-Learning Topics: Principle of sensors, application of different types of sensors, ultrasonic transducer for distance measurement (in liquid or air) velocity measurement, concept of photodiode. | | |
| | | **TOTAL** | **30** |

**List of Experiments of which minimum of 5 experiments should be completed.**

| Sr. No | Module | Experiment |
|---|---|---|
| 1 | Wave Optics | Measurement of wavelength of sodium light using a wedge shaped film. |
| 2 | Wave Optics | Determination of radius of curvature of a plano convex lens using Newton's rings. |
| 3 | Laser | Determination of Laser wavelength using diffraction grating. |
| 4 | Fiber optics | Determination of numerical aperture & acceptance angle of an optical fiber. |
| 5 | Semiconductor Physics | Estimation of the energy band gap of a semiconductor material. |
| 6 | Semiconductor Physics | Measurement of hall voltage using Hall Effect apparatus. |
| 7 | Semiconductor Physics | Analysis of the forward & reverse biased characteristics of a P-N junction diode. |

| | | |
|---|---|---|
| 8 | Semiconductor Physics | Study of the I-V characteristics of a photodiode. |
| 9 | Quantum Physics | Determination of planck's constant using a photocell setup. |
| 10 | Physics of Sensors | Calibration and Use of a PT100 Sensor for temperature measurement. |
| 11 | Physics of Sensors | Measurement of the distance between two surfaces using an ultrasonic distance metre. |

**Text Books:**


1. A Textbook of Engineering Physics – Avadhanulu & Kshirsagar (S. Chand)
2. Engineering Physics – R. K,. Gaur, S.L. Gupta, Dhanpatrai Publications.
3. Engineering Physics - Uma Mukherji - Alpha Science International Ltd.
4. Engineering Physics Laboratory Manual - Jayaraman et al, Pearson Education India.


**Reference Books:**


1. Optics - Ajay Ghatak, Tata McGraw Hill.
2. Handbook of Modern Sensors Physics design and application- Jacob Fraden, Springer, AIP press.
3. Introduction to Electrodynamics- D. J. Griffiths, Pearson publication.


**Useful Links:**

1. https://nptel.ac.in/courses/115102124
2. https://nptel.ac.in/courses/122106034
3. https://nptel.ac.in/courses/104104082

## Assessment Methodology

| Type of Course | Assessment Tool | Marks Distribution |
|---|---|---|
| **Theory** | **CA-20** | • Certification: NPTEL (20 Marks) (Approved by instructor)<br>OR<br>• Any two Pedagogies (10 marks each)<br>• MCQ /Class Test<br>• Case study/Assignment<br>• GATE based Tutorial<br>• MOOCs Certification (Approved by instructor)<br>• Open Book Test<br>• Working model/simulation of a course-based concept. |
| **Theory** | **MSE** | Question Paper Pattern is as follows:<br>All Questions are compulsory. |

| | | |
|---|---|---|
| | | • Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• MSE should be based on 50% syllabus.<br>• Time: 90 minutes (1 hour 30 minutes)<br>• Total Marks: 30 |
| **Theory** | **ESE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• Q4 A or B - 10 marks<br>• Q5 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• ESE should be based on 30% syllabus of MSE and 70% syllabus after MSE.<br>• Time: 120 minutes (2 hours)<br>• Total Marks: 50 |
| **Course - Laboratory** | **TW- 25** | • Active Participation (Lab) = 5 marks<br>• Laboratory Report = 10 marks<br>• Laboratory performance = 10 marks<br>Based on the performance and satisfactory completion of assigned laboratory work |

## 1. Course Vertical -BSC- Engineering Chemistry

<table>
<tr><th>Course Code</th><th>Course Name</th><th colspan="6">Teaching Scheme (Hrs. / Week)</th><th colspan="4">Credits Assigned</th></tr>
<tr><td rowspan="6">25FE1BSC03</td><td rowspan="6">Engineering Chemistry</td><td colspan="3">L</td><td>P</td><td>T</td><td>L</td><td>P</td><td>T</td><td>TOTAL</td></tr>
<tr><td colspan="3">2</td><td>1</td><td>-</td><td>2</td><td>0.5</td><td>-</td><td>2.5</td></tr>
<tr><td colspan="10">Evaluation Scheme</td></tr>
<tr><td></td><td>CA</td><td>MSE</td><td>ESE</td><td>TW</td><td>OR</td><td>PR</td><td colspan="3">Total</td></tr>
<tr><td>Theory</td><td>20</td><td>30</td><td>50</td><td>-</td><td>-</td><td>-</td><td colspan="3">100</td></tr>
<tr><td>Lab/Tut</td><td>-</td><td>-</td><td>-</td><td>25</td><td>-</td><td>-</td><td colspan="3">25</td></tr>
<tr><td colspan="2">Total</td><td colspan="8">125</td></tr>
</table>

**Course Objectives:**

1. To build a strong understanding of chemistry concepts to help students solve practical problems in various engineering areas.
2. To explore the essential principles governing material properties, chemical reactions, and environmental factors that influence engineering systems.
3. To apply chemical knowledge and analytical thinking to address challenges involving materials, energy sources, environmental processes, and system performance.
4. To develop data interpretation skills for recognizing trends and insights across various chemical and engineering applications.
5. To foster creativity in designing effective and sustainable solutions by integrating interdisciplinary knowledge from chemistry and engineering.

| | | |
|---|---|---|
| **Course Outcomes** | After successful completion of the course, students will be able to | |
| | CO1 | Recall core concepts in alloys, nanomaterial's, ceramics, and composites, water quality parameters, fuel properties, corrosion mechanisms, electrochemical principles, and the relevant chemistry used in engineering applications. |
| | CO2 | Explain the role and significance of advanced and high performance materials, water treatment processes, fuel combustion behaviour, corrosion control methods, electrochemical reactions, and the chemical principles that govern their behaviour and performance. |
| | CO3 | Apply chemistry knowledge to address challenges in selecting advanced materials, water purification, fuel efficiency, and corrosion prevention for industrial use. |
| | CO4 | Analyze chemical data and solve problems related to material properties, water chemistry, fuel characteristics, and corrosion behavior to infer their suitability and performance in engineering applications. |

| | | |
|---|---|---|
| | CO5 | Evaluate the chemical properties, performance reliability of engineering materials, water treatment technologies, fuel types, and corrosion protection methods in various engineering applications. |
| | CO6 | Design sustainable engineering solutions by applying concepts from materials, water, fuels, and corrosion and present them through reports, models, or simulations |

**Syllabus:**

| Module No. | Unit No. | Topics | Hours |
|---|---|---|---|
| **1** | | **Water** | |
| | 1.1 | Water Quality Assessment Parameter- Types of Hardness: Temporary and Permanent hardness. Disadvantages of using Hard water in industries | 5 |
| | 1.2 | Numerical on Total hardness. Introduction to Hardness Measurement Technique - EDTA titration method-Principle and Reactions. | |
| | 1.3 | Softening Techniques: Ion exchange method - Principle and Reactions, Advantages and Applications. Numerical on Ion exchange method. | |
| | 1.4 | Water Purification Technologies: Reverse Osmosis (RO) - Working Principle, Advantages and Applications. | |
| | **Self-Learning Topics:** General Water Quality Assessment Parameters, Methods of Water Disinfection: Ultraviolet Treatment. | | |
| **2** | | **Corrosion** | |
| | 2.1 | Introduction to Corrosion: Definition and significance.<br>Types of Corrosion: a) Dry (chemical) Corrosion-Concept of stability of oxide films, b) Wet (electrochemical) Corrosion-Mechanism of Electrochemical Corrosion | 6 |
| | 2.2 | Factors affecting Corrosion Rate: Humidity, Position of metal in Galvanic series, pH, Temperature, Relative area of cathode to anode, Presence of Impurities.<br>Factors contributing to corrosion in electronic devices. | |
| | 2.3 | Different forms of Corrosion: Galvanic corrosion, Differential Aeration corrosion, Intergranular Corrosion. | |
| | 2.4 | Corrosion Prevention:<br>Non-Metallic Coatings-Acrylic, Epoxy.<br>Anti-Rust Lubricant- Definition of Lubricant and Acid Value of Oil and Its Significance, Numerical on Acid Value, Corrosion Inhibitors in Engine Oils.<br>Metallic Protective Coatings: Differences Between Galvanization and Tinning. Surface Treatment- Anodizing. | |
| | 2.5 | Cathodic Protection: Principle and Application of Sacrificial anode and Impressed Current Systems | |

| | | | |
|---|---|---|---|
| | **Self-Learning Topics:** Introduction to Electrochemistry, Corrosion Control Techniques based on Design considerations, Material selection and modification | | |
| **3** | | **Polymers** | |
| | 3.1 | Introduction to Polymers, Important properties of Polymers: Average Molecular Weight, Numerical on Average Molecular Weight. | 6 |
| | 3.2 | Important Properties of Polymers: Glass Transition Temperature (Tg), Viscoelasticity, Factors Affecting Glass Transition Temperature and Melting Temperature (Tm). Significance | |
| | 3.3 | Advanced Polymers: Types, Properties, Applications of a) Smart Polymers, b) Conducting Polymers c) Biopolymers | |
| | 3.4 | Classification of Polymers as Thermosetting and Thermoplastic Polymers Introduction to the Compounding of Polymers, Fabrication and Molding Techniques of Polymers: Injection, Compression. | |
| | **Self-Learning Topics**: Overview of Polymer Classification, Fabrication Methods - Extrusion Process | | |
| **4** | | **Alloys and Application of Spectroscopy in Metal Analysis.** | |
| | 4.1 | Introduction to Alloys, Different types of Ferrous alloys - Plain Carbon Steels-Composition, Properties and Applications<br>Special effects of alloying elements on steel - Cr, Ni, W, Co, V. | 4 |
| | 4.2 | Introduction To Shape Memory Alloys and Its Applications. | |
| | 4.3 | Spectroscopic Determination of Metals from Metal Ion Solutions- Definition of spectroscopy, Principle of Atomic Absorption Spectroscopy (AAS) and Colorimetric methods- Beer-Lambert's Law, Numerical on Beer-Lambert's Law | |
| | **Self-Learning Topics**. Purpose of making alloys, Composition, properties and uses of Duralumin, German silver. | | |
| **5** | | **Fuels and Energy Storage Technologies** | |
| | 5.1 | Solid Fuels: Concept Of Calorific Value and Its Significance. Introduction to Proximate and Ultimate Analysis. Numerical On Calorific Value and Proximate Analysis | 5 |
| | 5.2 | Numerical on Combustion Analysis of Solid Fuel. | |
| | 5.3 | Liquid Fuels: Octane Number, Cetane Number, Knocking and Anti-Knocking Agents.,Unleaded Petrol and Oxygenates. | |
| | 5.4 | Use of Catalytic converter. Bio diesel-Definition, Properties and Uses. | |
| | 5.5 | Introduction to Lithium-Ion Batteries, Lithium-Polymer Batteries, their Advantages and Applications. | |
| | **Self-Learning Topics:** Fuel - Definition, Types And Characteristics Of Good Fuel, Hydrogen as a Fuel – Advantages, Limitations | | |
| **6** | | **High Performance Materials: Nanomaterials, Composites, Ceramics.** | |

| | | | |
|---|---|---|---|
| | 6.1 | Nanomaterials: Definition, Specific Properties- Surface-to-Volume Ratio, Quantum Size Effects, Optical Properties, Chemical Reactivity, Applications. Types of Nanostructured Materials.<br>Graphene: Structure and Properties | 4 |
| | 6.2 | Carbon Nanotubes: Types (SWCNTs and MWCNTs), Properties and Applications. Synthesis using Chemical Vapor Deposition (CVD). | |
| | 6.3 | Composites: Definition, Classification with Examples and Advantages. Properties and Important Application of Polymer Composites | |
| | 6.4 | Ceramics: Definition of Ceramics, Properties and Important Applications of commonly used Engineering Ceramics - Alumina, Silicon Carbide, Zirconia | |
| | **Self-Learning Topics:** Properties and Important Applications of Plywood, Concept of Bio-Composites. | | |
| | | **TOTAL** | **30** |

**Text Books:**


1. A Text book of Engineering Chemistry, 12th edition S.S Dara & Dr. S.S Umare, S Chand & Company Ltd., 2011.
2. A Text Book of Engineering Chemistry, 17th edition, P. C. Jain and Monica Jain, Dhanapat Rai Publications, New Delhi, 2018.
3. A Text Book of Engineering Chemistry, 4th edition, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd. 2016.
4. Wiley's Engineering Chemistry, 2nd Edition, Dr. Shubha Ramesh et al., (Wiley India), 2013.


**Reference Books:**


1. Gowariker, V. R., Viswanathan, N. V., & Sreedhar, J.,3rd edition. *Polymer Science*. New Age International (P) Limited, 2019.
2. Callister, W. D., & Rethwisch, D. G. (2020). *Materials Science and Engineering: An Introduction*, 10th edition. Wiley
3. Text Book of Polymer Science, 4th edition, F.W. Billmeyer, John Wiley & Sons, 2007
4. Vogel's Quantitative Chemical Analysis by: J. Mendham, R.C. Denney, J.D. Barnes, Edition: 6th edition (2009) Publisher: Pearson Education


**Web Resources:**

1. https://onlinecourses.nptel.ac.in/noc24_mm42/preview
2. http://digimat.in/nptel/courses/video/113106093/L01.html
3. https://www.coursera.org/learn/corrosion
4. https://edu.rsc.org/exhibition-chemistry/nailing-corrosion-demonstrations/2000054.article

**List of Experiments**

A minimum of five experiments from the following list must be successfully completed**.**

| Sr. No. | Module | Experiment Name |
|---|---|---|
| 1 | Water | Determination of Water Hardness by using EDTA method |
| 2 | Corrosion | Corrosion Investigation of Iron Nail in Various Media |
| 3 | Fuel | Determination of Moisture in Coal |
| 4 | Alloys | Estimation of Copper by Colorimetric method |
| 5 | Polymers | Preparation of Urea Formaldehyde Resin |
| 6 | Fuel | Determination of Flash Point of Oil |
| 7 | Corrosion and Electrochemistry. | Measurement of EMF of Daniel Cell |
| 8 | Alloys | Estimation of Iron using Potentiometric Titrations |
| 9 | Water | Determination of Efficiency of Ion Exchange Resin |
| 10 | Corrosion and Fuel | Determination of Acid Value of Oil |
| 11 | Polymers | Synthesis of Biopolymer from Banana Peels |

## Assessment Methodology

| Type of Course | Assessment Tool | Marks Distribution |
|---|---|---|
| **Theory** | **CA-20** | • Certification: NPTEL (20 Marks) (Approved by instructor)<br>OR<br>• Any two Pedagogies (10 marks each)<br>• MCQ /Class Test<br>• Case study/Assignment<br>• GATE based Tutorial<br>• MOOCs Certification (Approved by instructor)<br>• Open Book Test<br>• Working model/simulation of a course-based concept. |
| **Theory** | **MSE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• MSE should be based on 50% syllabus.<br>• Time: 90 minutes (1 hour 30 minutes) |

| | | |
|---|---|---|
| | | • Total Marks: 30 |
| **Theory** | **ESE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• Q4 A or B - 10 marks<br>• Q5 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• ESE should be based on 30% syllabus of MSE and 70% syllabus after MSE.<br>• Time: 120 minutes (2 hours)<br>• Total Marks: 50 |
| **Course - Laboratory** | **TW- 25** | • Active Participation (Lab) = 5 marks<br>• Laboratory Report = 10 marks<br>• Laboratory performance = 10 marks<br>Based on the performance and satisfactory completion of assigned laboratory work |

## 1. Course Vertical - ESC- Engineering Graphics

| Course Code | Course Name | Teaching Scheme (Hrs. / Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| 25ESC1C01 | Engineering Graphics | **L** | **P** | **T** | **L** | **P** | **T** | **TOTAL** |
| | | 2 | 2 | - | 2 | 1 | - | 3 |
| | | **Examination Scheme** | | | | | | |
| | | | **CA** | **MSE** | **ESE** | **TW** | **OR** | **PR** | **Total** |
| | | **Theory** | 20 | 30 | 50 | - | - | - | 100 |
| | | **Lab/Tut** | - | - | - | 25 | - | - | 25 |
| | | **Total** | **125** | | | | | | |

**Course Objectives:**

1. To impart and inculcate understanding of the theory of projection.

2. To enable students to improve their visualization skill, understand and interpret drawings.

3. To apply the principles of projection to represent three-dimensional objects on a two- dimensional surface.

4. To enable students to represent the internal features of a 3D object using sections that clearly depict their internal arrangement.

| | | |
|---|---|---|
| **Course Outcomes** | After successful completion of the course, students will be able to | |
| | CO1 | Recall and recognize standard drawing conventions, symbols, line types, dimensioning practices, and projection methods (orthographic, isometric) used in engineering drawings.(Remembering) |
| | CO2 | Interpreting principles of orthographic and isometric projection, sectional views, and the relationship between 2D representations and 3D objects (Understanding). |
| | CO3 | Construct engineering drawings of points, lines, planes, and solids, including orthographic projections, sectional views, and isometric representations, using appropriate tools. (Applying) |
| | CO4 | Analyze engineering drawings to identify geometric features, view relationships, and the logical sequence used in multi-view and sectional representations. (Analyzing) |
| | CO5 | Evaluate technical drawings for correctness, completeness, and clarity by verifying projections, dimensions, and adherence to BIS/ISO standards. (Evaluating) |
| | CO6 | Generate complete and accurate engineering drawings, integrating orthographic, sectional, and isometric views, to effectively communicate design intent and represent complex 3D engineering components. (Creating) |

**Syllabus:**

| Module No. | Unit No. | Topics | Hours |
|---|---|---|---|
| **1** | | **Introduction to Engineering Drawing** | |
| | 1.1 | Introduction to Engineering Graphics and its significance in the Engineering domain. Types of Lines, Dimensioning Systems as per IS conventions. | 3 |
| | 1.2 | Introduction to plain and diagonal scales. | |
| | 1.3 | Engineering Curves: Basic construction of Cycloid, Involutes and Helix (cylinder only). | |
| | **Self-Learning Topics:** Problems based on Application of line & curves. | | |
| **2** | | **Projections of Points, Lines and Planes** | |
| | 2.1 | Projections of Points<br>Projections of points in any quadrants as well as resting on planes. | 6 |
| | 2.2 | Projections of Lines<br>Projections of lines inclined to both the reference planes. | |
| | | Projections of Planes<br>Projections of planes (Triangular, Square, Rectangular, Pentagonal, Hexagonal and Circular) inclined to both the Reference Planes. | |
| | **Self-Learning Topics:** Problems based on line in two different quadrants. | | |
| **3** | | **Projections of Solids** | |
| | 3.1 | Projections of solids with the axis inclined to one and both reference planes. (prism, pyramid, cylinder and cone only). Triangular, square, pentagonal & hexagonal prism and pyramids to be considered. | 6 |
| | **Self-Learning Topics:** Problems based on hollow solids | | |
| **4** | | **Sections of Solids** | |
| | 4.1 | Sections of Prism, Pyramid, Cylinder, & Cone cut by plane perpendicular to at least one reference plane (Exclude Curved Section Plane). Use change of position or Auxiliary plane method. | 4 |
| **5** | | **Orthographic Projections** | |
| | 5.1 | Orthographic Projections<br>Fundamentals of orthographic projections like concept of quadrants, observer position, horizontal, vertical and profile plane, symbol etc. Different orthographic views, First and Third angle method of projection.<br>Views of a simple machine part as per the first angle projection method recommended by I.S. | 7 |

| | | | |
|---|---|---|---|
| | 5.2 | Sectional Orthographic Projections: Fundamentals of sectional projections like concept of section plane, its representation, section lines and its features, need of sectional views, rib and web in section. Types of section and its representation. Different views of a simple machine part as per the first angle projection. | |
| | **Self-Learning Topics:** Completion of three orthographic views from any other two given views. (Missing view) | | |
| **6** | | **Isometric Views** | |
| | 6.1 | Basic concept of isometric projection like why it is called isometric, what does it represents, its need, isometric and non-isometric lines, isometric axis and isometric scale. Difference between isometric projection and isometric views. Conversion of orthographic views to isometric views (Excluding sphere). | 4 |
| | **Self-Learning Topics:** Isometric view for Spherical shape objects. | | |
| **TOTAL** | | | **30** |

**List of Term-Sheets /Assignments**

| Sr. No. | List of Term-Sheets | Hours |
|---|---|---|
| 01 | Prerequisite Test<br>To draw basic geometric shapes like pentagon, hexagon and square (in different orientation). Divide a line into equal number of parts. Divide a circle into equal number of parts. (Prerequisite syllabus should not be considered for paper setting) | 02 |
| 02 | Two problems on Projection of Lines and two problems on Projection of Planes to be drawn on drawing sheet. | 02 |
| 03 | A minimum of two problems on the Projection of Solids to be drawn on the drawing sheet. Out of two problems, one should be on the prism category (includes cylinder) and other should be on the pyramid category (includes cone). | 03 |
| 04 | Minimum of two problems on Sections of Solids to be drawn on drawing sheet. Out of two problems one should be on the prism category (includes cylinder) and other should be on the pyramid category (includes cone). | 04 |
| 05 | Two problems on Isometric Projections to be drawn on drawing sheet. | 04 |

| | | |
|---|---|---|
| 06 | **Overview of Computer Graphics Covering:**<br><br>Basic information about the drafting software (CAD). Demonstrating knowledge of the theory of CAD software such as: 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.<br><br>**Customization & CAD Drawing:**<br><br>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.<br><br>**Annotations, layering & other Functions Covering:**<br><br>Applying dimensions to objects, applying annotations to drawings, setting up and use of layers, layers to create drawings, Create, edit and use customized layers, changing line lengths through modifying existing lines (extend/lengthen). | 06 |
| 07 | Two problems on Orthographic Projections (without section) using drafting software. | 03 |
| 08 | Two problems on Orthographic Projections (with section) using drafting software. | 03 |
| 09 | Minimum two problems on Isometric Projections using drafting software. | 03 |

Students must solve a minimum of fifteen (15) questions from the problems mentioned above for the successful completion of term work.

**Text Books:**


1. N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt. Ltd Edition: 54th Edition, 2023.
2. N.D. Bhatt & V.M. Panchal, "Machine Drawing", Charotar Publishing House Pvt. Ltd. 51st Edition 2022.


**Reference Books:**


1. Narayana, K.L. & P Kannaiah (2008), Textbook on Engineering Drawing, Scitech Publisher.
2. Prof. Sham Tickoo (Purdue University) & Gaurav Verma, "(CAD Soft Technologies).
3. Dhananjay A Jolhe, "Engineering Drawing" Tata McGraw Hill.


**Useful Links:**

1. https://archive.nptel.ac.in/courses/112/105/112105294/
2. https://nptel.ac.in/courses/112103019
3. https://archive.nptel.ac.in/courses/112/102/112102304/

**Assessment Methodology**

| Type of Course | Assessment Tool | Marks Distribution |
|---|---|---|
| **Theory** | **CA-20** | • Certification: NPTEL (20 Marks) (Approved by instructor)<br>OR<br>• Any two Pedagogies (10 marks each)<br>• MCQ /Class Test<br>• Case study/Assignment<br>• GATE based Tutorial<br>• MOOCs Certification (Approved by instructor)<br>• Open Book Test<br>• Working model/simulation of a course-based concept. |
| **Theory** | **MSE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• MSE should be based on 50% syllabus.<br>• Time: 90 minutes (1 hour 30 minutes)<br>• Total Marks: 30 |
| **Theory** | **ESE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• Q4 A or B - 10 marks<br>• Q5 A or B - 10 marks<br>• For each question, A and B should be based on the same CO. |

| | | |
|---|---|---|
| | | • ESE should be based on 30% syllabus of MSE and 70% syllabus after MSE.<br>• Time: 120 minutes (2 hours)<br>• Total Marks: 50 |
| **Course - Laboratory** | **TW- 25** | • Active Participation (Lab) = 5 marks<br>• Drawing hall Term sheets = 10 marks<br>• Auto-cad lab Term sheets = 10 marks<br>Based on the performance and satisfactory completion of assigned laboratory work |

**1. Course Vertical - ESC- Basic Electrical and Digital Electronics**

| Course Code | Course Name | Teaching Scheme (Hrs. / Week) | | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|---|
| 25FE1ESC02 | Basic Electrical and Digital Electronics | L | | P | T | L | P | T | TOTAL |
| | | 3 | | 2 | - | 3 | 1 | - | 4 |
| | | Evaluation Scheme | | | | | | | |
| | | | CA | MSE | ESE | TW | OR | PR | Total |
| | | Theory | 20 | 30 | 50 | - | - | - | 100 |
| | | Lab | - | - | - | 25 | 25 | - | 50 |
| | | Total | 150 | | | | | | |

**Course Objectives:**

1. To teach fundamental electrical concepts, laws, and network theorems applicable to DC and AC circuits.
2. To explain the operation of single-phase and three-phase systems, electrical machines, and power backup devices.
3. To introduce number systems, binary arithmetic, logic gates, and Boolean algebra for digital circuit analysis.
4. To implement digital circuits for real-world applications.

| | | |
|---|---|---|
| **Course Outcomes** | After successful completion of the course, the students will be able to | |
| | CO1 | Recall fundamental concepts of electric circuits, machines, power systems, and digital electronics. (Remembering) |
| | CO2 | Explain the working principles of DC and AC circuits, electrical machines, batteries and logic circuits. (Understanding) |
| | CO3 | Apply network theorems, circuit laws and logic principles to solve problems in electrical and digital circuits. (Applying) |
| | CO4 | Analyze the performance of electrical circuits, machines, and digital logic systems under different input and loading conditions. (Analyzing) |
| | CO5 | Evaluate and choose the most efficient electrical circuits/devices and logic circuits for specific practical applications. (Evaluating) |
| | CO6 | Design basic electrical and digital systems for real world implementations. (Creating) |

**Syllabus**

| Module No. | Unit No. | Topics | Hours |
|---|---|---|---|
| **1** | **DC Circuits and Network Theorems** | | **10** |
| | 1.1 | Kirchhoff's Laws, Series and Parallel DC Circuits, Voltage/Current Division Rule, Ideal and Practical Sources, Source Transformation. | |
| | 1.2 | Mesh analysis, nodal analysis | |
| | 1.3 | Network Theorems: Superposition, Thevenin, Norton, Maximum Power Transfer theorems. | |
| | **Self-Learning Topics:** Study the conversion between star and delta networks and their practical use in simplification of electrical networks. | | |
| **2** | **AC Circuits and Power Systems** | | **9** |
| | 2.1 | Sinusoidal Waveforms: RMS, Average, Peak, Phase, Frequency | |
| | 2.2 | Concept of Single-phase and Three-phase Supply | |
| | 2.3 | Effect of AC signal on R, L, C, RL, RC, RLC series and parallel circuits. | |
| | 2.4 | AC Power: Active, Reactive, Apparent Power | |
| | 2.5 | Resonance in series circuit | |
| | **Self-Learning Topics:** Resonance in parallel circuits, comparison and applications. | | |
| **3** | **Electrical Machines and Power Backup Systems** | | **5** |
| | 3.1 | DC Motors: Brushed and Brushless – Principle, Construction, Applications | |
| | 3.2 | Single-phase Induction Motors – Construction, working and Applications | |
| | 3.3 | Power Backup Systems: Inverter, UPS, SMPS – Block Diagram & Principle. | |
| | 3.4 | Batteries: Lead-acid and Lithium-ion – Construction & Characteristics | |
| | **Self-Learning Topics:** Comparison of DC Motor, Induction Motor, Inverter, UPS, Battery (Lead-acid and Li-ion) | | |
| **4** | **Number Systems and Binary Arithmetic** | | **6** |
| | 4.1 | Number Systems: Decimal, Binary, Octal, Hexadecimal | |
| | 4.2 | Conversions between Number Systems | |
| | 4.3 | Binary Arithmetic: Addition and Subtraction (Using 1's and 2's complement) | |
| | 4.4 | Introduction to Binary code, BCD Code, Gray Code and its code conversions. | |
| | **Self-Learning Topics**: Practice and understand the process of code conversion through more examples. | | |
| **5** | **Logic Gates and Boolean Algebra** | | **8** |
| | 5.1 | Logic Gates: AND, OR, NOT, NAND, NOR, XOR – Symbols and Truth Tables | |

| | | | |
|---|---|---|---|
| | 5.2 | Universal Gates: Realization of basic gates using NAND/NOR | |
| | 5.3 | Boolean Algebra – Laws, Identities, Minimization of Boolean Expressions. | |
| | 5.4 | Sum of Product (SOP) and Product of Sum(POS), K-Map Simplification (up to 4 variables), realization of circuits using logic gates. | |
| | **Self-Learning Topics**: Implement XOR, XNOR using universal gates | | |
| **6** | **Combinational Circuits and Applications** | | **7** |
| | 6.1 | Introduction to Combinational and Sequential circuits, Performance parameters of digital circuits. | |
| | 6.2 | Half Adder , Full Adder, Half Subtractor, Full Subtractor, realization of adders and subtractors using logic gates. | |
| | 6.3 | Multiplexer, Demultiplexer, Encoder, Decoder and Comparator | |
| | 6.4 | Realization of real world applications using combinational circuits. | |
| | **Self-Learning Topics**: Explore more real-life applications of combinational circuits | | |
| | | **TOTAL** | **45** |

**Suggested List of Experiments**

| Experiment Number | Title of the Experiment |
|---|---|
| 1 | Verify Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) |
| 2 | Mesh and Nodal Analysis in a resistive circuit |
| 3 | Superposition Theorem using two independent sources in resistive networks. |
| 4 | Verification of Thevenin's Theorem |
| 5 | Study of phase relationship between voltage, current and power in an RL series circuit |
| 6 | Resonance in an RLC series circuit |
| 7 | Verify truth tables of basic logic gates (AND, OR, NOT) using digital ICs |
| 8 | Realize basic gates using universal gates (NAND and NOR) |
| 9 | Implement a logic expression using universal gates (NAND/NOR) on a breadboard or simulator |
| 10 | Design and verify a Half Adder and Full Adder using logic gates |
| 11 | Study of DC Motor |
| 12 | Study of Single-phase Induction Motor |
| 13 | Perform Decimal to Binary, Octal, and Hexadecimal conversions, and vice versa |
| 14 | Perform Binary addition and subtraction using 1's and 2's complement methods |
| 15 | Multiplexer (MUX) or Decoder circuit using ICs or digital simulation |

**Text Books:**

1. D. P. Kothari and I. J. Nagrath, Basic Electrical and Electronics Engineering, 2nd edition, New Delhi, India, McGraw Hill Education.
2. R. P. Jain, Modern Digital Electronics, 4th edition, New Delhi, India, McGraw Hill Education.
3. B.L. Theraja, A Textbook of Electrical Technology, Vol. I & II, S. Chand Publication.

**Reference Books:**

1. R. Prasad, Fundamentals of Electrical Engineering, New Delhi, India: PHI Learning Pvt. Ltd.
2. D. P. Leach, A. P. Malvino, and G. Saha, Digital Principles and Applications, 8th edition, New Delhi, India: McGraw Hill Education.

**Useful Links:**

1. https://onlinecourses.nptel.ac.in/noc22_ee113/
2. https://onlinecourses.nptel.ac.in/noc25_ee45/

## Assessment Methodology:

| Type of Course | Assessment Tool | Marks Distribution |
|---|---|---|
| **Theory** | **CA-20** | • Certification: NPTEL (20 Marks) (Approved by instructor)<br>OR<br>• Any two Pedagogies (10 marks each)<br>• MCQ /Class Test<br>• Case study/Assignment<br>• GATE based Tutorial<br>• MOOCs Certification (Approved by instructor)<br>• Open Book Test<br>• Working model/simulation of a course-based concept. |
| **Theory** | **MSE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• MSE should be based on 50% syllabus. |

| | | |
|---|---|---|
| | | • Time: 90 minutes (1 hour 30 minutes)<br>• Total Marks: 30 |
| **Theory** | **ESE** | Question Paper Pattern is as follows:<br>All Questions are compulsory.<br>• Q1 A or B - 10 marks<br>• Q2 A or B - 10 marks<br>• Q3 A or B - 10 marks<br>• Q4 A or B - 10 marks<br>• Q5 A or B - 10 marks<br>• For each question, A and B should be based on the same CO.<br>• ESE should be based on 30% syllabus of MSE and 70% syllabus after MSE.<br>• Time: 120 minutes (2 hours)<br>• Total Marks: 50 |
| **Course - Laboratory** | **TW- 25** | • Active Participation (Lab) = 5 marks<br>• Drawing hall Term sheets = 10 marks<br>• Auto-cad lab Term sheets = 10 marks<br>Based on the performance and satisfactory completion of assigned laboratory work |
| | **OR-25** | Oral examination will be based on the entire syllabus. |

## Branch: Mechanical

<table>
<tr><th>Course Code</th><th>Course Name</th><th colspan="3">Teaching Scheme (Hrs. / Week)</th><th colspan="4">Credits Assigned</th></tr>
<tr><td rowspan="7">25FE1VSE01</td><td rowspan="7">Engineering Skills Workshop-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
<tr><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>1</td><td>1</td></tr>
<tr><td colspan="7">Examination Scheme</td></tr>
<tr><td></td><td>CA1</td><td>CA2</td><td>MSE</td><td>ESE</td><td colspan="2">Total</td></tr>
<tr><td>Theory</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="2"></td></tr>
<tr><td></td><td>Trade 1</td><td>Trade 2</td><td>Trade 3</td><td>Att</td><td colspan="2">Total</td></tr>
<tr><td>Lab</td><td>15</td><td>15</td><td>15</td><td>05</td><td colspan="2">50</td></tr>
</table>

**Course Objectives:**

1. To familiarize students with basic mechanical, electrical, and electronic measuring instruments and their applications in Engineering.
2. To develop practical skills in handling tools, workshop operations, assembling desktop computer systems, and executing electrical wiring projects.
3. To inculcate safety awareness and systematic procedures for installing, testing, and troubleshooting electrical and electronic systems in real-world environments.

| | | |
|---|---|---|
| **Course Outcomes** | After successful completion of the course, students will be able to | |
| | CO1 | Recall the names, functions, and safety procedures for common mechanical, electrical, and electronic tools and measuring instruments used in engineering workshops.(Remembering) |
| | CO2 | Explain the principles of operation and application of linear measuring instruments, electronic instruments (DMM, Function Generator, CRO, Power Supply), wiring accessories, and earthing/protection systems.(Understanding) |
| | CO3 | Use hand tools, measuring instruments (Vernier caliper, micrometer, DMM, CRO), wiring tools, and testing equipment to perform basic mechanical measurements, assemble a PC, and construct/test electrical wiring circuits safely.(Applying) |
| | CO4 | Analyze electrical circuits and PC hardware configurations to identify faults, troubleshoot wiring problems, and diagnose system issues using appropriate testing methods and instruments.(Analyzing) |
| | CO5 | Select appropriate tools, instruments, wiring components, and PC hardware based on technical specifications, operational requirements, and safety standards for specific workshop tasks.(Evaluating) |

| | | |
|---|---|---|
| | CO6 | Assemble a functional desktop PC, construct basic electrical wiring installations conforming to safety standards, and develop solutions for troubleshooting.(Creating) |

**Syllabus:**

| Module No. | Unit No. | Topics | Hours |
|---|---|---|---|
| **1** | | **Trade 1: Mechanical, Electrical & Electronics Measurements** | **10** |
| | 1.1 | Measurement of linear dimensions using linear measurement tools like Vernier caliper, micrometer,Vernier height gauge. | |
| | 1.2 | Measurement of small dimensions by Optical Profile Projector | |
| | 1.3 | Setting of dimensions using precision gauge blocks (slip gauges) by Wringing process, Measurement of components deviations w.r.t. standard using mechanical comparator | |
| | 1.4 | Spirit Level for Alignment test, Feeler Gauges for Gap measurement, Thread Gauges for thread measurement | |
| | 1.5 | Introduction to Electronic Measurement Instruments<br>Basics of Measurement Instruments and concepts<br>Overview of Key Instruments | |
| | 1.6 | Power Supply<br>Types of Power Supplies, Block diagram and Functionality<br>Applications and Hands-On Exercise | |
| | 1.7 | Digital Multi-meter (DMM)<br>Introduction to DMM<br>Modes of Operation and functionality<br>Applications and Hands-On Exercise | |
| | 1.8 | Function Generator, Cathode Ray Oscilloscope (CRO)<br>Overview of Function Generators and CRO<br>Types of Function generators & its signals, CRO functions,<br>Applications and Hands-On Exercise | |
| **2** | | **Trade 2: PC Assembly** | |
| | 2.1 | Desktop Basics: Identifying components-motherboard, CPU, RAM, storage, etc. | **10** |
| | 2.2 | Assembling a PC | |
| | 2.3 | BIOS/UEFI overview and settings Hands-on: Build and boot a desktop system | |
| | 2.4 | Preparing bootable media (USB) BIOS boot settings | |
| | 2.5 | Installing Windows/Linux OS, Initial OS configuration and activation, Hands-on: OS installation practice on 2–3 different hardware configurations | |
| **3** | | **Trade 3: Electrical Wiring** | |
| | 3.1 | Introduction to Electrical Tools and Accessories | **10** |

| | | | |
|---|---|---|---|
| | | Electrical Systems and Safety Protocols: Ohm's Law and its applications, AC vs. DC systems, Personal Protective Equipment (PPE), Electrical hazards and safety measures, First aid and emergency<br>Hand Tools and Equipment: Identification and use of screwdrivers, pliers, wire cutters, etc., Drilling machines and bits, Insulation resistance testers. | |
| | 3.2 | Electrical Wiring<br>Wiring Accessories, Types of switches, sockets, MCBs, ELCBs, and distribution board, Selection criteria and installation<br>Types of Wiring Systems and wiring practices for Single-phase and three-phase circuits, Installation and techniques and Cables | |
| | 3.3 | Earthing and Protection Systems<br>Earthing Methods<br>Copper Plate earthing, pipe earthing, and rod earthing<br>Protection Devices<br>MCBs, ELCBs, RCCBs<br>Electrical Testing and Troubleshooting, Testing Procedures, Polarity, continuity, insulation, and earthing tests, Use of testing instruments: Multimeter, Megger.<br>Identifying and rectifying faults in circuits, Electrical Installations in Residential and Commercial, Industry Standards and Regulations, Regulatory Bodies and Codes | |
| | 3.4 | Practical Sessions and Hands-On Training<br>Circuit Construction, Building and testing basic circuits, installation Projects, Residential and commercial wiring installations<br>Fault Simulation, Creating and diagnosing faults in circuits, Safety Drills, Emergency response and safety protocol exercises<br>Tools and Equipment, Multi-meter, Meggers, Insulation testers. Cable cutters, strippers, crimping | |
| | 3.5 | Electrical Networks<br>House Wiring, Stair Case and Go down wiring<br>Series bulb and Extension Board wiring<br>Electrical Gadgets, Repairing of appliances like Table fan/Ceiling fan<br>Emergency extension Board and Electrical fan | |
| | | **TOTAL** | **30** |

**Text Books:**


1. "Practical Electronics for Inventors" by Paul Scherz and Simon Monk (4th Edition, McGraw-Hill Education, 2016)
2. Engineering Metrology and Measurements, Authors: N.V. Raghavendra, L. Krishnamurthy, Publisher: Oxford University Press
3. "Computer Hardware and Networking" Author: K. L. James, Publisher: Scitech Publications
4. "Electrical Wiring, Estimating and Costing", Author: S.L. Uppal and G.C. Garg, Publisher: Khanna Publishers

**Reference Books:**


1. "Fundamentals of Electrical Engineering and Technology" by BL Theraja (S. Chand Publishing)
2. PC Hardware: The Complete Reference", Author: Craig Zacker and John Rourke, Publisher: McGraw Hill Education
3. "Electrical Wiring, Maintenance and Estimating", Author: B.L. Theraja, Publisher: S. Chand Publishing


**Term Work:**
Students are expected to complete all Three trades conducted individually and batch-wise in laboratory settings.

| Type of Course | Assessment Tool | Marks Distribution |
|---|---|---|
| **Workshop** | **CA-50** | • Active Participation = 5 marks<br>• Trade 1# = 15 marks<br>• Trade 2# = 15 marks<br>• Trade 3# = 15 marks<br># Based on the performance and satisfactory completion of trade wise tasks. |

## Branch: Electronics and Telecommunication

<table>
<tr><th>Course Code</th><th>Course Name</th><th colspan="3">Teaching Scheme (Hrs. / Week)</th><th colspan="4">Credits Assigned</th></tr>
<tr><td rowspan="8">25FE1VSE01</td><td rowspan="8">Engineering Skills Workshop-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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<tr><td></td><td>CA1</td><td>CA2</td><td>MSE</td><td>ESE</td><td colspan="2">Total</td></tr>
<tr><td>Theory</td><td>-</td><td>-</td><td>-</td><td>-</td><td colspan="2"></td></tr>
<tr><td></td><td>Trade 1</td><td>Trade 2</td><td>Trade 3</td><td>Att</td><td colspan="2">Total</td></tr>
<tr><td>Lab</td><td>15</td><td>15</td><td>15</td><td>05</td><td colspan="2">50</td></tr>
</table>

**Course Objectives:**

1. To familiarize students with basic mechanical, electrical, and electronic measuring instruments and their applications in Engineering.
2. To develop practical skills in handling tools, workshop operations, assembling desktop computer systems, and executing electrical wiring projects.
3. To inculcate safety awareness and systematic procedures for installing, testing, and troubleshooting electrical and electronic systems in real-world environments.

<table>
<tr><td rowspan="6">Course Outcomes</td><td colspan="2">After successful completion of the course, students will be able to</td></tr>
<tr><td>CO1</td><td>Recall the names, functions, and safety procedures for common mechanical, electrical, and electronic tools and measuring instruments used in engineering workshops.(Remembering)</td></tr>
<tr><td>CO2</td><td>Explain the principles of operation and application of linear measuring instruments, electronic instruments (DMM, Function Generator, CRO, Power Supply), wiring accessories, and earthing/protection systems.(Understanding)</td></tr>
<tr><td>CO3</td><td>Use hand tools, measuring instruments (Vernier caliper, micrometer, DMM, CRO), wiring tools, and testing equipment to perform basic mechanical measurements, assemble a PC, and construct/test electrical wiring circuits safely.(Applying)</td></tr>
<tr><td>CO4</td><td>Analyze electrical circuits and PC hardware configurations to identify faults, troubleshoot wiring problems, and diagnose system issues using appropriate testing methods and instruments.(Analyzing)</td></tr>
<tr><td>CO5</td><td>Select appropriate tools, instruments, wiring components, and PC hardware based on technical specifications, operational requirements, and safety standards for specific workshop tasks.(Evaluating)</td></tr>
</table>

| | | |
|---|---|---|
| | CO6 | Assemble a functional desktop PC, construct basic electrical wiring installations conforming to safety standards, and develop solutions for troubleshooting.(Creating) |

**Syllabus:**

| Module No. | Unit No. | Topics | Hours |
|---|---|---|---|
| **1** | | **Trade 1: Mechanical, Electrical & Electronics Measurements** | **10** |
| | 1.1 | Measurement of linear dimensions using linear measurement tools like Vernier caliper, micrometer,Vernier height gauge. | |
| | 1.2 | Measurement of small dimensions by Optical Profile Projector | |
| | 1.3 | Setting of dimensions using precision gauge blocks (slip gauges) by Wringing process, Measurement of components deviations w.r.t. standard using mechanical comparator | |
| | 1.4 | Spirit Level for Alignment test, Feeler Gauges for Gap measurement, Thread Gauges for thread measurement | |
| | 1.5 | Introduction to Electronic Measurement Instruments<br>Basics of Measurement Instruments and concepts<br>Overview of Key Instruments | |
| | 1.6 | Power Supply:<br>Types of Power Supplies, Block diagram and Functionality<br>Applications and Hands-On Exercise | |
| | 1.7 | Digital Multi-meter (DMM)<br>Introduction to DMM<br>Modes of Operation and functionality<br>Applications and Hands-On Exercise | |
| | 1.8 | Function Generator, Cathode Ray Oscilloscope (CRO)<br>Overview of Function Generators and CRO<br>Types of Function generators & its signals, CRO functions,<br>Applications and Hands-On Exercise | |
| **2** | | **Trade 2: PC Assembly** | |
| | 2.1 | Desktop Basics: Identifying components-motherboard, CPU, RAM, storage, etc. | **10** |
| | 2.2 | Assembling a PC | |
| | 2.3 | BIOS/UEFI overview and settings Hands-on: Build and boot a desktop system | |
| | 2.4 | Preparing bootable media (USB) BIOS boot settings | |
| | 2.5 | Installing Windows/Linux OS, Initial OS configuration and activation, Hands-on: OS installation practice on 2–3 different hardware configurations | |
| **3** | | **Trade 3: Electrical Wiring** | |
| | 3.1 | Introduction to Electrical Tools and Accessories | **10** |

| | | | |
|---|---|---|---|
| | | Electrical Systems and Safety Protocols: Ohm's Law and its applications, AC vs. DC systems, Personal Protective Equipment (PPE), Electrical hazards and safety measures, First aid and emergency<br>Hand Tools and Equipment: Identification and use of screwdrivers, pliers, wire cutters, etc., Drilling machines and bits, Insulation resistance testers. | |
| | 3.2 | Electrical Wiring<br>Wiring Accessories, Types of switches, sockets, MCBs, ELCBs, and distribution board, Selection criteria and installation<br>Types of Wiring Systems and wiring practices for Single-phase and three-phase circuits, Installation and techniques and Cables | |
| | 3.3 | Earthing and Protection Systems<br>Earthing Methods<br>Copper Plate earthing, pipe earthing, and rod earthing<br>Protection Devices<br>MCBs, ELCBs, RCCBs<br>Electrical Testing and Troubleshooting, Testing Procedures, Polarity, continuity, insulation, and earthing tests, Use of testing instruments: Multimeter, Megger.<br>Identifying and rectifying faults in circuits, Electrical Installations in Residential and Commercial, Industry Standards and Regulations, Regulatory Bodies and Codes | |
| | 3.4 | Practical Sessions and Hands-On Training<br>Circuit Construction, Building and testing basic circuits, installation Projects, Residential and commercial wiring installations<br>Fault Simulation, Creating and diagnosing faults in circuits, Safety Drills, Emergency response and safety protocol exercises<br>Tools and Equipment, Multi-meter, Meggers, Insulation testers. Cable cutters, strippers, crimping | |
| | 3.5 | Electrical Networks<br>House Wiring, Stair Case and Go down wiring<br>Series bulb and Extension Board wiring<br>Electrical Gadgets, Repairing of appliances like Table fan/Ceiling fan<br>Emergency extension Board and Electrical fan | |
| | | **TOTAL** | **30** |

**Text Books:**


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2. Engineering Metrology and Measurements, Authors: N.V. Raghavendra, L. Krishnamurthy, Publisher: Oxford University Press
3. "Computer Hardware and Networking" Author: K. L. James, Publisher: Scitech Publications
4. "Electrical Wiring, Estimating and Costing", Author: S.L. Uppal and G.C. Garg, Publisher: Khanna Publishers

**Reference Books:**


1. "Fundamentals of Electrical Engineering and Technology" by BL Theraja (S. Chand Publishing)
2. PC Hardware: The Complete Reference", Author: Craig Zacker and John Rourke, Publisher: McGraw Hill Education
3. "Electrical Wiring, Maintenance and Estimating", Author: B.L. Theraja, Publisher: S. Chand Publishing


**Term Work:**
Students are expected to complete all Three trades conducted individually and batch-wise in laboratory settings.

| Type of Course | Assessment Tool | Marks Distribution |
|---|---|---|
| **Workshop** | **CA-50** | • Active Participation = 5 marks<br>• Trade 1# = 15 marks<br>• Trade 2# = 15 marks<br>• Trade 3# = 15 marks<br># Based on the performance and satisfactory completion of trade wise tasks. |

## Branch: Computer Engineering/ Information Technology

<table>
<tr><th>Course Code</th><th>Course Name</th><th colspan="3">Teaching Scheme (Hrs. / Week)</th><th colspan="4">Credits Assigned</th></tr>
<tr><td rowspan="7">25FE1VSE01</td><td rowspan="7">Engineering Skills Workshop-I</td><td>L</td><td>T</td><td>P</td><td>L</td><td>T</td><td>P</td><td>Total</td></tr>
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**Course Objectives:**

1. To familiarize students with basic mechanical, electrical, and electronic measuring instruments and their applications in Engineering.
2. To develop practical skills in handling tools, workshop operations, assembling desktop computer systems, and executing electrical wiring projects.
3. To inculcate safety awareness and systematic procedures for installing, testing, and troubleshooting electrical and electronic systems in real-world environments.

| | | |
|---|---|---|
| **Course Outcomes** | After successful completion of the course, students will be able to | |
| | CO1 | Recall the names, functions, and safety procedures for common mechanical, electrical, and electronic tools and measuring instruments used in engineering workshops.(Remembering) |
| | CO2 | Explain the principles of operation and application of linear measuring instruments, electronic instruments (DMM, Function Generator, CRO, Power Supply), wiring accessories, and earthing/protection systems.(Understanding) |
| | CO3 | Use hand tools, measuring instruments (Vernier caliper, micrometer, DMM, CRO), wiring tools, and testing equipment to perform basic mechanical measurements, assemble a PC, and construct/test electrical wiring circuits safely.(Applying) |
| | CO4 | Analyze electrical circuits and PC hardware configurations to identify faults, troubleshoot wiring problems, and diagnose system issues using appropriate testing methods and instruments.(Analyzing) |
| | CO5 | Select appropriate tools, instruments, wiring components, and PC hardware based on technical specifications, operational requirements, and safety standards for specific workshop tasks.(Evaluating) |

| | | |
|---|---|---|
| | CO6 | Assemble a functional desktop PC, construct basic electrical wiring installations conforming to safety standards, and develop solutions for troubleshooting.(Creating) |

**Syllabus:**

| Module No. | Unit No. | Topics | Hours |
|---|---|---|---|
| **1** | | **Trade 1: Mechanical, Electrical & Electronics Measurements** | **10** |
| | 1.1 | Measurement of linear dimensions using linear measurement tools like Vernier caliper, micrometer,Vernier height gauge. | |
| | 1.2 | Measurement of small dimensions by Optical Profile Projector | |
| | 1.3 | Setting of dimensions using precision gauge blocks (slip gauges) by Wringing process, Measurement of components deviations w.r.t. standard using mechanical comparator | |
| | 1.4 | Spirit Level for Alignment test, Feeler Gauges for Gap measurement, Thread Gauges for thread measurement | |
| | 1.5 | Introduction to Electronic Measurement Instruments<br>Basics of Measurement Instruments and concepts<br>Overview of Key Instruments | |
| | 1.6 | Power Supply:<br>Types of Power Supplies, Block diagram and Functionality<br>Applications and Hands-On Exercise | |
| | 1.7 | Digital Multi-meter (DMM)<br>Introduction to DMM<br>Modes of Operation and functionality<br>Applications and Hands-On Exercise | |
| | 1.8 | Function Generator, Cathode Ray Oscilloscope (CRO)<br>Overview of Function Generators and CRO<br>Types of Function generators & its signals, CRO functions,<br>Applications and Hands-On Exercise | |
| **2** | | **Trade 2: PC Assembly** | |
| | 2.1 | Desktop Basics: Identifying components-motherboard, CPU, RAM, storage, etc. | **10** |
| | 2.2 | Assembling a PC | |
| | 2.3 | BIOS/UEFI overview and settings Hands-on: Build and boot a desktop system | |
| | 2.4 | Preparing bootable media (USB) BIOS boot settings | |
| | 2.5 | Installing Windows/Linux OS, Initial OS configuration and activation, Hands-on: OS installation practice on 2–3 different hardware configurations | |
| **3** | | **Trade 3: Electrical Wiring** | |
| | 3.1 | Introduction to Electrical Tools and Accessories | **10** |

| | | | |
|---|---|---|---|
| | | Electrical Systems and Safety Protocols: Ohm's Law and its applications, AC vs. DC systems, Personal Protective Equipment (PPE), Electrical hazards and safety measures, First aid and emergency<br>Hand Tools and Equipment: Identification and use of screwdrivers, pliers, wire cutters, etc., Drilling machines and bits, Insulation resistance testers. | |
| | 3.2 | Electrical Wiring<br>Wiring Accessories, Types of switches, sockets, MCBs, ELCBs, and distribution board, Selection criteria and installation<br>Types of Wiring Systems and wiring practices for Single-phase and three-phase circuits, Installation and techniques and Cables | |
| | 3.3 | Earthing and Protection Systems<br>Earthing Methods<br>Copper Plate earthing, pipe earthing, and rod earthing<br>Protection Devices<br>MCBs, ELCBs, RCCBs<br>Electrical Testing and Troubleshooting, Testing Procedures, Polarity, continuity, insulation, and earthing tests, Use of testing instruments: Multimeter, Megger.<br>Identifying and rectifying faults in circuits, Electrical Installations in Residential and Commercial, Industry Standards and Regulations, Regulatory Bodies and Codes | |
| | 3.4 | Practical Sessions and Hands-On Training<br>Circuit Construction, Building and testing basic circuits, installation Projects, Residential and commercial wiring installations<br>Fault Simulation, Creating and diagnosing faults in circuits, Safety Drills, Emergency response and safety protocol exercises<br>Tools and Equipment, Multi-meter, Meggers, Insulation testers. Cable cutters, strippers, crimping | |
| | 3.5 | Electrical Networks<br>House Wiring, Stair Case and Go down wiring<br>Series bulb and Extension Board wiring<br>Electrical Gadgets, Repairing of appliances like Table fan/Ceiling fan<br>Emergency extension Board and Electrical fan | |
| | | **TOTAL** | **30** |

**Text Books:**


1. "Practical Electronics for Inventors" by Paul Scherz and Simon Monk (4th Edition, McGraw-Hill Education, 2016)
2. Engineering Metrology and Measurements, Authors: N.V. Raghavendra, L. Krishnamurthy, Publisher: Oxford University Press
3. "Computer Hardware and Networking" Author: K. L. James, Publisher: Scitech Publications
4. "Electrical Wiring, Estimating and Costing", Author: S.L. Uppal and G.C. Garg, Publisher: Khanna Publishers

**Reference Books:**


1. "Fundamentals of Electrical Engineering and Technology" by BL Theraja (S. Chand Publishing)
2. PC Hardware: The Complete Reference", Author: Craig Zacker and John Rourke, Publisher: McGraw Hill Education
3. "Electrical Wiring, Maintenance and Estimating", Author: B.L. Theraja, Publisher: S. Chand Publishing


**Term Work:**
Students are expected to complete all Three trades conducted individually and batch-wise in laboratory settings.

| Type of Course | Assessment Tool | Marks Distribution |
|---|---|---|
| **Workshop** | **CA-50** | • Active Participation = 5 marks<br>• Trade 1# = 15 marks<br>• Trade 2# = 15 marks<br>• Trade 3# = 15 marks<br># Based on the performance and satisfactory completion of trade wise tasks. |

# 1. Course Vertical – VSEC- Problem Solving Using C Programming

| Course Code | Course Name | Teaching Scheme (Hrs. / Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| 25FE1VSEC02 | Problem Solving using C-Programming | L | P | T | L | P | T | TOTAL |
| | | - | 2*+ 2 | - | - | 2 | - | 2 |
| | | Examination Scheme | | | | | | |
| | | | CA | MSE | ESE | TW | OR | PR | Total |
| | | Theory | - | - | - | - | - | - | - |
| | | Lab/Tut | 25 | - | - | - | - | 25 | 50 |
| | | Total | 50 | | | | | | |

**Course Objectives:**

1. To introduce students to the fundamental principles of problem-solving, algorithm design, and various programming paradigms, with a focus on structured programming using C.
2. To equip students with the ability to implement and apply core programming constructs to develop solutions for real-world problems.
3. To develop the capability to analyze and create modular, efficient, and maintainable programs by integrating different C programming concepts including structures and file handling.

| | | |
|---|---|---|
| **Course Outcomes** | After successful completion, the students will be able to | |
| | CO1 | **Recall** key concepts of problem-solving, programming paradigms, and characteristics of algorithms and programs. (Remembering) |
| | CO2 | **Explain** the use of variables, data types, operators, and control structures in computer programming. (Understanding) |
| | CO3 | **Apply** appropriate control structures, arrays, and strings to solve real-life computational problems. (Applying) |
| | CO4 | **Analyze** the use of functions, recursion, and modular programming techniques in structured problem solving. (Analyzing) |
| | CO5 | **Compare** the use of structures, unions, and pointers to organize and access data in different programming scenarios. (Evaluating) |
| | CO6 | **Design and develop** complete C programs to solve real-world problems. (Creating) |

**Syllabus:**

| Module No. | Unit No. | Topics | Hours |
|---|---|---|---|
| **1** | | **Introduction to Problem Solving and Programming Paradigms** | |
| | 1.1 | Definition of a problem, steps in problem solving, writing and understanding algorithms, Distinction between an algorithm and program , characteristics of a good algorithm, examples of real-life problem solving. | 3 |
| | 1.2 | Introduction to computer programming, general programming paradigms and their comparison,top-down design approach, basics of C as a procedural language, concept of flowcharts, using flowcharts and algorithms for designing solutions. | |
| | **Self Learning:** Utilization of the SCRATCH tool for logic building : https://scratch.mit.edu/ | | |
| **2** | | **Basic Elements of Computer Programming and Control flow** | |
| | 2.1 | Variables, keywords, constant , Data types, Operators**:** Arithmetic, Relational and Logical, Assignment, Unary, Conditional, Bitwise, Expression, Statements. | 5 |
| | 2.2 | Branching Structures: if statement, if-else statement,nested if-else, multi-way decision, switch statement, continue statement, break statement, Iterative Structures: while, do-while, for, nested loops. | |
| | 2.3 | Problem Solving to apply, if, if-else, and nested if statements to make decisions based on conditions. Implement switch-case structures for multi-way branching.loops like for, while, and do-while to handle repeated operations.Utilize break, continue, and nested loops to manage flow in complex scenarios.<br>Eg. Grading System, ATM Cash Withdrawal, Electricity Bill Calculator, Prime Number Check, Menu-driven Program, etc. | |
| | **Self Learning:** Explore the virtual lab of this module in the link below: https://cse02-iiith.vlabs.ac.in/ | | |
| **3** | | **Problem Solving using Array Techniques** | |
| | 3.1 | Concept of arrays, declaration and initialization, accessing array elements, one-dimensional arrays, two-dimensional arrays, character arrays, and introduction to strings | 6 |
| | 3.2 | Problem solving such as reversing arrays, counting elements, searching, finding maximum or minimum values, and performing string operations like length calculation, keyword search, anagram and palindrome checks, and basic string modifications. | |
| | **Self Learning:** Explore the virtual lab of this module in the link below: https://cse02-iiith.vlabs.ac.in | | |
| **4** | | **Problem Solving using Modular Approach** | |
| | 4.1 | Defining a Function, accessing a Function, types of function, Function Prototype, Passing Arguments to a Function, call by value and call by reference, Recursion | 7 |
| | 4.2 | Problem solving using Functions and Recursion | |
| | **Self Learning :**Explore the virtual lab of this module in the link below: https://cse02-iiith.vlabs.ac.in | | |
| **5** | | **Structures, Unions and Pointers** | |

| | | | |
|---|---|---|---|
| | 5.1 | Structures and Union: Declaration, Initialization, structure within structure, Array of Structure, Operation on structures, Concept of Union, Difference between structure and union, Introduction to Pointers. | 6 |
| | 5.2 | Exercises demonstrating pointer arithmetic and data manipulation using pointers in arrays, functions, and strings and comparison of union , structure and pointers. | |
| | **Self Learning :**Explore the virtual lab of this module in the link below: https://cse02-iiith.vlabs.ac.in | | |
| **6** | | **File handling** | |
| | 6.1 | File handling**:** Types of File, File operation- creating ,opening, reading, writing, closing, introduction to dynamic memory allocation. | 3 |
| | | **Self-Learning:** Use any online compiler to print a student grade sheet using file handling techniques. | |
| | | **TOTAL** | **30** |

**Laboratory Experiments (Minimum 10)**

**Note: All problems should be implemented using C language.**

| Sr. No. | Title of the Experiment |
|---|---|
| **1** | Title: *Student Report Card Generator Using Console I/O in C*<br>Problem Statement: Mark Sheet Generation System<br>Create a C program that simulates a college mark sheet generation system. The program should collect student details such as name, roll number, and marks in three subjects, then display the result in a formatted manner. Use various C input/output functions like scanf(), printf(), getchar(), putchar(), gets(), and puts() to demonstrate basic console-based data handling. |
| **2** | Title: *Smart Billing Calculator for Grocery Store using Operators in C*<br>Problem Statement: Grocery Billing Assistant<br>Design a C program to assist a grocery store manager with daily billing tasks. The application should compute the total cost of items, apply discounts, calculate taxes, and compare prices using various C operators—arithmetic, relational, logical, assignment, unary, conditional, bitwise, and comma operators—to streamline routine calculations efficiently. |
| **3** | Title: *Automated Discount and Billing System Using Decision-Making Constructs in C*<br>Problem Statement: Clothing Store Billing System<br>Develop a C program to automate the billing process for a clothing store. The system should take the customer type and total purchase amount as input, determine applicable discounts based on store policies, and calculate the final bill. Use decision-making constructs like if, if-else, nested if, and switch-case to apply the correct discount rules. This program simulates a real-world retail scenario where billing decisions vary based on dynamic customer and purchase conditions. |
| **4** | Title: *Interactive ATM Application Using Looping Constructs in C*<br>Problem Statement: ATM Simulation System<br>Create a simple ATM simulation program in C that allows users to perform basic banking operations such as checking account balance, depositing money, withdrawing money, and exiting the application. Use while and do-while loops to repeatedly display the menu and |

| | |
|---|---|
| | manage user interaction until the user chooses to exit. This application mirrors the functionality of a real ATM interface and demonstrates the use of iterative control structures in practical scenarios. |
| **5** | Title: *Interactive Grade Classification System Using Control Flow Constructs in C*<br>Problem Statement: Student Grade Categorization System<br>Design a C program for a school that helps teachers input and categorize student grades into predefined ranges such as Excellent, Good, Average, or Poor. The system should use control flow mechanisms like switch, case, break, continue, and goto to manage user input, grade classification, and repeated interactions. This simulation mirrors how educational institutions classify academic performance efficiently. |
| **6** | Title: *Warehouse Stock Tracker Using Arrays and Control Structures in C*<br>Problem Statement: Inventory Management System<br>A warehouse maintains a variety of items and requires a basic inventory management system to monitor and update stock levels. Develop a C program that simulates the checking and updating of stock quantities for a specific item. The system should allow input of item details, current stock level, and restock quantity, then update and display the new stock status. Use arrays and control structures to manage item data and simulate real-time inventory operations typically needed in warehouse environments. |
| **7** | Title: *Seating Arrangement Permutations Using Iteration and Recursion in C*<br>Problem Statement: Event Planning – Seating Arrangement Calculation<br>You are tasked with organizing a formal event—such as a wedding, conference, or banquet—and need to calculate the number of possible ways to arrange a given number of guests in a row. This requires computing permutations based on the total number of guests, which is mathematically represented by the factorial of the number. Develop a C program that calculates the factorial using both iterative and recursive methods to determine all possible unique seating arrangements. This mirrors real-world event planning challenges where optimal arrangements and guest management are essential. |
| **8** | Title: *Library Management Using Arrays in C*<br>Problem Statement: Library Book Tracker<br>Create a C program to manage book borrowing in a small library using 1D arrays for book titles and 2D arrays to track borrowed copies by multiple users. This simulates a simple system to monitor library usage and book availability. |
| **9** | Title: *Hotel Guest Registry Using Strings in C*<br>Problem Statement: Guest Information Organizer<br>Design a C program to collect, store, and display guest details such as name, phone number, and email using character arrays and string handling. This simulates a simple hotel front desk system for managing guest information effectively. |
| **10** | Title: *Employee Record Management System Using Structures in C*<br>Problem Statement: Employee Record Manager<br>Design a C program to manage basic employee records for a company using structures. The program should store and display details like name, employee ID, department, and salary for multiple employees, simulating a simple HR database system. |

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|---|---|
| **11** | Title: *Patient Heart Rate Tracker Using Pointers and Arrays in C*<br>Problem Statement: Health Monitoring System<br>Design a C program that simulates a basic health monitoring system. The program should record a patient's heart rate readings over a day using an array and then determine the maximum and minimum heart rate using pointer arithmetic. This system reflects how wearable health devices or medical software analyze real-time data to monitor patient health trends efficiently. |
| **12** | Title: *Persistent Contact Saver Using File Handling in C*<br>Problem Statement: Contact Management System<br>Develop a mini Contact Management System in C that enables users to efficiently add new contact details—such as name and phone number—to a file using append mode, preserving previously saved data. The program should also retrieve and display all stored contacts, demonstrating the use of file handling for simple, real-world data storage and retrieval operations. |

**Text Books:**


1. Kernighan, B. W., Ritchie, D. M., "The C Programming Language", Second Edition, Pearson, 2015
2. Forouzan, B. A., "Computer Science: A Structured Programming Approach Using C", Third Edition, Cengage India Private Limited, 2007
3. Kanetkar, Yashavant P., "Let Us C: Authentic Guide to C Programming Language", 20th Edition, BPB Publications, 2024


**Reference Books:**


1. Ghezzi, Carlo, & Jazayeri, Mehdi, "Programming Language Concepts", Third Edition, John Wiley & Sons, 2008.
2. Rajaraman, V., & Adabala, Neeharika, "Computer Programming in C", Second Edition, PHI Learning, Eastern Economy Edition, 2014.
3. Gottfried, Byron, "Programming with C", Fourth Edition, McGraw Hill (Schaum's Outline Series), 2018.


**Useful Links:**

1. NPTEL Course: https://nptel.ac.in/courses/106105171
2. OnlineGDB: https://www.onlinegdb.com/
3. Programiz C Compiler: ttps://www.programiz.com/c-programming/online-compiler/
4. JDoodle: https://www.jdoodle.com/c-online-compiler
5. Replit: https://replit.com/
6. TutorialsPoint Coding Ground: https://www.tutorialspoint.com/compile_c_online.php

## Assessment Methodology:

| Type of Course | Assessment Tool | Marks Distribution |
|---|---|---|
| **Theory** | **CA-25** | • Certification: NPTEL (20 Marks) (Approved by instructor)<br>• Active Participation and Timely Submission of Laboratory and Programming Assignments ( 5 Marks)<br><br>OR<br><br>• Any two Pedagogies (10 marks each) and Active Participation and Timely Submission of Laboratory and Programming Assignments<br>• (5 Marks)<br><br>• MCQ /Class Test<br>• Case study/Assignment<br>• GATE based Tutorial<br>• MOOCs Certification (Approved by instructor)<br>• Open Book Test<br>• Working model / simulation of a course-based concept. |
| | **OR-25** | Practical examination will be based on the experiments performed by the students during laboratory sessions. |

## 1. Course Vertical VEC- Universal Human Values

| Course Code | Course Name | Teaching Scheme (Hrs. / Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| 25FE1VEC01 | Universal Human Values | L | P | T | L | P | T | TOTAL |
| | | 2 | - | - | 2 | - | - | 2 |
| | | Examination Scheme | | | | | | |
| | | | CA | MSE | ESE | TW | OR | PR | Total |
| | | Theory | 50 | - | - | - | - | - | 50 |
| | | Lab/Tut | - | - | - | - | - | - | - |
| | | Total | 50 | | | | | | |

**Course Objectives:**

1. Develop a holistic understanding of human aspirations, values, and harmony in existence.
2. Reflect on self, relationships, society, and nature through rational and verifiable exploration.
3. Cultivate ethical conduct, empathy, and sustainable problem-solving skills.
4. Apply human values in personal and professional life for societal well-being.

| | | |
|---|---|---|
| Course Outcomes | After successful completion, the students will be able to | |
| | CO1 | Recall the fundamental concepts of human aspirations, harmony, and values in personal, social, and environmental contexts. (Remembering) |
| | CO2 | Explain the interrelationship between the self, body, family, society, and nature, and how harmony is achieved at each level. (Understanding) |
| | CO3 | Apply the principles of trust, respect, and ethical reasoning to resolve real-life interpersonal and societal conflicts. (Applying) |
| | CO4 | Analyze social, economic, and environmental systems to identify factors influencing harmony, sustainability, and human well-being. (Analyzing) |
| | CO5 | Evaluate professional practices, policies, and lifestyles based on their alignment with ethical values and the universal human order. (Evaluating) |
| | CO6 | Design sustainable, ethical, and human-centric models or solutions for personal, professional, and societal development. (Creating) |

**Syllabus:**

| Module No. | Unit No. | Topics | Hours |
|---|---|---|---|
| **1** | | **Introduction to Value Education** | |
| | 1.1 | Purpose of education (NEP 2020 alignment), | **5** |
| | 1.2 | Self-exploration: Content, process, and motivation, | |
| | 1.3 | Human aspirations: Happiness, prosperity, and right understanding, Critical appraisal of modern societal challenges | |
| | Self-Learning Topics: NEP 2020 key points on value-based education; Current societal challenges (SDGs, social inequality, etc.) | | |
| **2** | | **Harmony in the Human Being** | |
| | 2.1 | Coexistence of 'I' (consciousness) and body | **5** |
| | 2.2 | Needs of self (happiness) vs. body (physical facilities) | |
| | 2.3 | Self-regulation, health, and prosperity | |
| | Self-Learning Topics: Case studies on balance between physical and mental well-being; Holistic health approaches | | |
| **3** | | **Harmony in the Family & Relationships** | |
| | 3.1 | Foundational values: Trust, respect, affection | 6 |
| | 3.2 | Programs for mutual fulfillment in relationships, | |
| | 3.3 | Case studies on family harmony | |
| | Self-Learning Topics: Conflict resolution methods (nonviolent communication); - Relationship-building techniques | | |
| **4** | | **Harmony in Society** | |
| | 4.1 | Human goals: Resolution, prosperity, fearlessness, coexistence, | **4** |
| | 4.2 | Vision of universal harmonious society (family to world family). | |
| | Self-Learning Topics: SDGs and their connection to societal harmony; Community welfare programs; Inspirational case studies on social entrepreneurs | | |
| **5** | | **Harmony in Nature & Existence** | |
| | 5.1 | Four orders of nature | **5** |
| | 5.2 | Interconnectedness and cyclability | |
| | 5.3 | Sustainable living and responsible resource use | |
| | Self-Learning Topics: Renewable energy technologies; - Traditional ecological knowledge and practices; Global sustainability movements | | |
| **6** | | **Professional Ethics & Universal Human Order** | |
| | 6.1 | Ethical human conduct in professions | 5 |
| | 6.2 | Humanistic education, constitution, and management models | |
| | 6.3 | Case studies: Eco-friendly technologies and systems | |

| | | | |
|---|---|---|---|
| | Self-Learning Topics: Renewable energy technologies; - Traditional ecological knowledge and practices; Global sustainability movements | | |
| | | **TOTAL** | **30** |

**Text Books:**

1. A Foundation Course in Human Values and Professional Ethics – R.R. Gaur.

**Reference Books:**

1. The Story of My Experiments with Truth – M.K. Gandhi
2. Small is Beautiful – E.F. Schumacher
3. Hind Swaraj – M.K. Gandhi

**Useful Links:**

1. Online Resources [UHV Foundation](https://uhv.org.in)

## Assessment Methodology

| Type of Course | Assessment Tool | Marks Distribution |
|---|---|---|
| **Theory** | **CA-50** | • Active Participation = 5 marks<br>• MCQ /Class Test= 10 marks<br>• Instructor Assessment of the Activity carried out by student = 25 marks<br>• Assignment = 10 marks |