

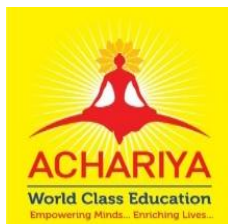
**ACHARIYA**  
**COLLEGE OF ENGINEERING TECHNOLOGY**  
*AN AUTONOMOUS INSTITUTION*  
*(Approved by AICTE, New Delhi, and affiliated to Pondicherry University) Accredited by NAAC & ISO 9001:2008 Certified Institution*

**Pondicherry – 605010**



**Curriculum and Syllabi for**  
**B. Tech (Mechanical Engineering)**  
**REGULATIONS – 2026**  
**(Effective from Academic Year 2026-2027)**

**Subject to the Approval of the First Academic Council meeting of Achariya College of Engineering Technology**



**DEPARTMENT OF MECHANICAL ENGINEERING**  
**ACHARIYA COLLEGE OF ENGINEERING TECHNOLOGY**

**INSTITUTION'S**  
**VISION & MISSION**

**VISION:**

To be a center of excellence in technical education, producing globally competent and ethically strong engineering professionals who contribute to the development of society and nation.

**MISSION:**

1. Provide high-quality engineering education through state-of-the-art infrastructure.
2. Foster innovation, research, and entrepreneurship among students.
3. Maintain lifelong connection with alumni and industry partners.
4. Inculcate moral values and psychological well-being

**DEPARTMENT OF MECHANICAL ENGINEERING**  
**VISION & MISSION**

**VISION**

To be regionally and nationally recognized as department of excellence providing high quality Mechanical Engineering education leading to competent shouldering the responsibility to contribute effectively to the advancement of industry and society

**MISSION**

1. Technical Excellence: To be a center of excellence for Mechanical Engineering education by providing the state of the art facilities & learning environment. To mould engineers with sound basics to adopt to latest technologies.
2. Industry Relationship: To promote industry-institute interaction through consultancy services and continuing education programs and providing specialized programs as per the need and become active partner for the industries in their R& D work.
3. Competency: Imparting quality education to the students and enhancing their skills to make them competitive Mechanical Engineers. And encouraging students to actively involve in entrepreneurship development.
4. Social and ethical Competency values: To provide the students with academic environment of excellence, leadership, ethical guidelines and lifelong learning needed for a long productive career.

## **CURRICULUM AND SYLLABUS**

The Curriculum of B.Tech. (Mechanical Engineering) is designed to fulfil the Program Educational Objectives (PEO) and the Program Outcomes (PO) listed below.

### **PROGRAM EDUCATIONAL OBJECTIVES (PEO)**

|             |                                                                                                                            |
|-------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>PEO1</b> | <b>Build successful careers by applying mechanical engineering fundamentals and robotics to solve industrial problems.</b> |
| <b>PEO2</b> | <b>Pursue higher education, research, innovation, and lifelong learning in emerging engineering technologies.</b>          |
| <b>PEO3</b> | <b>Demonstrate ethics, leadership, teamwork, and develop sustainable engineering solutions for society.</b>                |

### **PROGRAM OUTCOMES (PO)**

|            |                                                   |                                                                                                                                                                                                                                                                                      |
|------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PO1</b> | <b>Engineering Knowledge</b>                      | Apply the knowledge of Mathematics, Natural science, Computing, Engineering Fundamentals and an Engineering Specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems                                                        |
| <b>PO2</b> | <b>Problem Analysis</b>                           | Identify, formulate review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development (WK1-WK4)                                                                                                  |
| <b>PO3</b> | <b>Design / Development of solutions</b>          | Design creative solutions for complex engineering problems and design / develop systems / components / processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5) |
| <b>PO4</b> | <b>Conduct Investigations of complex problems</b> | Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis and interpretation of data to provide valid conclusions (WK8).                                                                            |
| <b>PO5</b> | <b>Engineering Tool Usage</b>                     | Create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling                                                                                                                                                   |

|             |                                               |                                                                                                                                                                                                                                                                              |
|-------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             |                                               | recognizing their limitations to solve complex engineering problems<br>(WK2 & WK6).                                                                                                                                                                                          |
| <b>PO6</b>  | <b>The Engineer and the world</b>             | Analyse and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment (WK1, WK5 and WK7).                                  |
| <b>PO7</b>  | <b>Ethics</b>                                 | Apply ethical principles and commit to professional ethics, human values. 4 Diversity and inclusion, adhere to national and international laws (WK9).                                                                                                                        |
| <b>PO8</b>  | <b>Individual and Collaborative Team Work</b> | Function effectively as an individual, and as a member or leader in diverse / multi-disciplinary teams.                                                                                                                                                                      |
| <b>PO9</b>  | <b>Communication</b>                          | Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentations, make effective presentations considering cultural, language, and learning differences |
| <b>PO10</b> | <b>Project Management and Finance</b>         | Apply knowledge and understanding of engineering management principles and economic decision making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.                                       |
| <b>PO11</b> | <b>Life-long learning</b>                     | Recognize the need for, and have the preparation and ability for<br>i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change (WK8).                                |

**KNOWLEDGE AND ATTITUDE PROFILE (WK)**

|            |                                     |                                                                                                                                                                                                                                                         |
|------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WK1</b> | <b>Natural Sciences</b>             | A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences                                                                                                                 |
| <b>WK2</b> | <b>Mathematics</b>                  | Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline                                            |
| <b>WK3</b> | <b>Engineering Fundamentals</b>     | A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline                                                                                                                                               |
| <b>WK4</b> | <b>Specialist Knowledge</b>         | Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.                                                |
| <b>WK5</b> | <b>Engineering Design/Ops</b>       | Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area                                     |
| <b>WK6</b> | <b>Engineering Practice</b>         | Knowledge of engineering practice (technology) in the practice areas in the engineering discipline                                                                                                                                                      |
| <b>WK7</b> | <b>Society &amp; Sustainability</b> | Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development                                    |
| <b>WK8</b> | <b>Research Literature</b>          | Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues                                                                |
| <b>WK9</b> | <b>Ethics &amp; Conduct</b>         | Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes |

### **PROGRAM SPECIFIC OUTCOMES (PSO)**

|             |                                                                                                                                                                                                           |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PSO1</b> | <b>Apply thermal sciences, robotics, mechatronics, automation, and digital technologies to analyze, design, optimize, and develop intelligent mechanical engineering and smart manufacturing systems.</b> |
| <b>PSO2</b> | <b>Develop innovative and sustainable mechanical engineering solutions using modern design, advanced manufacturing practices, and emerging engineering technologies.</b>                                  |

### **SUSTAINABLE DEVELOPMENT GOALS**

|              |                                                 |                                                                                                                                    |
|--------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>SDG01</b> | <b>No Poverty</b>                               | End poverty in all its forms everywhere (eradicate extreme poverty currently measured as people living on less than \$1.25 a day.) |
| <b>SDG02</b> | <b>Zero Hunger</b>                              | End hunger, achieve food security and improved nutrition and promote sustainable agriculture                                       |
| <b>SDG03</b> | <b>Good Health and Well-being</b>               | Ensure healthy lives and promote well-being for all at all ages                                                                    |
| <b>SDG04</b> | <b>Quality Education</b>                        | Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all                               |
| <b>SDG05</b> | <b>Gender Equality</b>                          | Achieve gender equality and empower all women and girls                                                                            |
| <b>SDG06</b> | <b>Clean Water and Sanitation</b>               | Ensure availability and sustainable management of water and sanitation for all                                                     |
| <b>SDG07</b> | <b>Affordable and Clean Energy</b>              | Ensure access to affordable, reliable, sustainable and modern energy for all                                                       |
| <b>SDG08</b> | <b>Decent Work and Economic Growth</b>          | Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all               |
| <b>SDG09</b> | <b>Industry, Innovation, and Infrastructure</b> | Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation                          |
| <b>SDG10</b> | <b>Reduced Inequalities</b>                     | Reduce inequality within and among countries                                                                                       |
| <b>SDG11</b> | <b>Sustainable Cities and Communities</b>       | Make cities inclusive, safe, resilient, and sustainable.                                                                           |
| <b>SDG12</b> | <b>Responsible Consumption and Production</b>   | Ensure sustainable consumption and production patterns.                                                                            |

|              |                                                |                                                                                         |
|--------------|------------------------------------------------|-----------------------------------------------------------------------------------------|
| <b>SDG13</b> | <b>Climate Action</b>                          | Ensure sustainable consumption and production patterns.                                 |
| <b>SDG14</b> | <b>Life Below Water</b>                        | Conserve and sustainably use marine resources.                                          |
| <b>SDG15</b> | <b>Life on Land</b>                            | Protect ecosystems, manage forests, combat desertification, and halt biodiversity loss. |
| <b>SDG16</b> | <b>Peace, Justice, and Strong Institutions</b> | Promote peaceful societies, access to justice, and effective institutions.              |
| <b>SDG17</b> | <b>Partnerships for the Goals</b>              | Strengthen the global partnership for sustainable development.                          |

## DEFINITION OF CREDIT

| TEACHING ACTIVITY                                        | CREDIT EQUIVALENT |
|----------------------------------------------------------|-------------------|
| 1 Hour Lecture (L) per week per semester                 | <b>1 Credit</b>   |
| 1 Hour Tutorial (T) per week per semester                | <b>1 Credit</b>   |
| 2 Hours Practical / Laboratory (P) per week per semester | <b>1 Credit</b>   |

Note: variations can be done according to requirements of hours for syllabus completion

## SCHEME OF CREDIT DISTRIBUTION-SUMMARY

|                                         | <b>I</b>    | <b>II</b>   | <b>III</b>  | <b>IV</b>   | <b>V</b>  | <b>VI</b> | <b>VII</b> | <b>VIII</b> | <b>Total</b> |
|-----------------------------------------|-------------|-------------|-------------|-------------|-----------|-----------|------------|-------------|--------------|
| <b>Basic Science Courses</b>            | 8.5         | 7           | 4           | 4           | -         | -         | -          | -           | 23.5         |
| <b>Engineering Science Courses</b>      | 10          | 10.5        | -           | -           | -         | -         | -          | -           | 20.5         |
| <b>Professional Core Courses</b>        | -           | -           | 18.5        | 18.5        | 17        | 12.5      | 3          | -           | 69.5         |
| <b>Professional Elective Courses</b>    | -           | -           | -           | -           | -         | 3         | 6          | 3           | 12           |
| <b>Humanities and Social Management</b> | 3           | 3           | -           | -           | 3         | 1.5       | -          | -           | 10.5         |
| <b>Open Elective Courses</b>            | -           | -           | -           | -           | -         | 3         | 6          | -           | 9            |
| <b>Project</b>                          | -           | -           | -           | -           | 1         | 2         | 3          | 8           | 14           |
| <b>Mandatory Courses</b>                | -           | -           | -           | -           | -         | -         | -          | -           | 0            |
| <b>Career Development Skill</b>         | 1           | 1           | 1           | 1           | 1         | 1         | -          | -           | 6            |
| <b>Skill Development Laboratory</b>     | -           | -           | -           | 1           | 1         | 1         | 1          | -           | 4            |
| <b>TOTAL</b>                            | <b>22.5</b> | <b>21.5</b> | <b>23.5</b> | <b>24.5</b> | <b>23</b> | <b>24</b> | <b>19</b>  | <b>11</b>   | <b>169</b>   |

**STRUCTURE OF THE UG PROGRAMME (Total: 170 Credits)**

| <b>Sl. No</b> | <b>CODE</b> | <b>CATEGORY</b>                  | <b>SUGGESTED CREDITS (160-192)</b> | <b>TOTAL CREDIT ASSIGNED (169)</b> |
|---------------|-------------|----------------------------------|------------------------------------|------------------------------------|
| 1             | BSC         | Basic Science Courses            | 29*                                | 23.5                               |
| 2             | ESC         | Engineering Science Courses      | 27*                                | 20.5                               |
| 3             | PCC         | Professional Core Courses        | 58*                                | 69.5                               |
| 4             | PEL         | Professional Elective Courses    | 09*                                | 12                                 |
| 5             | HSM         | Humanities and Social Management | 12*                                | 10.5                               |
| 6             | OEL         | Open Elective Courses            | 09*                                | 09                                 |
| 7             | PROJ        | Project / Internship / Seminar   | 16*                                | 14                                 |
| 8             | SDL         | Skill Development Laboratory     | 04*                                | 04                                 |
| 9             | MAN         | Mandatory Courses                | Non-Credit                         | ---                                |
| 10            | CDS         | Employability Enhancement Skill  | 06                                 | 06                                 |
|               |             | Total Credits                    | <b>170</b>                         | <b>169</b>                         |

### **ABBREVIATION**

| <b>S.NO</b> | <b>ABBREVIATION</b> | <b>FULL FORM</b>                 |
|-------------|---------------------|----------------------------------|
| 1           | BSC                 | Basic Science Courses            |
| 2           | ESC                 | Engineering Science Courses      |
| 3           | HSM                 | Humanities and Social Management |
| 4           | CDS                 | Career Development Skill         |
| 5           | PCC                 | Professional Core Courses        |
| 6           | MAN                 | Mandatory Courses                |
| 7           | PROJ                | Project                          |
| 8           | PEC                 | Professional Elective Courses    |
| 9           | OEC                 | Open Elective Courses            |
| 10          | PET                 | Physical Education & Training    |
| 11          | AEC                 | Ability Enhancement Course       |
| 12          | SDL                 | Skill Development Learning       |
| 13          | MA                  | Mathematics                      |
| 14          | UH                  | Universal Human Values           |
| 15          | CS                  | Computer Science                 |
| 16          | IT                  | Information Technology           |
| 17          | BO                  | Biology                          |
| 18          | ME                  | Mechanical Engineering           |
| 19          | CD                  | Carrier Development              |
| 20          | PE                  | Physical Education               |
| 21          | EN                  | English                          |
| 22          | EE                  | Electrical & Electronics         |
| 23          | PC                  | Physics & Chemistry              |
| 24          | NS                  | National Social Service          |
| 25          | MAN                 | Mandatory                        |
| 26          | NIH                 | NPTEL / Internship / Hackathon   |
| 27          | YOC                 | Yoga                             |

**LIST OF PROGRAMS OFFERED**

| <b>S.No.</b>                       | <b>Programme</b>                                                                                              | <b>Programme Code</b> |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>UNDER GRADUATE</b>              |                                                                                                               |                       |
| <b>B.Tech., Programmes Offered</b> |                                                                                                               |                       |
| 1                                  | B.Tech., - Artificial Intelligence and Data Science                                                           | AD                    |
| 2                                  | B.Tech., - Computer Science Engineering                                                                       | CS                    |
| 3                                  | B.Tech., - Electronics and Communication Engineering                                                          | EC                    |
| 4                                  | B.Tech., - Electrical and Electronics Engineering                                                             | EE                    |
| 5                                  | B.Tech., - Mechanical Engineering                                                                             | ME                    |
| 6                                  | B.Tech., - Information Technology                                                                             | IT                    |
| 7                                  | B.Tech., - Robotics and Automation                                                                            | RA                    |
| 8                                  | B.Tech., - Computer Science Engineering<br>( <i>IOT including Cyber Security and Block Chain Management</i> ) | CB                    |
| <b>POSTGRADUATE</b>                |                                                                                                               |                       |
| <b>M.Tech., Programmes Offered</b> |                                                                                                               |                       |
| 1                                  | M.Tech., - Artificial Intelligence and Data Science                                                           | AS                    |
| <b>MBA</b>                         |                                                                                                               |                       |
| 1                                  | MBA – General                                                                                                 | MA                    |

## SEMESTER-WISE COURSES AND CREDITS

### **I SEMESTER**

| <b>Course Code</b> | <b>Course Title</b>                                          | <b>L</b>  | <b>T</b> | <b>P</b>  | <b>SL</b> | <b>C</b>    | <b>Hrs/<br/>Wk</b> | <b>CIA</b> | <b>ESE</b> | <b>Total</b> | <b>Category</b> |
|--------------------|--------------------------------------------------------------|-----------|----------|-----------|-----------|-------------|--------------------|------------|------------|--------------|-----------------|
| MAC26101           | Matrices and Calculus                                        | 3         | 1        | 0         | 2         | 4           | 4                  | 40         | 60         | 100          | <b>BSC</b>      |
| ENC26102           | Technical English and Communication                          | 3         | 0        | 0         | 1         | 3           | 3                  | 40         | 60         | 100          | <b>HSM</b>      |
| PCT26103           | Fundamentals of Physics and Chemistry                        | 3         | 0        | 0         | 1         | 3           | 3                  | 40         | 60         | 100          | <b>BSC</b>      |
| EEC26104           | Basic Electrical & Electronics Engineering                   | 3         | 0        | 0         | 1         | 3           | 3                  | 40         | 60         | 100          | <b>ESC</b>      |
| MET26105           | Engineering Mechanics                                        | 3         | 1        | 0         | 1         | 4           | 4                  | 40         | 60         | 100          | <b>ESC</b>      |
| MEL26101           | Engineering Graphics Laboratory                              | 0         | 0        | 4         | 1         | 1.5         | 4                  | 60         | 40         | 100          | <b>ESC</b>      |
| EEP26102           | Basic Electrical & Electronics Engineering Laboratory        | 0         | 0        | 2         | 1         | 1.5         | 2                  | 60         | 40         | 100          | <b>ESC</b>      |
| PCL26101           | Physical Science Laboratory (Physics & Chemistry) Laboratory | 0         | 0        | 4         | 1         | 1.5         | 4                  | 60         | 40         | 100          | <b>BSC</b>      |
| CDC26101           | Career Development Skill – I                                 | 0         | 0        | 2         | 1         | 1           | 2                  | 100        | -          | 100          | <b>CDS</b>      |
| PEC26101           | Physical Education and Training                              | 0         | 0        | 1         | 1         | -           | 1                  | -          | -          | -            | <b>PET</b>      |
| <b>TOTAL</b>       |                                                              | <b>15</b> | <b>2</b> | <b>13</b> | <b>11</b> | <b>22.5</b> | <b>30</b>          | <b>-</b>   | <b>-</b>   | <b>-</b>     | <b>-</b>        |

## II SEMESTER

| Course Code  | Course Title                                   | L         | T        | P         | SL        | C           | Hrs/<br>Wk | CIA      | ESE      | Total    | Category |
|--------------|------------------------------------------------|-----------|----------|-----------|-----------|-------------|------------|----------|----------|----------|----------|
| MAC26201     | Partial Differential Equations and Transforms  | 3         | 1        | 0         | 2         | 4           | 4          | 40       | 60       | 100      | BSC      |
| UHC26202     | Universal Human Values                         | 3         | 0        | 0         | 1         | 3           | 3          | 40       | 60       | 100      | HSM      |
| CST26203     | Basics of Python                               | 3         | 0        | 0         | 1         | 3           | 3          | 40       | 60       | 100      | ESC      |
| BMT26204     | Biology for Mechanical Engineers               | 3         | 0        | 0         | 1         | 3           | 3          | 40       | 60       | 100      | BSC      |
| MET26205     | Basic Civil and Mechanical Engineering         | 3         | 1        | 0         | 1         | 3           | 4          | 40       | 60       | 100      | ESC      |
| CSL26201     | Python Programming Laboratory                  | 0         | 0        | 2         | 1         | 1.5         | 2          | 60       | 40       | 100      | ESC      |
| MEL26202     | Engineering Workshop Practice Laboratory – I   | 0         | 0        | 2         | 1         | 1.5         | 2          | 60       | 40       | 100      | ESC      |
| MEL26203     | Design Thinking and Idea Laboratory            | 0         | 0        | 2         | 1         | 1.5         | 2          | 60       | 40       | 100      | ESC      |
| CDC26201     | Career Development Skill – II                  | 0         | 0        | 2         | 1         | 1           | 2          | 100      | -        | 100      | CDS      |
| NSC26201     | National Social Service / Village Camp / Rally | 0         | 0        | 1         | -         | -           | 1          | -        | -        | -        | NSS      |
| <b>TOTAL</b> |                                                | <b>15</b> | <b>2</b> | <b>09</b> | <b>10</b> | <b>21.5</b> | <b>26</b>  | <b>-</b> | <b>-</b> | <b>-</b> | <b>-</b> |

### III SEMESTER

| Course Code  | Course Title                                                    | L         | T        | P        | SL        | C           | Hrs/ Wk   | CI A     | SEE      | Total    | Category |
|--------------|-----------------------------------------------------------------|-----------|----------|----------|-----------|-------------|-----------|----------|----------|----------|----------|
| MAC26301     | Probability and Statistics                                      | 3         | 1        | 0        | 2         | 4           | 4         | 40       | 60       | 100      | BSC      |
| MET26301     | Applied & Engineering Thermodynamics                            | 3         | 1        | 0        | 2         | 4           | 4         | 40       | 60       | 100      | PCC      |
| MET26302     | Mechanics of Solids                                             | 3         | 1        | 0        | 2         | 4           | 4         | 40       | 60       | 100      | PCC      |
| MET26303     | Manufacturing Technology (Forming, Casting, Machines, Moulding) | 3         | 0        | 0        | 1         | 3           | 3         | 40       | 60       | 100      | PCC      |
| MET26304     | Metallurgy and Material Sciences                                | 3         | 0        | 0        | 1         | 3           | 3         | 40       | 60       | 100      | PCC      |
| MNC26301     | Environmental Science                                           | 1         | 0        | 0        | 0         | -           | 1         | -        | 100      | 100      | MAN      |
| MEL26301     | Computer-Aided and Manual Machine Drawing Laboratory            | 2         | 0        | 2        | 1         | 1.5         | 4         | 60       | 40       | 100      | PCC      |
| MEL26302     | Material Testing Laboratory                                     | 0         | 0        | 2        | 1         | 1.5         | 2         | 60       | 40       | 100      | PCC      |
| MEL26303     | Manufacturing Technology- II                                    | 0         | 0        | 2        | 1         | 1.5         | 2         | 60       | 40       | 100      | PCC      |
| CDC26301     | Career Development Skill – III                                  | 0         | 0        | 2        | 1         | 1           | 2         | 100      | -        | 100      | CDS      |
| PET26301     | Physical Education and Training                                 | 0         | 0        | 1        | -         | -           | 1         | -        | -        | -        | AEC      |
| <b>TOTAL</b> |                                                                 | <b>18</b> | <b>3</b> | <b>9</b> | <b>12</b> | <b>23.5</b> | <b>30</b> | <b>-</b> | <b>-</b> | <b>-</b> | <b>-</b> |

#### IV SEMESTER

| Course Code  | Course Title                                            | L  | T | P  | SL | C    | Hrs/Wk | CIA | SEE | Total | Category |
|--------------|---------------------------------------------------------|----|---|----|----|------|--------|-----|-----|-------|----------|
| MAC26401     | Numerical Methods and Wave Equations                    | 3  | 1 | 0  | 2  | 4    | 4      | 40  | 60  | 100   | BSC      |
| MET26401     | Kinematics and Dynamics of Machinery                    | 3  | 1 | 0  | 2  | 4    | 4      | 40  | 60  | 100   | PCC      |
| MET26402     | Fluid Mechanics and Machinery                           | 3  | 1 | 0  | 1  | 4    | 4      | 40  | 60  | 100   | PCC      |
| MET26403     | Machining Sciences and Advanced Manufacturing Processes | 3  | 0 | 0  | 1  | 3    | 3      | 40  | 60  | 100   | PCC      |
| MET26404     | Mechanical Measurements and Metrology                   | 3  | 0 | 0  | 1  | 3    | 3      | 40  | 60  | 100   | PCC      |
| MNC26401     | Indian Constitution                                     | 1  | 0 | 0  | -  | -    | 1      | -   | 100 | 100   | MAN      |
| MEL26401     | Dynamics Laboratory                                     | 0  | 0 | 2  | 1  | 1.5  | 2      | 60  | 40  | 100   | PCC      |
| MEL26402     | Fluid Mechanics and Machinery Laboratory                | 0  | 0 | 2  | 1  | 1.5  | 2      | 60  | 40  | 100   | PCC      |
| MEL26403     | Mechanical Measurements and Metrology Laboratory        | 0  | 0 | 2  | 1  | 1.5  | 2      | 60  | 40  | 100   | PCC      |
| NIH26404     | NPTEL / Internship / Hackathon                          | 0  | 0 | 2  | 1  | 1    | 2      | 100 | -   | 100   | SDL      |
| CDC26401     | Career Development Skill – IV                           | 0  | 0 | 2  | 1  | 1    | 2      | 100 | -   | 100   | CDS      |
| YOC26401     | Yoga                                                    | 0  | 0 | 1  | -  | -    | 1      | -   | -   | -     | AEC      |
| <b>TOTAL</b> |                                                         | 16 | 3 | 11 | 12 | 24.5 | 30     | -   | -   | -     | -        |

## V SEMESTER

| Course Code | Course Title                                                                  | L  | T | P  | SL | C   | Hrs/Wk | CIA | SEE | Total | Category |
|-------------|-------------------------------------------------------------------------------|----|---|----|----|-----|--------|-----|-----|-------|----------|
| MET26501    | Design of Machine Elements                                                    | 3  | 1 | 0  | 2  | 4   | 4      | 60  | 40  | 100   | PCC      |
| MET26502    | Thermal Engineering                                                           | 3  | 1 | 0  | 2  | 4   | 4      | 60  | 40  | 100   | PCC      |
| MET26503    | CAD and CAM                                                                   | 3  | 0 | 0  | 1  | 3   | 3      | 60  | 40  | 100   | PCC      |
| MET26504    | Mechatronics, Robotics and Control                                            | 3  | 0 | 0  | 1  | 3   | 3      | 60  | 40  | 100   | PCC      |
| HST26501    | Operations Research                                                           | 3  | 0 | 0  | 1  | 3   | 3      | 60  | 40  | 100   | HSM      |
| MEL26501    | Modelling and Simulation (3D Modelling and Simulation using Ansys) Laboratory | 0  | 0 | 2  | 1  | 1.5 | 2      | 40  | 60  | 100   | PCC      |
| MEL26502    | Thermal Engineering Laboratory                                                | 0  | 0 | 2  | 1  | 1.5 | 2      | 40  | 60  | 100   | PCC      |
| MEW26501    | Mini Project                                                                  | 0  | 0 | 2  | 1  | 1   | 2      | 40  | 60  | 100   | PROJ     |
| NIH26506    | NPTEL / Internship at IIT/ NIT/ Government Sector Company / Hackathon         | 0  | 0 | 2  | 1  | 1   | 2      | 100 | -   | 100   | SDL      |
| CDC26501    | Career Development Skill – V                                                  | 0  | 0 | 2  | 1  | 1   | 2      | 100 | -   | 100   | CDS      |
| TOTAL       |                                                                               | 15 | 2 | 10 | 12 | 23  | 27     | -   | -   | -     | -        |

## VI SEMESTER

| Course Code          | Course Title                                                          | L  | T | P  | SL | C   | Hrs/Wk | CIA | SEE | Total | Category |
|----------------------|-----------------------------------------------------------------------|----|---|----|----|-----|--------|-----|-----|-------|----------|
| MET26601             | Heat and Mass Transfer                                                | 3  | 1 | 0  | 2  | 4   | 4      | 60  | 40  | 100   | PCC      |
| MET26602             | Design of Transmission Systems                                        | 3  | 1 | 0  | 2  | 4   | 4      | 60  | 40  | 100   | PCC      |
| MET26603             | Industrial and Manufacturing Automation                               | 3  | 0 | 0  | 1  | 3   | 3      | 60  | 40  | 100   | PCC      |
| MET26E01 to MET26E07 | Professional Elective – I                                             | 3  | 0 | 0  | 1  | 3   | 3      | 60  | 40  | 100   | PEL      |
| MEOE2601 to MEOE2606 | Open Elective – I                                                     | 3  | 0 | 0  | 1  | 3   | 3      | 60  | 40  | 100   | OEL      |
| MEL26601             | Heat Transfer Laboratory                                              | 0  | 0 | 2  | 1  | 1.5 | 2      | 40  | 60  | 100   | PCC      |
| MEW26605             | Micro Project                                                         | 0  | 0 | 4  | 1  | 2   | 4      | 40  | 60  | 100   | PROJ     |
| ENL2C602             | Communication Skills Laboratory                                       | 0  | 0 | 2  | 1  | 1.5 | 2      | 40  | 60  | 100   | HSM      |
| NIH26606             | NPTEL / Internship at IIT/ NIT/ Government Sector Company / Hackathon | 0  | 0 | 2  | 1  | 1   | 2      | 100 | 0   | 100   | SDL      |
| CDC26601             | Career Development Skill –VI                                          | 0  | 0 | 2  | 1  | 1   | 2      | 100 | -   | 100   | CDS      |
| TOTAL                |                                                                       | 15 | 2 | 12 | 12 | 24  | 29     | -   | -   | -     | -        |

## VII SEMESTER

| Course Code                | Course Title                                                                | L         | T        | P        | SL       | C         | Hrs/ Wk   | CIA      | SEE      | Total    | Category |
|----------------------------|-----------------------------------------------------------------------------|-----------|----------|----------|----------|-----------|-----------|----------|----------|----------|----------|
| MET26701                   | Industrial Psychology                                                       | 3         | 0        | 0        | 1        | 3         | 3         | 50       | 50       | 100      | PCC      |
| MEPE2608<br>To<br>MEPE2614 | Professional Elective – II                                                  | 3         | 0        | 0        | 1        | 3         | 3         | 40       | 60       | 100      | PEL      |
| MEPE2615<br>to<br>MEPE2621 | Professional Elective – III                                                 | 3         | 0        | 0        | 1        | 3         | 3         | 50       | 50       | 100      | PEL      |
| MEOE2607<br>to<br>MEOE2612 | Open Elective – II                                                          | 3         | 0        | 0        | 1        | 3         | 3         | 40       | 60       | 100      | OEL      |
| MEOE2613<br>to<br>MEOE2618 | Open Elective – III                                                         | 3         | 0        | 0        | 1        | 3         | 3         | 40       | 60       | 100      | OEL      |
| MEW26701                   | Project Work Phase - I                                                      | 0         | 0        | 6        | 1        | 3         | 6         | 60       | 40       | 100      | PROJ     |
| NIH26702                   | NPTEL / Internship at IIT/<br>NIT/ Government Sector<br>Company / Hackathon | 0         | 0        | 1        | 1        | 1         | 1         | 100      | 0        | 100      | SDL      |
| <b>TOTAL</b>               |                                                                             | <b>15</b> | <b>0</b> | <b>7</b> | <b>7</b> | <b>19</b> | <b>22</b> | <b>-</b> | <b>-</b> | <b>-</b> | <b>-</b> |

## VIII SEMESTER

| Course Code                | Course Title               | L | T | P  | SL | C  | Hrs/Wk | CIA | SEE | Total | Category |
|----------------------------|----------------------------|---|---|----|----|----|--------|-----|-----|-------|----------|
| MEPE2622<br>to<br>MEPE2628 | Professional Elective – IV | 3 | 0 | 0  | 1  | 3  | 3      | 40  | 60  | 100   | PEL      |
| MEW26801                   | Project Work – Phase II    | 0 | 0 | 16 | 1  | 8  | 16     | 60  | 40  | 100   | PROJ     |
| <b>TOTAL</b>               |                            | 3 | 0 | 16 | 2  | 11 | 19     | -   | -   | -     | -        |

# **SEMESTER - I**

|                 |                                  |                 |          |          |          |           |               |
|-----------------|----------------------------------|-----------------|----------|----------|----------|-----------|---------------|
| <b>MAC26101</b> | <b>MATRICES AND<br/>CALCULUS</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|                 |                                  | BSC             | 3        | 1        | 0        | 2         | 4             |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                           |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Course Prerequisite / Preamble</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                           |    |
| <ul style="list-style-type: none"> <li>• Basic knowledge of algebra, trigonometry, and calculus.</li> <li>• Understanding of matrices and elementary differential equations.</li> <li>• Foundation for advanced engineering mathematics and applications.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                           |    |
| <b>Course Objective</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                           |    |
| <ul style="list-style-type: none"> <li>• To introduce the concepts of Eigen values, Eigen vectors, matrix transformations, and quadratic forms.</li> <li>• To develop problem-solving skills in multivariable differential calculus and optimization techniques.</li> <li>• To provide knowledge of double and triple integrals and their applications in area and volume calculations.</li> <li>• To familiarize students with vector calculus operations and integral theorems used in engineering applications.</li> <li>• To enable students to solve higher order and simultaneous differential equations arising in scientific and engineering problems.</li> </ul> |                                                                                                                                           |    |
| <b>Course Outcome</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                           |    |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Apply matrix algebra concepts including Eigen values, Eigen vectors, diagonalization, and quadratic forms to solve mathematical problems. | K3 |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Use multivariable differential calculus techniques to analyze functions of several variables and optimization problems.                   | K3 |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Evaluate double and triple integrals for computing area, volume, and coordinate transformations.                                          | K3 |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Apply vector calculus operations and integral theorems to analyze vector fields and physical problems.                                    | K3 |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Solve higher order and simultaneous differential equations using appropriate analytical methods.                                          | K3 |

|                                                                                                                                                                                                                                                                         |                                         |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------|
| <b>Syllabus</b>                                                                                                                                                                                                                                                         |                                         |             |
| <b>Unit 1</b>                                                                                                                                                                                                                                                           | <b>Eigen Values and Quadratic Forms</b> | <b>(12)</b> |
| Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices – Reduction of Quadratic form to canonical form by using orthogonal transformation – Nature of a Quadratic form. |                                         |             |

|                                                                                                                                                                                                                                                                                          |                                            |             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-------------|
| <b>Unit 2</b>                                                                                                                                                                                                                                                                            | <b>Multivariable Differential Calculus</b> | <b>(12)</b> |
| Partial derivatives (excluding Euler's theorem) – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers. |                                            |             |
| <b>Unit 3</b>                                                                                                                                                                                                                                                                            | <b>Multiple Integrals</b>                  | <b>(12)</b> |
| Double integrals – Change of order of integration – Double integrals in polar co-ordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals                                                                    |                                            |             |
| <b>Unit 4</b>                                                                                                                                                                                                                                                                            | <b>Vector Calculus</b>                     | <b>(12)</b> |
| Vector Differential Operator – Gradient – Properties – Directional derivative – Divergence and Curl properties and relations – Solenoidal and Irrotational vector fields – Green's theorem – Stoke's theorem – Gauss divergence theorem.                                                 |                                            |             |
| <b>Unit 5</b>                                                                                                                                                                                                                                                                            | <b>Differential Equations</b>              | <b>(12)</b> |
| Higher order linear differential equations with constant coefficients – Method of undetermined coefficients – Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients.  |                                            |             |

**Total Hours: 60**

|                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>                                                                                                                                                                                                                                                                                                                                            |
| <ol style="list-style-type: none"> <li>1. Grewal, B. S. Higher Engineering Mathematics. 45th ed., Khanna Publishers, 2024.</li> <li>2. Sastry, S. S. Engineering Mathematics. Vol. 1, 4th ed., Prentice Hall of India, 2008.</li> <li>3. Bali, N. P., and Manish Goyal. A Textbook of Engineering Mathematics. 10th ed., Laxmi Publications, 2023.</li> </ol> |
| <b>Reference:</b>                                                                                                                                                                                                                                                                                                                                             |
| <ol style="list-style-type: none"> <li>1. Jain, R. K., and S. R. K. Iyengar. Advanced Engineering Mathematics. 5th ed., Narosa Publishing House, 2016.</li> <li>2. Ramana, B. V. Higher Engineering Mathematics. McGraw Hill Education, 2006.</li> <li>3. Singaravelu, A. Engineering Mathematics. 23rd ed., Meenakshi Agency, 2017.</li> </ol>               |

**Web / NPTEL Resources:**

1. <https://nptel.ac.in/courses/111105160>
2. [https://onlinecourses.nptel.ac.in/e-learning/preview/noc21\\_ma58](https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_ma58)
3. <https://www.coursera.org/specializations/mathematics-engineers>

**CO-PO Mapping**

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO2 | 3   | 3   | -   | -   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO3 | 3   | 2   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO4 | 3   | 3   | 1   | 1   | -   | -   | -   | -   | -   | -    | -    | 2    | 2    |
| CO5 | 3   | 3   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    |

**Assessment Methodology**

| Assessment Methodology | Assessment Tools    | Marks |
|------------------------|---------------------|-------|
| Internal Test I        | Written Examination | 10    |
| Internal Test II       | Written Examination | 10    |
| Internal Test III      | Written Examination | 10    |
| Assessment             | Assignment          | 5     |
| Attendance             | Performance         | 5     |
| Total                  |                     | 40    |

| <i>ENC26102</i>                                                                                                                                                                                                                                                           | <i>TECHNICAL ENGLISH<br/>AND COMMUNICATION</i>                                           | CATEGORY | L | T | P | SL | CREDIT |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------|---|---|---|----|--------|
|                                                                                                                                                                                                                                                                           |                                                                                          | HSM      | 3 | 0 | 0 | 1  | 3      |
| <b>Course Prerequisite / Preamble</b>                                                                                                                                                                                                                                     |                                                                                          |          |   |   |   |    |        |
| <ul style="list-style-type: none"><li>Enhances communication skills for academic and professional environments.</li><li>Develops LSRW skills for engineering students.</li><li>Focuses on technical, interpersonal, and employability communication skills.</li></ul>     |                                                                                          |          |   |   |   |    |        |
| <b>Course Objective</b>                                                                                                                                                                                                                                                   |                                                                                          |          |   |   |   |    |        |
| <ul style="list-style-type: none"><li>To develop effective LSRW skills for academic and professional communication.</li><li>To enhance technical and workplace communication skills.</li><li>To improve employability and professional communication practices.</li></ul> |                                                                                          |          |   |   |   |    |        |
| <b>Course Outcome</b>                                                                                                                                                                                                                                                     |                                                                                          |          |   |   |   |    |        |
| <b>CO1</b>                                                                                                                                                                                                                                                                | Apply effective communication principles in academic and professional contexts           |          |   |   |   |    | K3     |
| <b>CO2</b>                                                                                                                                                                                                                                                                | Demonstrate reading comprehension and analytical skills using technical materials        |          |   |   |   |    | K3     |
| <b>CO3</b>                                                                                                                                                                                                                                                                | Prepare structured technical and professional documents                                  |          |   |   |   |    | K4     |
| <b>CO4</b>                                                                                                                                                                                                                                                                | Demonstrate oral communication skills through presentations, discussions, and interviews |          |   |   |   |    | K3     |
| <b>CO5</b>                                                                                                                                                                                                                                                                | Use grammar, vocabulary, and workplace communication effectively in engineering contexts |          |   |   |   |    | K3     |

| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                     |                                                   |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------|
| <b>Unit 1</b>                                                                                                                                                                                                                                                                                                                                       | <b>Fundamentals of Technical Communication</b>    | <b>(9)</b> |
| Introduction to Communication – Process of Communication – Verbal and Non-verbal Communication – Barriers to Communication – Principles of Effective Communication – Seven C’s of Communication – Technical Communication in Engineering – Formal and Informal Communication – Digital Communication Etiquette – Listening Skills – Reading Skills. |                                                   |            |
| <b>Unit 2</b>                                                                                                                                                                                                                                                                                                                                       | <b>Reading and Language Development</b>           | <b>(9)</b> |
| Reading Techniques – Skimming – Scanning – Intensive and Extensive Reading – Reading Technical Articles, Manuals and Reports – Vocabulary Building – Root Words – Prefixes and Suffixes – Synonyms and Antonyms – Homophones and Homonyms – One-word Substitutes – Abbreviations and Acronyms – Contextual Meaning.                                 |                                                   |            |
| <b>Unit 3</b>                                                                                                                                                                                                                                                                                                                                       | <b>Professional Writing Skills</b>                | <b>(9)</b> |
| Sentence Structures – Paragraph Development – Coherence and Cohesion – Technical Description – Process Writing – Email Writing – Business Letters – Memorandum – Meeting Minutes – Resume Writing – Report Writing – Essay Writing – Instructions and Recommendations.                                                                              |                                                   |            |
| <b>Unit 4</b>                                                                                                                                                                                                                                                                                                                                       | <b>Oral Communication and Presentation Skills</b> | <b>(9)</b> |
| Phonetics and Pronunciation – Stress and Intonation – Public Speaking – JAM Sessions – Group Discussions – Debates – Role Plays – Technical Presentations – Presentation Tools and Visual Aids – Interview Skills – Corporate Communication Etiquette.                                                                                              |                                                   |            |

|                                                                                                                                                                                                                                                                                                                                       |                                                         |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|------------|
| <b>Unit 5</b>                                                                                                                                                                                                                                                                                                                         | <b>Workplace Communication and Employability skills</b> | <b>(9)</b> |
| Grammar for Professional Communication – Subject Verb Agreement – Articles and Prepositions – Error Correction – Punctuation – Common Workplace Errors – Indianisms – Cross-cultural Communication – Communication in Teams – Workplace Ethics – Communication for Innovation and Entrepreneurship – AI-assisted Communication Tools. |                                                         |            |

| <b>CO PO Mapping</b> |             |             |             |             |             |             |             |             |             |             |             |              |              |
|----------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|
| <b>COs</b>           | <b>PO 1</b> | <b>PO 2</b> | <b>PO 3</b> | <b>PO 4</b> | <b>PO 5</b> | <b>PO 6</b> | <b>PO 7</b> | <b>PO 8</b> | <b>PO 9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO 1</b> | <b>PSO 2</b> |
| CO1                  | 1           | 1           | -           | -           | -           | 2           | -           | 1           | 2           | 3           | -           | 1            | -            |
| CO2                  | 1           | 2           | -           | 1           | -           | -           | -           | -           | 1           | 3           | -           | 1            | 1            |
| CO3                  | 1           | 2           | 1           | -           | 1           | -           | -           | 1           | 2           | 3           | -           | 2            | 1            |
| C04                  | -           | -           | -           | -           | -           | 1           | -           | 1           | 3           | 3           | -           | 1            | 2            |
| C05                  | 1           | 1           | -           | -           | 1           | 2           | -           | 2           | 2           | 3           | 1           | 1            | 1            |

**Total: 45 Hrs**

| <b>Assessment Methodology</b> |                         |              |
|-------------------------------|-------------------------|--------------|
| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
| Internal Test I               | Written Examination     | 10           |
| Internal Test II              | Written Examination     | 10           |
| Internal Test III             | Written Examination     | 10           |
| Assessment                    | Assignment              | 5            |
| Attendance                    | Performance             | 5            |
| Total                         |                         | 40           |

|                 |                                                  |                 |          |          |          |           |               |
|-----------------|--------------------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
| <b>PCT26103</b> | <b>FUNDAMENTALS OF PHYSICS<br/>AND CHEMISTRY</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|                 |                                                  | BSC             | 3        | 0        | 0        | 1         | 3             |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                    |  |  |  |  |  |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|--|--|--|--|--|----|
| <b>Course Prerequisite / Preamble</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                    |  |  |  |  |  |    |
| <ul style="list-style-type: none"> <li>• Basic knowledge of Physics and Chemistry at Higher Secondary level.</li> <li>• Understanding of elementary concepts in materials science and electrochemistry.</li> <li>• Foundation for engineering applications involving materials, optics, water treatment, and energy systems.</li> </ul>                                                                                                                                                                                                                                               |                                                                                                    |  |  |  |  |  |    |
| <b>Course Objective</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                    |  |  |  |  |  |    |
| <ul style="list-style-type: none"> <li>• To introduce the concepts of magnetic, dielectric, and superconducting materials used in engineering applications.</li> <li>• To provide knowledge of quantum mechanics and wave nature of particles.</li> <li>• To familiarize students with laser principles and optical fiber communication systems.</li> <li>• To develop understanding of water treatment techniques and industrial water quality management.</li> <li>• To impart knowledge of electrochemical cells, batteries, fuel cells, and corrosion control methods.</li> </ul> |                                                                                                    |  |  |  |  |  |    |
| <b>Course Outcome</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                    |  |  |  |  |  |    |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Understand the properties and applications of magnetic, dielectric, and superconducting materials. |  |  |  |  |  | K2 |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Apply the principles of quantum mechanics and wave functions to engineering systems.               |  |  |  |  |  | K3 |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Explain the principles and applications of lasers and optical fiber communication.                 |  |  |  |  |  | K2 |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Analyze water quality parameters and water treatment methods used in industries.                   |  |  |  |  |  | K2 |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Evaluate electrochemical cells, batteries, and fuel cells for engineering applications.            |  |  |  |  |  | K2 |
| CO6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Identify various types of corrosion and recommend suitable corrosion prevention methods.           |  |  |  |  |  | K2 |

|                                                                                                                                                                                    |                                                           |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------|
| <b>Syllabus</b>                                                                                                                                                                    |                                                           |            |
| <b>Unit 1</b>                                                                                                                                                                      | <b>Magnetic, Dielectric and Superconducting Materials</b> | <b>(9)</b> |
| Introduction to magnetic materials – Ferromagnetism – Domain theory – Types of energy – Hysteresis – Hard and soft magnetic materials – Ferrites – Dielectric materials – Types of |                                                           |            |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                            |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------|
| polarization – Langevin-Debye equation – Frequency effects on polarization – Dielectric breakdown<br>– Ferroelectric materials – Superconducting materials and their properties.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                            |            |
| <b>Unit 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Quantum Mechanics</b>                   | <b>(9)</b> |
| Matter waves – de Broglie wavelength – Uncertainty principle – Physical significance of wave functions – Schrödinger wave equation – Time dependent and time independent equations – Particle in one-dimensional box – Tunnel diode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                            |            |
| <b>Unit 3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Laser and Fiber Optics</b>              | <b>(9)</b> |
| Lasers – Principles of laser – Spontaneous and stimulated emissions – Einstein's coefficients – Population inversion and laser action – Components of laser – Types of lasers – Nd:YAG laser, CO <sub>2</sub> laser, GaAs laser – Fiber optics – Principle and propagation of light in optical fiber – Numerical aperture and acceptance angle – Types of optical fibers based on material, refractive index, and mode.                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                            |            |
| <b>Unit 4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Water and Its Treatment</b>             | <b>(9)</b> |
| Water sources and impurities – Water quality parameters: colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD – Desalination of brackish water by reverse osmosis – Boiler troubles due to hard water – Internal treatment methods: phosphate, colloidal, sodium aluminate and Calgon conditioning – External treatment methods: ion exchange demineralization and zeolite process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                            |            |
| <b>Unit 5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Electrochemical Cells and Corrosion</b> | <b>(9)</b> |
| Galvanic cells – Single electrode potential – Standard electrode potential – Electrochemical series – EMF of a cell and its measurement – Nernst equation – Electrolyte concentration cell – Reference electrodes: hydrogen, calomel and Ag/AgCl electrodes – Batteries and fuel cells: alkaline battery, lead storage battery, nickel-cadmium battery, H <sub>2</sub> -O <sub>2</sub> fuel cell and applications. Corrosion – Introduction – Factors affecting corrosion – Types of corrosion – Galvanic and differential aeration corrosion – Corrosion control methods – Material selection and design aspects – Electrochemical protection – Sacrificial anode and impressed current cathodic protection methods – Inhibitors – Metallic coatings – Anodic and cathodic coatings – Metal cladding – Electroplating of copper and electroless plating of nickel. |                                            |            |

**Total Hours: 45**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <ol style="list-style-type: none"> <li>1. Jain, P. C., and Monika Jain. Engineering Chemistry. 17th ed., Dhanpat Rai Publishing Company, 2025.</li> <li>2. Fontana, Mars G. Corrosion Engineering. 3rd ed., McGraw Hill Education, 2018.</li> <li>3. Redlin, Jina, editor. Handbook of Electrochemistry. ML Books International, 2015.</li> </ol>                                                                                                        |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <b>Reference Books</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <ol style="list-style-type: none"> <li>1. Rajendran, V. Engineering Physics. 2nd ed., McGraw Hill Education, 2027.</li> <li>2. Dara, S. S., and S. S. Umare. A Textbook of Engineering Chemistry. 12th ed., S. Chand Publishing, 2022.</li> <li>3. Jain, P. C., and Monika Jain. Engineering Chemistry. 17th ed., Dhanpat Rai Publishing Company, 2025.</li> </ol>                                                                                       |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <b>Web / NPTEL Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |  |  |  |  |  |  |  |
| <ol style="list-style-type: none"> <li>1. <a href="https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016">https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016</a></li> <li>2. <a href="https://www.coursera.org/learn/material-science-engineering">https://www.coursera.org/learn/material-science-engineering</a></li> <li>3. <a href="https://nptel.ac.in/courses/113105102">https://nptel.ac.in/courses/113105102</a></li> </ol> |  |  |  |  |  |  |  |  |  |  |  |  |  |

| <b>COPQ Mapping</b> |     |     |     |     |     |     |     |     |     |      |      |      |      |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| COs                 | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1                 | 3   | 2   | 2   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | 1    |
| CO2                 | 3   | 2   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | 1    |
| CO3                 | 3   | 2   | 3   | 2   | -   | -   | -   | -   | -   | -    | -    | -    | 1    |
| CO4                 | 3   | 1   | -   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 1    |
| CO5                 | 3   | 1   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 1    |
| CO6                 | 3   | 1   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | -    | 1    |

| <b>Assessment Methodology</b> |                     |       |
|-------------------------------|---------------------|-------|
| Assessment Methodology        | Assessment Tools    | Marks |
| Internal Test I               | Written Examination | 10    |
| Internal Test II              | Written Examination | 10    |
| Internal Test III             | Written Examination | 10    |
| Assessment                    | Assignment          | 5     |
| Attendance                    | Performance         | 5     |
| Total                         |                     | 40    |

|                 |                                                                 |                 |          |          |           |          |               |
|-----------------|-----------------------------------------------------------------|-----------------|----------|----------|-----------|----------|---------------|
| <b>EEC26104</b> | <b>BASIC<br/>ELECTRICAL AND<br/>ELECTRONICS<br/>ENGINEERING</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>SL</b> | <b>P</b> | <b>CREDIT</b> |
|                 |                                                                 | <b>ESC</b>      | <b>3</b> | <b>0</b> | <b>1</b>  | <b>0</b> | <b>3</b>      |

#### **Course Prerequisite / Preamble**

- Basic knowledge of Physics and Mathematics.
- Understanding of fundamental electrical and electronic concepts.
- Knowledge of algebra and basic circuit calculations.
- This course introduces the fundamentals of electrical circuits, electrical machines, power systems and electronic devices.
- The course provides foundational knowledge required for advanced electrical and electronics engineering subjects.

#### **Course Objective**

- To understand the fundamental concepts of DC and AC electrical circuits.
- To analyze electrical circuits using basic network laws and circuit analysis techniques.
- To introduce the basics of transformers, electrical machines and power systems.
- To understand the construction, operation and characteristics of semiconductor diodes and transistor devices.
- To familiarize students with field effect transistors and opto-electronic devices.
- To develop foundational knowledge in electrical and electronics engineering for advanced engineering applications.

#### **Course Outcome**

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

|            |                                                                                                                       |    |
|------------|-----------------------------------------------------------------------------------------------------------------------|----|
| <b>CO1</b> | Understand the basic concepts and analysis of DC electrical circuits using network laws and circuit analysis methods. | K2 |
| <b>CO2</b> | Explain the characteristics and analysis of AC circuits, resonance and three-phase circuits.                          | K2 |
| <b>CO3</b> | Understand the basic principles of transformers, electrical machines and power systems.                               | K2 |
| <b>CO4</b> | Analyze the construction, operation and characteristics of semiconductor diodes and bipolar junction transistors.     | K3 |
| <b>CO5</b> | Understand the operation and applications of field effect transistors and opto-electronic devices.                    | K2 |

#### **SYLLABUS**

|                                                                                                                                                                                                 |                                 |            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------|
| <b>Unit 1</b>                                                                                                                                                                                   | <b>DC AND MAGNETIC CIRCUITS</b> | <b>(9)</b> |
| Voltage, current, power and energy - Basic electrical circuits - Ohm's law - Kirchhoff's laws - Series and parallel circuits - Voltage and current division - Basic network analysis - Magnetic |                                 |            |

|                                                                                                                                                                                                                                                                                |                                       |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------------|
| circuits - Magnetic materials - Electromagnetic induction - Faraday's law - Lenz's law - Self and mutual induction.                                                                                                                                                            |                                       |            |
| <b>Unit 2</b>                                                                                                                                                                                                                                                                  | <b>AC CIRCUITS</b>                    | <b>(9)</b> |
| AC fundamentals - AC waveform - RMS and average values - R, L and C circuits - Phasors - Impedance - AC power - Power factor - Single-phase and three-phase circuits - Star and Delta connections - Line and phase values.                                                     |                                       |            |
| <b>Unit 3</b>                                                                                                                                                                                                                                                                  | <b>ELECTRICAL WIRING AND SAFETY</b>   | <b>(9)</b> |
| Electrical safety - Electrical tools - Wiring types - Domestic wiring - Basic lighting circuits - Fuses and circuit breakers - Electrical shock and protection - Industrial wiring - Cables and conductors - Earthing - Electrical installation - Basic energy audit and ECAD. |                                       |            |
| <b>Unit 4</b>                                                                                                                                                                                                                                                                  | <b>BASIC ELECTRONIC DEVICES</b>       | <b>(9)</b> |
| Semiconductors – PN Junction Diode – Forward and Reverse Bias – Zener Diode – LED – Photodiode – Basic Rectifiers – BJT: NPN and PNP – JFET and MOSFET – Basic Applications.                                                                                                   |                                       |            |
| <b>Unit 5</b>                                                                                                                                                                                                                                                                  | <b>DIGITAL ELECTRONICS AND OP-AMP</b> | <b>(9)</b> |
| Basic Number Systems – Logic Gates – Boolean Algebra – Half Adder and Full Adder – Basic Flip-Flops – Counters – Shift Registers – Introduction to Op-Amp – Inverting and Non-Inverting Amplifiers – Integrator – Differentiator – Comparator.                                 |                                       |            |

**Total Hours : 45**

|                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <ol style="list-style-type: none"> <li>1. Basic Electrical and Electronics Engineering, Basic Electrical and Electronics Engineering, Pearson Education, 2nd Edition, 2019.</li> <li>2. Basic Electrical Engineering, Basic Electrical Engineering, McGraw Hill Education, 3rd Edition, 2019.</li> <li>3. Electronic Devices and Circuit Theory, Electronic Devices and Circuit Theory, Pearson Education, 11th Edition, 2015.</li> </ol> |
| <b>Reference:</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <ol style="list-style-type: none"> <li>1. Theraja, B. L., and A. K. Theraja. A Textbook of Electrical Technology. 24th ed., S. Chand Publishing, 2025.</li> <li>2. Boylestad, Robert L., and Brian A. Olivari. Introductory Circuit Analysis. 14th ed., Pearson Education, 2025.</li> <li>3. Schultz, Mitchel E. Grob's Basic Electronics. 2024 release ed., McGraw Hill Education, 2024.</li> </ol>                                      |

|                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Web / NPTEL Resources:</b>                                                                                                                                                                                                                                                                                                      |
| <ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/108108076">nptel.ac.in/courses/108108076</a></li> <li>2. <a href="https://nptel.ac.in/courses/117106108">nptel.ac.in/courses/117106108</a></li> <li>3. <a href="https://nptel.ac.in/courses/108101091">nptel.ac.in/courses/108101091</a></li> </ol> |

**CO-PO Mapping**

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 3   | 2   | -   | -   | 1   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO2 | 3   | 2   | -   | -   | 1   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO3 | 3   | 2   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO4 | 3   | 2   | 1   | 1   | 1   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO5 | 3   | 2   | 1   | 1   | 1   | -   | -   | -   | -   | -    | -    | 2    | 1    |

| Assessment Methodology |                     |       |
|------------------------|---------------------|-------|
| Assessment Methodology | Assessment Tools    | Marks |
| Internal Test I        | Written Examination | 10    |
| Internal Test II       | Written Examination | 10    |
| Internal Test III      | Written Examination | 10    |
| Assessment             | Assignment          | 5     |
| Attendance             | Performance         | 5     |
| Total                  |                     | 40    |

|                            |                                        |                 |          |          |          |           |               |
|----------------------------|----------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
| <b>MET2610</b><br><b>5</b> | <b>ENGINEERING</b><br><b>MECHANICS</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|                            |                                        | ESC             | 3        | 1        | 0        | 2         | 4             |

| <b>Course Prerequisite / Preamble</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                     |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Basic understanding of Physics and Mathematics including vectors, forces, moments, and elementary calculus.<br>This course provides the foundation for analysing forces, equilibrium, motion, and friction in engineering systems.                                                                                                                                                                                                                                                        |                                                                                     |      |
| <b>Course Objective</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                     |      |
| <ul style="list-style-type: none"> <li>• To understand the basics of mechanics and apply the concept of equilibrium of system of forces.</li> <li>• To understand the concept of equilibrium and to solve problems of rigid bodies.</li> <li>• To learn about centroid, centre of gravity, and moment of inertia.</li> <li>• To understand the concepts of friction and dynamics of particles.</li> <li>• To apply kinematics and kinetics principles to engineering problems.</li> </ul> |                                                                                     |      |
| <b>Course Outcome</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                     |      |
| <b>CO1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Analyse forces in engineering systems using vector and scalar representation        | (K2) |
| <b>CO2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Solve equilibrium problems of rigid bodies in engineering applications.             | (K3) |
| <b>CO3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Determine centroid, centre of gravity, and moment of inertia of surfaces and solids | (K4) |
| <b>CO4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Solve kinematics and kinetics problems of particles and rigid bodies                | (K3) |
| <b>CO5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Analyse frictional systems and rigid body dynamics applications                     | (K5) |

| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------|
| <b>Unit I</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>STATICS OF PARTICLES</b>              | <b>(12)</b> |
| Introduction – Units and Dimensions – Laws of Mechanics – Lami’s theorem, Parallelogram and triangular Law of forces – Resolution of forces – Vector operations of forces - Coplanar Forces – rectangular components – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.                                                                                         |                                          |             |
| <b>Unit II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>EQUILIBRIUM OF RIGID BODIES</b>       | <b>(12)</b> |
| Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in and three dimensions (class room lecture only) –(Descriptive treatment only) |                                          |             |
| <b>UNIT III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>PROPERTIES OF SURFACES AND SOLIDS</b> | <b>(12)</b> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                         |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------|
| Centroids - First moment of area – Second moment of area and centre of mass – Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula –Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia-Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia. |                                         |             |
| <b>Unit IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Dynamics of Particles</b>            | <b>(12)</b> |
| Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion - Newton ‘s laws of motion – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                         |             |
| <b>Unit V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Friction and Rigid Body Dynamics</b> | <b>(12)</b> |
| Friction force – Laws of sliding friction - Characteristics of dry friction – equilibrium analysis of simple systems with sliding friction –wedge friction, Ladder friction, Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.                                                                                                                                                                                                                                                                                                                                                                                          |                                         |             |

**Total Hours: 60**

|                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                                                                        |
| <ol style="list-style-type: none"> <li>1. Beer, Ferdinand P., et al. Vector Mechanics for Engineers: Statics and Dynamics. 13th ed., McGraw-Hill Education, 2026.</li> <li>2. Timoshenko, S., et al. Engineering Mechanics. 5th ed., McGraw-Hill Education, 2013.</li> <li>3. Shames, Irving H., and G. Krishna Mohana Rao. Engineering Mechanics: Statics and Dynamics. 4th ed., Pearson, 2019.</li> </ol>              |
| <b>Reference</b>                                                                                                                                                                                                                                                                                                                                                                                                         |
| <ol style="list-style-type: none"> <li>1. Hibbeler, R. C. Engineering Mechanics: Statics and Dynamics. 16th ed., Pearson, 2026.</li> <li>2. Meriam, J. L., et al. Engineering Mechanics: Dynamics. 9th ed., Wiley, 2020.</li> <li>3. Singer, Ferdinand L. Engineering Mechanics: Statics and Dynamics. 3rd ed., BS Publications, 2026.</li> </ol>                                                                        |
| <b>Web / NPTEL Resources</b>                                                                                                                                                                                                                                                                                                                                                                                             |
| <ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/112106180">https://nptel.ac.in/courses/112106180</a></li> <li>2. <a href="https://nptel.ac.in/courses/115105098">https://nptel.ac.in/courses/115105098</a></li> <li>3. <a href="https://ocw.mit.edu/courses/1-050-engineering-mechanics-i-fall-2007/">https://ocw.mit.edu/courses/1-050-engineering-mechanics-i-fall-2007/</a></li> </ol> |

| <b>COPPO Mapping</b> |            |            |            |            |            |            |            |            |            |             |             |             |             |
|----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>Cos</b>           | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| <b>CO1</b>           | 3          | 2          | 1          | -          | 1          | 1          | -          | -          | 1          | 1           | -           | 3           | 2           |
| <b>CO2</b>           | 3          | 3          | 2          | 1          | 1          | 1          | -          | -          | 1          | 1           | -           | 3           | 2           |
| <b>CO3</b>           | 3          | 3          | 2          | 2          | 1          | 1          | -          | -          | 1          | 1           | -           | 3           | 2           |
| <b>CO4</b>           | 3          | 3          | 2          | 2          | 1          | 1          | -          | -          | 1          | 1           | -           | 3           | 2           |
| <b>CO5</b>           | 3          | 3          | 3          | 2          | 2          | 1          | 1          | -          | 1          | 1           | -           | 3           | 2           |

| <b>Assessment Methodology</b> |                         |              |
|-------------------------------|-------------------------|--------------|
| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
| Internal Test I               | Written Examination     | 10           |
| Internal Test II              | Written Examination     | 10           |
| Internal Test III             | Written Examination     | 10           |
| Assessment                    | Assignment              | 5            |
| Attendance                    | Performance             | 5            |
| Total                         |                         | 40           |

| <i>MEL26101</i> | <i>ENGINEERING GRAPHICS<br/>LABORATORY</i> | CATEGORY | L | T | P | SL | CREDIT |
|-----------------|--------------------------------------------|----------|---|---|---|----|--------|
|                 |                                            | ESC      | 0 | 0 | 4 | 1  | 1.5    |

#### **Course Prerequisite / Preamble**

- Basic knowledge of plane geometry (Class X / XII level).
- Familiarity with drawing instruments and their usage.
- Understanding of spatial visualization and 3D shapes.
- Engineering Graphics is the universal language of engineering communication. This laboratory course equips students with the fundamental skills to interpret, construct, and communicate engineering information through standard graphical representations.
- Students are trained in manual drafting techniques, orthographic projections, isometric and perspective views, and the conventions of first-angle and third-angle projections in accordance with BIS standards. The course lays the essential foundation for design, manufacturing, and CAD-based courses in subsequent semesters.

#### **Course Objective**

- To impart proficiency in the use of drawing instruments and BIS conventions for engineering drawing.
- To develop the ability to construct conic sections, engineering curves, and their applications.
- To train students in orthographic projections of points, lines, planes, and solids.
- To develop skills in drawing isometric and perspective views from multi-view orthographic drawings.
- To enable conversion between 2D multi-view drawings and 3D pictorial representations.

#### **Course Outcome**

|     |                                                                                                                                       |    |
|-----|---------------------------------------------------------------------------------------------------------------------------------------|----|
| CO1 | Draw engineering curves such as conic sections, involutes, and cycloids using standard drawing instruments following BIS conventions. | K3 |
| CO2 | Construct orthographic projections of points and lines in various quadrants and determine true lengths and true inclinations.         | K3 |
| CO3 | Generate orthographic projections of planes and regular solids in different positions and inclinations.                               | K3 |

|     |                                                                                                                             |    |
|-----|-----------------------------------------------------------------------------------------------------------------------------|----|
| CO4 | Produce isometric projections and isometric views from given orthographic multi-view drawings.                              | K3 |
| CO5 | Develop perspective projections and convert given pictorial views to orthographic drawings demonstrating spatial reasoning. | K3 |

| S.No | Experiments                                                                                                                                                    | Hours |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1    | Drawing of engineering curves – Ellipse (Concentric circles method and Oblong method), Parabola and Hyperbola                                                  | 6     |
| 2    | Drawing of engineering curves – Cycloid, Epicycloid, Hypocycloid, and Involute of a circle and a square                                                        | 6     |
| 3    | Projection of points – projection of points in all four quadrants; determination of quadrant from given projections                                            | 6     |
| 4    | Projection of straight lines – lines parallel and inclined to both reference planes; determination of true length and true inclination by rotating line method | 6     |
| 5    | Projection of planes – projection of triangular, rectangular, pentagonal, and hexagonal planes in various positions                                            | 6     |
| 6    | Projection of regular solids (prisms and pyramids) with axis perpendicular and inclined to the reference planes                                                | 6     |
| 7    | Projection of regular solids (cylinders and cones) with axis inclined to HP and VP; true shape of sections                                                     | 6     |
| 8    | Development of lateral surfaces of prisms, cylinders, pyramids, and cones (including cut solids)                                                               | 6     |
| 9    | Isometric projection and isometric view of simple and combination solids; conversion from orthographic multi-view to isometric view                            | 6     |
| 10   | Perspective projection of prisms and pyramids using visual ray method; conversion of pictorial views to orthographic projections (Mini-Exercise)               | 6     |

|                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                                                               |
| <ol style="list-style-type: none"> <li>1. Venugopal, K., and V. Prabhu Raja. Engineering Drawing + AutoCAD. 7th ed., New Age International Publishers, 2025.</li> <li>2. Bhatt, N. D., and V. M. Panchal. Engineering Drawing: Plane and Solid Geometry. 54th ed., Charotar Publishing House, 2023.</li> <li>3. Gopalakrishna, K. R. Engineering Drawing. Vols. I–II, 25th ed., Subhas Stores, 2017.</li> </ol> |
| <b>Reference</b>                                                                                                                                                                                                                                                                                                                                                                                                |
| <ol style="list-style-type: none"> <li>1. French, Thomas E., et al. Engineering Drawing and Graphic Technology. 14th ed., McGraw-Hill, 1993.</li> <li>2. Shah, M. B., and B. C. Rana. Engineering Drawing. 2nd ed., Pearson Education, 2009.</li> <li>3. Bureau of Indian Standards. Engineering Drawing Practice for Schools and Colleges. SP 46:2003, BIS, 2003.</li> </ol>                                   |

| <b>CO PO Mapping</b> |            |            |            |            |            |            |            |            |            |             |             |             |             |
|----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>Cos</b>           | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| CO1                  | 3          | 2          | 1          | -          | 1          | -          | -          | 1          | -          | -           | -           | 3           | 2           |
| CO2                  | 3          | 2          | 2          | -          | 1          | -          | -          | 1          | -          | -           | -           | 3           | 2           |
| CO3                  | 3          | 3          | 2          | -          | 1          | -          | -          | 1          | -          | -           | -           | 3           | 2           |
| CO4                  | 3          | 3          | 2          | -          | 2          | -          | -          | 1          | -          | -           | -           | 3           | 3           |
| CO5                  | 3          | 3          | 3          | -          | 2          | -          | -          | 1          | -          | -           | -           | 3           | 3           |

| <b>Assessment Methodology</b>                     | <b>Assessment Tools</b> | <b>Marks</b> |
|---------------------------------------------------|-------------------------|--------------|
| Objective                                         | Observation             | 10           |
| Record Work                                       |                         | 10           |
| Model Exam                                        |                         | 15           |
| Virtual Lab Assignment / Online Coding Assessment | Review                  | 10           |
| Model Creation                                    | Presentation            | 05           |
| Attendance                                        |                         | 10           |
| <b>Total</b>                                      |                         | <b>60</b>    |

|                 |                                                                    |                 |          |          |          |           |               |
|-----------------|--------------------------------------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
| <b>EEL26102</b> | <b><i>BASIC ELCTETRICAL<br/>AND ELECTRONICS<br/>LABORATORY</i></b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|                 |                                                                    | ESC             | 0        | 0        | 2        | 1         | 1.5           |

#### **Course Prerequisite / Preamble**

- Basic knowledge of Physics and fundamental electrical concepts such as voltage, current, resistance, and power.
- Understanding of basic electronic components including resistors, capacitors, diodes, and transistors.
- Familiarity with electrical safety practices, circuit symbols, and measuring instruments.
- Ability to analyze simple electrical and electronic circuits using basic laws and principles.
- Interest in developing practical skills in wiring, testing, troubleshooting, and implementation of electrical and electronic circuits.

#### **Course Objective**

- To provide practical exposure to electrical tools, measuring instruments, wiring techniques, and safety practices used in domestic and industrial applications.
- To develop hands-on skills in designing, testing, and troubleshooting basic electrical and electronic circuits.
- To study the characteristics and applications of semiconductor devices such as diodes, transistors, JFETs, MOSFETs, and opto-electronic devices.
- To analyze the operation of rectifier, clipper, clamper, and biasing circuits used in electronic systems.
- To enhance experimental, analytical, and problem-solving skills through laboratory implementation and performance evaluation of electrical and electronic circuits.

#### **Course Outcome**

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

|            |                                                                                                                                                       |    |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>CO1</b> | Identify electrical tools, measuring instruments, wiring accessories, and follow electrical safety practices in laboratory and domestic applications. | K2 |
| <b>CO2</b> | Design and implement basic domestic wiring circuits and analyze the operation of electrical loads and protection devices.                             | K3 |
| <b>CO3</b> | Analyze the characteristics and behavior of semiconductor devices such as PN junction diode, Zener diode, BJT, JFET, and MOSFET.                      | K4 |
| <b>CO4</b> | Design and test electronic circuits including rectifiers, filters, clippers, clampers, and transistor biasing circuits.                               | K4 |
| <b>CO5</b> | Investigate the performance of opto-electronic devices and troubleshoot basic electrical and electronic circuits effectively.                         | K4 |

**LIST OF EXPERIMENTS (ANY TEN EXPERIMENT)****Total Hours: 45**

|                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Study of electrical tools, accessories, symbols and safety precautions.                                                                  |
| 2. Study of electrical measuring instruments and protective devices.                                                                        |
| 3. Verification of series and parallel lamp circuits.                                                                                       |
| 4. Domestic wiring practice – staircase wiring.                                                                                             |
| 5. Domestic wiring practice – bedroom wiring.                                                                                               |
| 6. Godown wiring and fluorescent lamp wiring.                                                                                               |
| 7. Wiring and testing of ceiling fan and electrical appliances.                                                                             |
| 8. V-I characteristics of PN junction diode and Zener diode                                                                                 |
| 9. Clipper and Clamper circuits using diodes.                                                                                               |
| 10. Input and output characteristics of BJT in CE configuration.                                                                            |
| 11. Study of BJT biasing circuits.                                                                                                          |
| 12. Transfer and drain characteristics of JFET.                                                                                             |
| 13. Transfer characteristics of MOSFET.                                                                                                     |
| 14. Determination of ripple factor for half-wave and full-wave rectifiers (centre-tapped and bridge configuration) with and without filter. |
| 15. Implementation of Half Wave and Full Wave Rectifier Circuits with Filters.                                                              |
| 16. Study of Opto-Electronic Devices such as LED, Photodiode and Opto-coupler.                                                              |
| <b>Text Books:</b>                                                                                                                          |
| 1. Kothari, D. P., and I. J. Nagrath. Basic Electrical Engineering. 4th ed., McGraw Hill Education, 2019.                                   |
| 2. Mehta, V. K., and Rohit Mehta. Principles of Electronics. 12th ed., S. Chand Publishing, 2020.                                           |
| 3. Boylestad, Robert L., and Louis Nashelsky. Electronic Devices and Circuit Theory. 11th ed., Pearson Education, 2015.                     |
| <b>Reference:</b>                                                                                                                           |
| 1. Bhattacharya, S. K. Basic Electrical and Electronics Engineering. 2nd ed., Pearson Education, 2017.                                      |
| 2. Floyd, Thomas L. Electronic Devices: Conventional Current Version. 10th ed., Pearson Education, 2018.                                    |

3. Sukhija, M. S., and T. K. Nagsarkar. Basic Electrical and Electronics Engineering. 2nd ed., Oxford University Press, 2019.

**Web / NPTEL Resources:**

1. <https://www.vlab.co.in/broad-area-electrical-engineering>
2. <https://www.amrita.edu/course/basic-electrical-and-electronics-engineering-lab/nptel.ac.in/courses/122106025>

**CO-PO Mapping**

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 3   | 2   | -   | 2   | 2   | 3   | -   | 2   | 1   | -    | -    | 3    | 1    |
| CO2 | 3   | 3   | 3   | 2   | 2   | 2   | -   | 1   | 2   | -    | -    | 3    | 2    |
| CO3 | 3   | 3   | 2   | 3   | 2   | -   | -   | -   | 1   | -    | -    | 3    | 3    |
| CO4 | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | 1   | -    | -    | 3    | 3    |
| CO5 | 3   | 3   | 2   | 3   | 2   | -   | -   | 1   | 2   | -    | -    | 3    | 3    |

| Assessment Methodology                               | Assessment Tools | Marks |
|------------------------------------------------------|------------------|-------|
| Objective                                            | Observation      | 10    |
| Record Work                                          |                  | 10    |
| Model Exam                                           |                  | 15    |
| Virtual Lab Assignment /<br>Online Coding Assessment | Review           | 10    |
| Model Creation                                       | Presentation     | 05    |
| Attendance                                           |                  | 10    |
| Total                                                |                  | 60    |

|                 |                                         |                 |          |          |          |           |               |
|-----------------|-----------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
| <b>PEC26101</b> | <b>PHYSICAL SCIENCES<br/>LABORATORY</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|                 |                                         | <b>BSC</b>      | <b>0</b> | <b>0</b> | <b>4</b> | <b>1</b>  | <b>1.5</b>    |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                   |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------|
| <b>Course Prerequisite / Preamble</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                   |             |
| <ul style="list-style-type: none"> <li>• Basic understanding of Physics and Chemistry concepts studied at Higher Secondary level.</li> <li>• This laboratory course provides practical exposure to experimental techniques, measurement methods, and scientific analysis in Physics and Chemistry.</li> </ul>                                                                                                                                                                                             |                                                                                   |             |
| <b>Course Objective</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                   |             |
| <ul style="list-style-type: none"> <li>• To develop practical skills in conducting Physics and Chemistry experiments.</li> <li>• To understand the principles behind scientific instruments and measurements.</li> <li>• To enhance analytical and observation skills through laboratory investigations.</li> <li>• To familiarize students with experimental procedures and data interpretation.</li> <li>• To apply theoretical concepts of Physics and Chemistry in practical applications.</li> </ul> |                                                                                   |             |
| <b>Course Outcome</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                   |             |
| <b>CO1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Perform Physics experiments using standard laboratory instruments and techniques. | <b>(K3)</b> |
| <b>CO2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Analyse experimental results and verify scientific principles in Physics.         | <b>(K4)</b> |
| <b>CO3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Conduct Chemistry experiments related to volumetric and instrumental analysis.    | <b>(K3)</b> |
| <b>CO4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Apply safety measures and good laboratory practices during experiments            | <b>(K3)</b> |
| <b>CO5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Interpret experimental observations and prepare laboratory reports effectively    | <b>(K4)</b> |

|                                                                    |              |
|--------------------------------------------------------------------|--------------|
| <b>Physics Laboratory</b>                                          |              |
| <b>List of Experiments</b>                                         | <b>Hours</b> |
| 1. Determination of wavelength of laser using grating.             | (2 Hours)    |
| 2. Determination of thickness of thin wire using air wedge method. | (2 Hours)    |
| 3. Determination of dispersive power of prism using spectrometer.  | (2 Hours)    |
| 4. Determination of numerical aperture of optical fiber.           | (2 Hours)    |
| 5. Determination of energy band gap of semiconductor diode.        | (2 Hours)    |
| 6. Verification of Stefan's law.                                   | (2 Hours)    |
| 7. Determination of rigidity modulus using torsion pendulum.       | (3 Hours)    |
| 8. Determination of viscosity of liquid using Poiseuille's method. | (3 Hours)    |

| <b>Chemistry Laboratory</b>                                                             |              |
|-----------------------------------------------------------------------------------------|--------------|
| <b>List of Experiments</b>                                                              | <b>Hours</b> |
| 1. Estimation of hardness of water by EDTA method.                                      | (2 Hours)    |
| 2. Determination of alkalinity of water sample.                                         | (2 Hours)    |
| 3. Determination of chloride content in water sample.                                   | (2 Hours)    |
| 4. Estimation of dissolved oxygen in water sample.                                      | (2 Hours)    |
| 5. Determination of strength of given hydrochloric acid using standard sodium carbonate | (2 Hours)    |
| 6. Conductometric titration of acid-base reaction.                                      | (2 Hours)    |
| 7. Potentiometric titration using redox reaction.                                       | (3 Hours)    |
| 8. Estimation of iron using potassium dichromate.                                       | (3 Hours)    |

**Total Hours : 36**

| <b>Text Books</b>                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Arora, C. L. B.Sc, Practical Physics. S. Chand Publishing, 2020.<br>2. Mendham, J., et al. Vogel's Textbook of Quantitative Chemical Analysis. 6th ed., Pearson Education, 2024.<br>3. Khosla, B. D., et al. Senior Practical Physical Chemistry: A Comprehensive Course of Experiments. 18th ed., R. Chand & Co., 2023. |
| <b>Reference</b>                                                                                                                                                                                                                                                                                                            |
| 1. Ahluwalia, V. K., and Sunita Dhingra. College Practical Chemistry. Universities Press, 2018.<br>2. Aparna, P., and B. Ramadevi. Lab Manual for Engineering Chemistry. S. Chand Publications, 2022.<br>3. Sasi Kumar, P. R. Practical Physics. PHI Learning Private Limited, 2015.                                        |
| <b>Web / NPTEL Links</b>                                                                                                                                                                                                                                                                                                    |
| 1. <a href="https://www.olabs.edu.in/">https://www.olabs.edu.in/</a><br>2. <a href="https://vlab.amrita.edu/">https://vlab.amrita.edu/</a>                                                                                                                                                                                  |

**CO PO Mapping**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 3   | 2   | -   | 2   | 2   | 3   | -   | 2   | 1   | -    | -    | 3    | 1    |
| CO2 | 3   | 3   | 3   | 2   | 2   | 2   | -   | 1   | 2   | -    | -    | 3    | 2    |
| CO3 | 3   | 3   | 2   | 3   | 2   | -   | -   | -   | 1   | -    | -    | 3    | 3    |
| CO4 | 3   | 3   | 3   | 3   | 2   | -   | -   | -   | 1   | -    | -    | 3    | 3    |
| CO5 | 3   | 3   | 2   | 3   | 2   | -   | -   | 1   | 2   | -    | -    | 3    | 3    |

| Assessment Methodology                            | Assessment Tools | Marks |
|---------------------------------------------------|------------------|-------|
| Objective                                         | Observation      | 10    |
| Record Work                                       |                  | 10    |
| Model Exam                                        |                  | 15    |
| Virtual Lab Assignment / Online Coding Assessment | Review           | 10    |
| Model Creation                                    | Presentation     | 05    |
| Attendance                                        |                  | 10    |
| Total                                             |                  | 60    |

| <b>CDC26101</b> | <b>CAREER DEVELOPMENT<br/>SKILL-I</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|-----------------|---------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
|                 |                                       | CDS             | 2        | 0        | 2        | 1         | 1.5           |

#### **Course Prerequisite / Preamble**

- Basic understanding of English communication and grammar.
- Interest in developing aptitude and reasoning skills.
- Willingness to participate in communication and personality development activities.

#### **Course Objective**

- To improve communication and interpersonal skills.
- To develop aptitude and logical reasoning abilities.
- To enhance confidence and professional skills.

#### **Course Outcome**

|            |                                                                                                                  |    |
|------------|------------------------------------------------------------------------------------------------------------------|----|
| <b>CO1</b> | Develop effective verbal and non-verbal communication skills for academic and professional environments.         | K2 |
| <b>CO2</b> | Apply basic quantitative aptitude concepts to solve numerical and logical problems efficiently.                  | K2 |
| <b>CO3</b> | Demonstrate improved vocabulary, grammar, and sentence construction skills for professional communication.       | K2 |
| <b>CO4</b> | Analyze and solve basic reasoning and analytical problems using logical thinking techniques.                     | K3 |
| <b>CO5</b> | Exhibit positive attitude, teamwork, confidence, and time management skills for personal and career development. | K2 |

#### **Syllabus**

|                                                                                                                                                                            |                                         |            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------|
| <b>Unit 1</b>                                                                                                                                                              | <b>Communication Fundamentals</b>       | <b>(6)</b> |
| Basics of Communication, Verbal and Non-Verbal Communication, Listening Skills, Introduction to Public Speaking, Self Introduction Techniques, and Professional Etiquette. |                                         |            |
| <b>Unit 2</b>                                                                                                                                                              | <b>Vocabulary Development</b>           | <b>(6)</b> |
| Synonyms & Antonyms, Word Formation, Commonly Confused Words, One Word Substitution, Sentence Construction, and Basic Grammar Usage.                                       |                                         |            |
| <b>Unit 3</b>                                                                                                                                                              | <b>Quantitative Aptitude – Basics</b>   | <b>(6)</b> |
| Number System, Simplification, HCF & LCM, Percentages, Ratio & Proportion, and Average Problems.                                                                           |                                         |            |
| <b>Unit 4</b>                                                                                                                                                              | <b>Logical Reasoning – Introduction</b> | <b>(6)</b> |
| Coding & Decoding, Series Completion, Blood Relations, Direction Sense Test, Odd One Out, and Basic Analytical Thinking.                                                   |                                         |            |
| <b>Unit 5</b>                                                                                                                                                              | <b>Personality Development</b>          | <b>(6)</b> |
| Goal Setting, Positive Attitude, Confidence Building, Time Management, Team Work Activities, and Stress Management Basics.                                                 |                                         |            |

**Total Hours : 30**

|                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                |
| 1. Aggarwal, R. S. Quantitative Aptitude for Competitive Examinations. S. Chand Publishing, 2024.<br>2. Mitra, Barun K. Personality Development and Soft Skills. 2nd ed., Oxford University Press, 2022.<br>3. Dhanavel, S. P. English and Soft Skills. Orient BlackSwan, 2010.                                                  |
| <b>Reference</b>                                                                                                                                                                                                                                                                                                                 |
| 1. Lewis, Norman. Word Power Made Easy. Goyal Publishers, 2012.<br>2. Tyra, M. Magical Book on Quicker Maths. 5th rev. ed., BSC Publishing, 2018.<br>3. Carnegie, Dale. How to Win Friends and Influence People. Simon & Schuster, 2009.                                                                                         |
| <b>NPTEL / Web Resources</b>                                                                                                                                                                                                                                                                                                     |
| 1. <a href="https://nptel.ac.in/courses/109107121">https://nptel.ac.in/courses/109107121</a><br>2. <a href="https://nptel.ac.in/courses/109106066">https://nptel.ac.in/courses/109106066</a><br>3. <a href="https://nptel.ac.in/syllabus/syllabus_pdf/109104040.pdf">https://nptel.ac.in/syllabus/syllabus_pdf/109104040.pdf</a> |

| <b>CO PO Mapping</b> |     |     |     |     |     |     |     |     |     |      |      |      |      |      |
|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| COs                  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1                  | 1   | -   | -   | -   | -   | -   | -   | 2   | 2   | 3    | -    | 2    | 1    | 2    |
| CO2                  | 1   | -   | -   | -   | -   | -   | -   | 1   | -   | 3    | -    | 2    | 1    | 2    |
| CO3                  | 3   | 2   | -   | 1   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    | 2    |
| CO4                  | 2   | 3   | 1   | 2   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    | 2    |
| CO5                  | -   | -   | -   | -   | -   | -   | -   | 2   | 3   | 2    | 1    | 1    | 1    | 2    |

| <b>Assessment Methodology</b>      |                                   |       |
|------------------------------------|-----------------------------------|-------|
| Assessment Methodology             | Assessment Tools                  | Marks |
| Continuous Internal Assessment     | Observation/Record work/Viva voce | 20    |
| Internal Practical Examination     | Laboratory Performance            | 30    |
| End Semester Practical Examination | Experiment and Viva voce          | 40    |
| Attendance                         | Attendance Record                 | 10    |
| Total                              |                                   | 100   |

|                 |                                        |                 |          |          |          |               |
|-----------------|----------------------------------------|-----------------|----------|----------|----------|---------------|
| <b>PEC26101</b> | <b>PHYSICAL EDUCATION AND TRAINING</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>CREDIT</b> |
|                 |                                        | PET             | 0        | 0        | 1        | -             |

#### **Course Prerequisite / Preamble**

- This course focuses on physical fitness, sports participation, health awareness, and personality development through regular physical education and training activities. Students gain practical exposure to physical exercises, fitness training, sports skills, recreational activities, and wellness practices that contribute to overall physical and mental well-being.
- The course promotes discipline, teamwork, leadership, sportsmanship, and healthy lifestyle habits.

#### **Course Objective**

- To promote physical fitness and healthy lifestyle practices among students.
- To develop interest and participation in sports and physical activities.
- To improve physical endurance, flexibility, coordination, and mental fitness.
- To encourage teamwork, discipline, leadership, and sportsmanship qualities.
- To create awareness about health, nutrition, and wellness practices.

#### **Course Outcome**

|            |                                                                                                           |    |
|------------|-----------------------------------------------------------------------------------------------------------|----|
| <b>CO1</b> | Understand the importance of physical fitness, sports, and healthy lifestyle practices.                   | K2 |
| <b>CO2</b> | Perform basic physical exercises and fitness activities effectively.                                      | K3 |
| <b>CO3</b> | Demonstrate participation in sports and recreational activities with discipline and teamwork.             | K2 |
| <b>CO4</b> | Apply health, hygiene, nutrition, and wellness practices for physical well-being.                         | K4 |
| <b>CO5</b> | Develop leadership qualities, sportsmanship, and positive attitude through physical education activities. | K3 |

#### **LIST OF ACTIVITIES**

1. Introduction to physical fitness, health awareness, and importance of physical education.
2. Warm-up exercises, stretching, and flexibility training.
3. Physical fitness exercises for endurance, strength, and coordination.
4. Practice sessions in athletics – running, relay, jumping, and basic field events.
5. Training in indoor and outdoor sports activities.
6. Team games and recreational activities for teamwork and leadership development.
7. Yoga, breathing exercises, and relaxation techniques for mental wellness.
8. Awareness programme on nutrition, hygiene, and healthy lifestyle practices.
9. Participation in sports events, fitness competitions, and physical training drills.
10. Physical fitness assessment, activity record submission, and performance evaluation.

#### **GUIDELINES**

1. Students shall actively participate in all physical education and sports activities.\
2. Proper sports attire and discipline shall be maintained during training sessions.
3. Students shall follow safety measures and instructor guidelines during physical activities.
4. Participation in fitness assessments, sports events, and wellness programmes is mandatory.
5. Students shall maintain an activity record / fitness logbook throughout the course.
6. Attendance and regular participation are essential for successful completion of the course.

### Text Books

1. Greenberg, Jayne D., and Judy LoBianco. Organization and Administration of Physical Education: Theory and Practice. 2nd ed., Human Kinetics, 2026.
2. Ministry of Youth Affairs and Sports – Fitness Guidelines.

### Reference

1. Brusseau, Timothy A., et al. Dynamic Physical Education for Secondary School Students. 10th ed., Human Kinetics, 2025.
2. Siedentop, Daryl, and Hans van der Mars. Introduction to Physical Education, Fitness, and Sport. 9th ed., Human Kinetics, 2023.

### Web / NPTEL Resources

1. <https://yas.nic.in/>
2. <https://fitindia.gov.in/>
3. <https://nptel.ac.in/>
4. <https://www.who.int/health-topics/physical-activity>

### CO PO Mapping

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 2   | 3   | 2   | 2   | -   | -   | -   | 2   | 3   | 3    | 1    | 2    | 2    |
| CO2 | 2   | 3   | 2   | 2   | -   | -   | -   | 2   | 3   | 3    | 1    | 2    | 2    |
| CO3 | 2   | 3   | 2   | 2   | -   | -   | -   | 2   | 3   | 3    | 1    | 2    | 2    |
| CO4 | 2   | 3   | 2   | 2   | -   | -   | -   | 2   | 3   | 3    | 1    | 2    | 2    |
| CO5 | 2   | 3   | 2   | 2   | -   | -   | -   | 2   | 3   | 3    | 1    | 2    | 2    |

### Assessment Methodology

| Assessment Methodology        | Assessment Tools                                              | Marks |
|-------------------------------|---------------------------------------------------------------|-------|
| Participation and Performance | Physical Activities / Sports Participation / Fitness Training | 40    |
| Physical Fitness Evaluation   | Endurance, Flexibility, and Skill Assessment                  | 30    |
| Activity Record / Fitness     | Logbook Documentation and Reflection                          | 20    |
| Discipline and Attendance     | Regularity, Conduct, and Team Participation                   | 10    |
| Total                         |                                                               | 100   |

# **SEMESTER - II**

|          |                                                          |          |   |   |   |    |        |
|----------|----------------------------------------------------------|----------|---|---|---|----|--------|
| MAC26201 | <b>PARTIAL DIFFERENTIAL<br/>EQUATIONS AND TRANSFORMS</b> | CATEGORY | L | T | P | SL | CREDIT |
|          |                                                          | BSC      | 3 | 1 | 0 | 2  | 4      |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                      |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| <b>Course Prerequisite / Preamble</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                      |    |
| <ul style="list-style-type: none"> <li>• Basic knowledge of Engineering Mathematics – I, calculus, differential equations, and complex numbers.</li> <li>• Understanding of integration, matrices, and elementary transforms.</li> <li>• This course is designed to provide students with mathematical tools required for solving engineering problems involving complex variables, Laplace transforms, inverse Laplace transforms, and Fourier transforms. The course develops analytical and problem-solving skills for applications in engineering systems, signal processing, heat transfer, fluid mechanics, and control systems.</li> </ul> |                                                                                                                                                                      |    |
| <b>Course Objective</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                      |    |
| <ul style="list-style-type: none"> <li>• To formulate and solve problems involving analytic functions and conformal mappings.</li> <li>• To understand and apply Taylor and Laurent series expansions for complex functions.</li> <li>• To understand Laplace transforms and their properties.</li> <li>• To apply Laplace transforms in solving ordinary differential equations and simultaneous differential equations.</li> <li>• To understand and apply Fourier transform techniques and their engineering applications.</li> </ul>                                                                                                          |                                                                                                                                                                      |    |
| <b>Course Outcome</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                      |    |
| <b>CO1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Apply the concepts of analytic functions, Cauchy–Riemann equations, harmonic functions, and construction of analytic functions in solving complex variable problems. | K3 |
| <b>CO2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Analyze conformal and bilinear transformations, perform Taylor and Laurent series expansions, and classify singularities of complex functions.                       | K4 |
| <b>CO3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Understand the Laplace transform and its properties for engineering applications.                                                                                    | K3 |
| <b>CO4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Apply Laplace transforms to solve ordinary differential equations with constant coefficients and simultaneous ordinary differential equations.                       | K4 |
| <b>CO5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Understand and apply Fourier transform techniques including Fourier integral theorem, convolution, and Parseval’s identity.                                          | K4 |

|                 |                    |             |
|-----------------|--------------------|-------------|
| <b>SYLLABUS</b> |                    |             |
| <b>Unit I</b>   | <b>Derivatives</b> | <b>(12)</b> |

Continuity, derivative and analytic functions – Necessary conditions – Cauchy Riemann equations (Cartesian and polar form) and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic function – Construction of analytic functions.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                          |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------|
| <b>Unit II</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Complex Functions</b> | <b>(12)</b> |
| <p>Conformal mapping – Simple and standard transformations like <math>w = z + c</math>, <math>cz</math>, <math>z^2</math>, <math>e^z</math>, <math>\sin z</math>, <math>\cosh z</math> and <math>z + \frac{1}{z}</math> – Bilinear transformation and cross ratio property (excluding Schwarz-Christoffel transformation). Taylor's and Laurent's theorem (without proof) – Series expansion of complex valued functions – Classification of singularities.</p>    |                          |             |
| <b>Unit III</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Transformations</b>   | <b>(12)</b> |
| <p>Existence conditions – transforms of elementary functions – properties – transform of unit step function and unit impulse function – transforms of derivatives and integrals – transforms of periodic functions – initial and final value theorems. Inverse Laplace transforms – properties – convolution theorem – application to solution of ordinary differential equations with constant coefficients and simultaneous ordinary differential equations.</p> |                          |             |
| <b>Unit IV</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Fourier</b>           | <b>(12)</b> |
| <p>Fourier Integral theorem (statement only) – Fourier transform and its inverse – Fourier sine and cosine transform – properties of Fourier transforms – convolution and Parseval's identity.</p>                                                                                                                                                                                                                                                                 |                          |             |
| <b>Unit V</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Laplace</b>           | <b>(12)</b> |
| <p>Applications of Laplace and Fourier transforms in engineering problems – heat transfer analysis – vibration systems – electrical circuits – signal processing – boundary value problems.</p>                                                                                                                                                                                                                                                                    |                          |             |

|                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                            |
| <ol style="list-style-type: none"> <li>1. Veerarajan, T. Engineering Mathematics for First Year. Tata McGraw Hill, 2017.</li> <li>2. Venkataraman, M. K. Engineering Mathematics. Vols. II–III, National Publishing Company, 1996.</li> <li>3. Grewal, B. S. Higher Engineering Mathematics. 45th ed., Khanna Publishers, 2023.</li> </ol>                                   |
| <b>Reference</b>                                                                                                                                                                                                                                                                                                                                                             |
| <ol style="list-style-type: none"> <li>1. Erwin Kreyszig, Advanced Engineering Mathematics, 7th Edition, Wiley India, 2007.</li> <li>2. Bali N.P. and Manish Goyal, Text Book of Engineering Mathematics, 3rd Edition, Laxmi Publications Pvt. Ltd., 2008.</li> <li>3. Grewal B.S., Higher Engineering Mathematics, 40th Edition, Khanna Publishers, Delhi, 2007.</li> </ol> |

**Web / NPTEL Resources**

1. [https://onlinecourses.nptel.ac.in/noc23\\_ma33/preview](https://onlinecourses.nptel.ac.in/noc23_ma33/preview)
2. <http://textofvideo.nptel.ac.in/noc/courses/noc20/SEM1/noc20-ma13/>
3. <http://kcl.digimat.in/nptel/courses/video/111105167/L44.html>

**CO PO Mapping**

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| CO1 | 3   | 2   | -   | -   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO2 | 3   | 3   | -   | 1   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO3 | 3   | 2   | 1   | -   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO4 | 3   | 3   | 2   | 1   | -   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO5 | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -   | -    | -    | 2    | 2    |

**Assessment Methodology**

| Assessment Methodology | Assessment Tools    | Marks |
|------------------------|---------------------|-------|
| Internal Test I        | Written Examination | 10    |
| Internal Test II       | Written Examination | 10    |
| Internal Test III      | Written Examination | 10    |
| Assessment             | Assignment          | 5     |
| Attendance             | Performance         | 5     |
| Total                  |                     | 40    |

| <i><b>UHC26202</b></i> | <i><b>UNIVERSAL<br/>HUMAN VALUES</b></i> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|------------------------|------------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
|                        |                                          | HSM             | 3        | 0        | 0        | 1         | 3             |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                   |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----|
| <b>Preamble</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                   |    |
| This course on Value Education helps students develop a holistic understanding of life through right values, ethical conduct, harmonious relationships, and responsible living. It promotes self-exploration, social harmony, professional ethics, and sustainable practices to achieve continuous happiness and prosperity. The course also develops moral responsibility, social awareness, and value-based professional competence through discussions and case studies. |                                                                                   |    |
| <b>Course Prerequisite</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                   |    |
| <ul style="list-style-type: none"> <li>• Basic understanding of human values and ethical behavior</li> <li>• Ability to think logically and reflect on personal experiences</li> <li>• Interest in self-development, social harmony, and professional ethics</li> <li>• Basic communication and comprehension skills for discussions and reflective learning</li> <li>• Openness to self-exploration and value-based learning processes</li> </ul>                          |                                                                                   |    |
| <b>Course Objective</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                   |    |
| <ul style="list-style-type: none"> <li>• To understand the fundamentals of Python programming language.</li> <li>• To apply decision-making and looping concepts in problem solving.</li> <li>• To develop modular programming skills using functions and modules.</li> <li>• To learn Python data structures and file handling techniques.</li> <li>• To implement object-oriented programming concepts using Python.</li> </ul>                                           |                                                                                   |    |
| <b>Course Outcome</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                   |    |
| <b>CO1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To have a holistic vision of life                                                 | K2 |
| <b>CO2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To enhance a socially responsible behaviour.                                      | K2 |
| <b>CO3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To understand the responsibility of an environmental work.                        | K2 |
| <b>CO4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To understand the Competence and Capabilities for Maintaining Health and Hygiene. | K2 |
| <b>CO5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | To appreciate the aspiration for excellence (merit) and gratitude for all.        | K2 |

| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                        |                                         |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|----------|
| <b>Unit 1</b>                                                                                                                                                                                                                                                                                                                                          | <b>INTRODUCTION TO VALUE EDUCATION:</b> | <b>9</b> |
| Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity the Basic Human Aspirations, Happiness and Prosperity Current Scenario, Method to Fulfil the Basic Human Aspirations. |                                         |          |
| <b>Unit 2</b>                                                                                                                                                                                                                                                                                                                                          | <b>HARMONY IN THE HUMAN BEING:</b>      | <b>9</b> |

|                                                                                                                                                                                                                                                                                                                                                                     |                                                    |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|----------|
| Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.                                                                     |                                                    |          |
| <b>Unit 3</b>                                                                                                                                                                                                                                                                                                                                                       | <b>HARMONY IN THE FAMILY AND SOCIETY:</b>          | <b>9</b> |
| Harmony in the Family, the Basic Unit of Human Interaction, Trust, Foundational Value in Relationship, Respect, Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.                                                                                               |                                                    |          |
| <b>Unit 4</b>                                                                                                                                                                                                                                                                                                                                                       | <b>HARMONY IN THE NATURE/EXISTENCE:</b>            | <b>9</b> |
| Understanding Harmony in the Nature, Interconnectedness, self- regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence. Describing, Defining, Classifying, providing examples or evidence, Writing introduction and conclusion.                        |                                                    |          |
| <b>Unit 5</b>                                                                                                                                                                                                                                                                                                                                                       | <b>IMPLICATIONS OF THE HOLISTIC UNDERSTANDING:</b> | <b>9</b> |
| Natural Acceptance of Human Values, Definitive- ness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Hu- man Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models- Typical Case Studies, Strategies for Transition towards Value-based Life and Profession. |                                                    |          |

**Total Hours : 45**

|                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>                                                                                                                                                                                                                                                                                                                                                                                                  |
| <ol style="list-style-type: none"> <li>1. Kapoor, Premvir. Professional Ethics and Human Values. Khanna Book Publishing, 2019.</li> <li>2. Gaur, R. R., et al. The Textbook: A Foundation Course in Human Values and Professional Ethics. 2nd rev. ed., Excel Books, 2019.</li> <li>3. Tripathi, A. N. Human Values. 4th ed., New Age International, 2024.</li> </ol>                                               |
| <b>Reference:</b>                                                                                                                                                                                                                                                                                                                                                                                                   |
| <ol style="list-style-type: none"> <li>1. Leonard, Annie. The Story of Stuff: How Our Obsession with Stuff Is Trashing the Planet, Our Communities, and Our Health—and a Vision for Change. Free Press, 2010.</li> <li>2. Tripathi, A. N. Human Values. 3rd ed., New Age International Publishers, 2009.</li> <li>3. Gandhi, Mohandas Karamchand. The Story of My Experiments with Truth. Penguin, 2001.</li> </ol> |
| <b>Web / NPTEL Resources:</b>                                                                                                                                                                                                                                                                                                                                                                                       |
| <a href="https://nptel.ac.in/courses/109104068">https://nptel.ac.in/courses/109104068</a><br><a href="https://onlinecourses.nptel.ac.in/noc25_mg141/preview">https://onlinecourses.nptel.ac.in/noc25_mg141/preview</a><br><a href="https://nptel.ac.in/courses/110105138">https://nptel.ac.in/courses/110105138</a>                                                                                                 |

**CO-PO MAPPING**

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3   | 3   | 2   | 2   | -   | -   | 2   | -   | -   | -    | -    | 3    | 2    | 2    |
| CO2 | 3   | 3   | 2   | 2   | -   | 1   | -   | -   | 1   | -    | -    | 3    | 2    | 2    |
| CO3 | 3   | 3   | 2   | 2   | -   | 1   | -   | 1-  | -   | -    | -    | 3    | 2    | 2    |
| CO4 | 3   | 3   | 2   | 2   | -   | 1   | -   | -   | -   | 2    | -    | 3    | 2    | 2    |
| CO5 | 3   | 3   | 2   | 2   | -   | 1   | -   | -   | -   | -    | 1    | 3    | 2    | 2    |

| <b>Assessment Methodology</b> |                         |              |
|-------------------------------|-------------------------|--------------|
| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
| Internal Test I               | Written Examination     | 10           |
| Internal Test II              | Written Examination     | 10           |
| Internal Test III             | Written Examination     | 10           |
| Assessment                    | Assignment              | 5            |
| Attendance                    | Performance             | 5            |
| Total                         |                         | 40           |

| CST26203 | PROBLEM SOLVING AND PYTHON PROGRAMMING | CATEGORY | L | T | P | SL | CREDIT |
|----------|----------------------------------------|----------|---|---|---|----|--------|
|          |                                        | ESC      | 3 | 0 | 0 | 1  | 3      |

| Course Prerequisite / Preamble                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                              |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----|
| <ul style="list-style-type: none"> <li>Basic understanding of computers, logical reasoning, and programming fundamentals.</li> <li>This course provides the foundation for developing problem-solving skills and programming applications using Python.</li> </ul>                                                                                                                                                      |                                                                                              |    |
| Course Objective                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                              |    |
| <ul style="list-style-type: none"> <li>To understand the fundamentals of Python programming language.</li> <li>To apply decision-making and looping concepts in problem solving.</li> <li>To develop modular programming skills using functions and modules.</li> <li>To learn Python data structures and file handling techniques.</li> <li>To implement object-oriented programming concepts using Python.</li> </ul> |                                                                                              |    |
| Course Outcome                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                              |    |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                     | Explain the fundamentals, syntax, and programming constructs of Python language              | K2 |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                     | Apply decision-making statements and looping techniques to solve computational problems      | K3 |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                     | Develop modular programs using functions, modules, and packages in Python                    | K3 |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                     | Utilize Python data structures and file handling techniques for data processing applications | K3 |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                                     | Implement object-oriented programming concepts to develop real-world Python applications     | K4 |

| Syllabus                                                                                                                                                                                                       |                                   |     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----|
| Unit 1                                                                                                                                                                                                         | Introduction to Python            | (9) |
| Introduction to Python – Features of Python – Installation and execution – Variables and data types – Input and output statements – Operators and expressions – Type conversion – Python programming examples. |                                   |     |
| Unit 2                                                                                                                                                                                                         | Decision Making and Looping       | (9) |
| Conditional statements – if, if-else, nested if – Looping statements – for loop, while loop – break, continue, pass statements – Pattern generation – Problem solving using loops.                             |                                   |     |
| Unit 3                                                                                                                                                                                                         | Functions and Modules             | (9) |
| Functions – Function arguments – Return values – Lambda functions – Recursive functions – Modules and packages – Import statements – Python standard libraries.                                                |                                   |     |
| Unit 4                                                                                                                                                                                                         | Data Structures and File handling | (9) |

|                                                                                                                                                                   |                                              |            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------|
| Strings – Lists – Tuples – Dictionaries – Sets – File operations – Reading and writing files – Exception handling – Applications using data structures and files. |                                              |            |
| <b>Unit 5</b>                                                                                                                                                     | <b>Object Oriented Programming in Python</b> | <b>(9)</b> |
| Classes and objects – Constructors – Inheritance – Polymorphism – Encapsulation – Method overloading and overriding – Simple applications using Python.           |                                              |            |

**Total Hours : 45**

|                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                                                                    |
| <ol style="list-style-type: none"> <li>1. Thareja, Reema. Python Programming: Using Problem Solving Approach. 2nd ed., Oxford University Press, 2023.</li> <li>2. Liang, Y. Daniel. Introduction to Programming Using Python. 2nd ed., Pearson Education, 2017.</li> <li>3. Deitel, Paul, and Harvey Deitel. Python for Programmers. Pearson Education, 2019.</li> </ol>                                             |
| <b>Reference</b>                                                                                                                                                                                                                                                                                                                                                                                                     |
| <ol style="list-style-type: none"> <li>1. Lutz, Mark. Learning Python. 5th ed., O'Reilly Media, 2013.</li> <li>2. Downey, Allen B. Think Python: How to Think Like a Computer Scientist. Green Tea Press.</li> <li>3. Lambert, Kenneth A. Fundamentals of Python: First Programs. 3rd ed., Cengage Learning, 2024.</li> </ol>                                                                                        |
| <b>Web Resources/ NPTEL</b>                                                                                                                                                                                                                                                                                                                                                                                          |
| <ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/106106145">https://nptel.ac.in/courses/106106145</a></li> <li>2. <a href="https://onlinecourses.nptel.ac.in/noc23_cs20preview">https://onlinecourses.nptel.ac.in/noc23_cs20preview</a></li> <li>3. <a href="https://onlinecourses.nptel.ac.in/noc26_cs87/preview">https://onlinecourses.nptel.ac.in/noc26_cs87/preview</a></li> </ol> |

| <b>CO PO Mapping</b> |     |     |     |     |     |     |     |     |     |      |      |      |      |
|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| COs                  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1                  | 3   | 2   | -   | -   | 1   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO2                  | 3   | 3   | 1   | -   | 1   | -   | -   | -   | -   | -    | -    | 2    | 1    |
| CO3                  | 3   | 3   | 2   | 1   | 1   | -   | -   | -   | -   | -    | -    | 2    | 2    |
| CO4                  | 3   | 3   | 2   | 1   | 2   | -   | -   | -   | -   | -    | -    | 2    | 2    |
| CO5                  | 3   | 3   | 3   | 2   | 2   | -   | -   | -   | -   | -    | -    | 2    | 2    |

| <b>Assessment Methodology</b> |                         |              |
|-------------------------------|-------------------------|--------------|
| <b>Assessment Methodology</b> | <b>Assessment Tools</b> | <b>Marks</b> |
| Internal Test I               | Written Examination     | 10           |
| Internal Test II              | Written Examination     | 10           |
| Internal Test III             | Written Examination     | 10           |
| Assessment                    | Assignment              | 5            |
| Attendance                    | Performance             | 5            |
| Total                         |                         | 40           |

| BMT26204 | <i>BIOLOGY FOR MECHANICAL ENGINEERS</i> | CATEGORY | L | T | P | SL | CREDIT |
|----------|-----------------------------------------|----------|---|---|---|----|--------|
|          |                                         | BSC      | 3 | 0 | 0 | 1  | 3      |

| Course Prerequisite / Preamble                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                               |      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------|
| <ul style="list-style-type: none"> <li>Basic understanding of Biology concepts studied at Higher Secondary level.</li> <li>This course provides the foundation for understanding biological systems and their engineering applications in biotechnology, healthcare, environment, and sustainable technologies.</li> </ul>                                                                                                                                                                              |                                                                               |      |
| Course Objective                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                               |      |
| <ul style="list-style-type: none"> <li>To introduce the fundamental concepts of biology relevant to engineering applications.</li> <li>To understand the structure and functions of cells and biomolecules.</li> <li>To familiarize students with genetics, biotechnology, and bioengineering concepts.</li> <li>To provide knowledge on biological processes and their industrial applications.</li> <li>To create awareness about environmental sustainability and biomedical innovations.</li> </ul> |                                                                               |      |
| Course Outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                               |      |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Understand the structure and functions of cells and biomolecules.             | (K2) |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Explain biological processes and metabolic pathways relevant to engineering.  | (K2) |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Apply genetics and biotechnology concepts in engineering applications.        | (K3) |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Analyse environmental and biomedical applications of biology.                 | (K4) |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Interpret the role of biological systems in sustainable engineering solutions | (K5) |

| Unit I                                                                                                                                                                                                                                                              | Cell Biology               | (9) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----|
| Introduction to Biology – Cell as basic unit of life – Prokaryotic and eukaryotic cells – Cell structure and functions – Cell membrane – Nucleus – Mitochondria – Chloroplast – Cell division – Mitosis and meiosis– Applications in engineering and biotechnology. |                            |     |
| Unit II                                                                                                                                                                                                                                                             | Biomolecules and Enzymes   | (9) |
| Structure and functions of carbohydrates, proteins, lipids, and nucleic acids – DNA and RNA – Enzymes – Classification and mechanism of enzyme action – Factors affecting enzyme activity –Industrial and biomedical applications of enzymes.                       |                            |     |
| Unit III                                                                                                                                                                                                                                                            | Genetics and Biotechnology | (9) |
| Principles of genetics – Mendel’s laws – Chromosomes and genes – Genetic engineering – Recombinant DNA technology – Polymerase Chain Reaction (PCR) – Cloning – Applications of biotechnology in medicine, agriculture, and industry.                               |                            |     |

|                                                                                                                                                                                                                                              |                                                   |            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------|
| <b>Unit IV</b>                                                                                                                                                                                                                               | <b>Microbiology and Environmental Biology</b>     | <b>(9)</b> |
| Introduction to microorganisms – Bacteria, fungi, and viruses – Microbial growth – Industrial microbiology – Waste management – Bioremediation – Environmental pollution and control – Sustainable environmental practices.                  |                                                   |            |
| <b>Unit V</b>                                                                                                                                                                                                                                | <b>Bioengineering and Biomedical Applications</b> | <b>(9)</b> |
| Introduction to bioengineering – Tissue engineering – Biosensors – Biomedical devices – Artificial organs – Bioinformatics – Applications of biology in healthcare engineering – Ethical issues in biotechnology and biomedical engineering. |                                                   |            |
| <b>Total Hours : 45</b>                                                                                                                                                                                                                      |                                                   |            |

|                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                               |
| <ol style="list-style-type: none"> <li>1. Johnson, Arthur T. Biology for Engineers. 2nd ed., CRC Press, 2019.</li> <li>2. Johnson, Arthur T. Biology for Engineers. 2nd ed., Academic Press, 2019.</li> <li>3. Campbell, Neil A., and Jane B. Reece. Biology. 12th ed., Pearson Education, 2021.</li> </ol>                                     |
| <b>Reference</b>                                                                                                                                                                                                                                                                                                                                |
| <ol style="list-style-type: none"> <li>1. Nelson, David L., and Michael M. Cox. Lehninger Principles of Biochemistry. 8th ed., W. H. Freeman, 2021.</li> <li>2. Willey, Joanne M., et al. Prescott's Microbiology. 12th ed., McGraw Hill Education, 2023.</li> <li>3. Singh, B. D. Biotechnology. 4th ed., Kalyani Publishers, 2012.</li> </ol> |
| <b>Web / NPTEL Resources</b>                                                                                                                                                                                                                                                                                                                    |
| <ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/121106008">https://nptel.ac.in/courses/121106008</a></li> <li>2. <a href="https://nptel.ac.in/courses/102106081">https://nptel.ac.in/courses/102106081</a></li> </ol>                                                                                            |

| <b>CO-PO Mapping</b>          |     |     |     |     |     |     |                         |     |     |              |      |      |      |
|-------------------------------|-----|-----|-----|-----|-----|-----|-------------------------|-----|-----|--------------|------|------|------|
| COs                           | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7                     | PO8 | PO9 | PO10         | PO11 | PSO1 | PSO2 |
| CO1                           | 3   | 2   | -   | -   | 1   | -   | -                       | -   | -   | -            | -    | 2    | 1    |
| CO2                           | 3   | 3   | 1   | 1   | 1   | -   | -                       | -   | -   | -            | -    | 2    | 1    |
| CO3                           | 3   | 3   | 2   | 2   | 2   | -   | -                       | -   | -   | 1            | -    | 2    | 2    |
| CO4                           | 3   | 2   | 1   | 2   | 1   | 2   | 2                       | 1   | -   | 1            | -    | 2    | 2    |
| CO5                           | 3   | 3   | 2   | 2   | 2   | 2   | 2                       | 1   | 1   | 1            | -    | 2    | 2    |
| <b>Assessment Methodology</b> |     |     |     |     |     |     |                         |     |     |              |      |      |      |
| <b>Assessment Methodology</b> |     |     |     |     |     |     | <b>Assessment Tools</b> |     |     | <b>Marks</b> |      |      |      |
| Internal Test I               |     |     |     |     |     |     | Written Examination     |     |     | 10           |      |      |      |
| Internal Test II              |     |     |     |     |     |     | Written Examination     |     |     | 10           |      |      |      |
| Internal Test III             |     |     |     |     |     |     | Written Examination     |     |     | 10           |      |      |      |
| Assessment                    |     |     |     |     |     |     | Assignment              |     |     | 5            |      |      |      |

|            |             |    |
|------------|-------------|----|
| Attendance | Performance | 5  |
| Total      |             | 40 |

|                 |                                               |                 |          |          |          |           |               |
|-----------------|-----------------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
| <b>MET26204</b> | <b>BASIC CIVIL AND MECHANICAL ENGINEERING</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|                 |                                               | <b>Theory</b>   | <b>3</b> | <b>0</b> | <b>0</b> | <b>1</b>  | <b>3</b>      |

|                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                              |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------|
| <b>Course Prerequisite / Preamble</b>                                                                                                                                                                                                                                                                                                                                                         |                                                                                              |           |
| <ul style="list-style-type: none"> <li>• Introduces the basic concepts and applications of Civil and Mechanical Engineering.</li> <li>• Covers surveying, civil engineering materials, buildings, infrastructure, engines, power plants, pumps, refrigeration and air conditioning.</li> <li>• Provides an understanding of engineering systems used in society and everyday life.</li> </ul> |                                                                                              |           |
| <b>Course Objective</b>                                                                                                                                                                                                                                                                                                                                                                       |                                                                                              |           |
| <ul style="list-style-type: none"> <li>• To introduce the major branches and applications of Civil and Mechanical Engineering.</li> <li>• To provide basic knowledge of surveying, civil engineering materials, building components and infrastructure.</li> <li>• To explain the working principles of engines, power plants, pumps, refrigeration and air conditioning systems.</li> </ul>  |                                                                                              |           |
| <b>Course Outcome</b>                                                                                                                                                                                                                                                                                                                                                                         |                                                                                              |           |
| <b>CO1</b>                                                                                                                                                                                                                                                                                                                                                                                    | Explain the basic concepts and applications of Civil and Mechanical Engineering.             | <b>K2</b> |
| <b>CO2</b>                                                                                                                                                                                                                                                                                                                                                                                    | Describe basic surveying methods and common civil engineering materials.                     | <b>K2</b> |
| <b>CO3</b>                                                                                                                                                                                                                                                                                                                                                                                    | Explain building components, infrastructure and green building practices.                    | <b>K2</b> |
| <b>CO4</b>                                                                                                                                                                                                                                                                                                                                                                                    | Explain the working principles of engines, power plants, pumps and turbines.                 | <b>K2</b> |
| <b>CO5</b>                                                                                                                                                                                                                                                                                                                                                                                    | Explain the basic principles and applications of refrigeration and air conditioning systems. | <b>K2</b> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                         |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|------------|
| <b>Syllabus</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                         |            |
| <b>Unit 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Introduction to Civil and Mechanical Engineering</b> | <b>(9)</b> |
| <b>Civil Engineering:</b> Role in society – Major areas: Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering – National Building Code – Basic building terms: Plinth area, Carpet area, Floor area, Built-up area and Floor Space Index – Residential and Industrial buildings.<br><b>Mechanical Engineering:</b> Introduction – Contributions to society – Manufacturing, Automation, Automobile and Energy Engineering – Interdisciplinary applications. |                                                         |            |
| <b>Unit 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Surveying and Civil Engineering Materials</b>        | <b>(9)</b> |
| Surveying: Purpose – Classification – Basic principles – Measurement of distances and angles – Leveling – Area measurement – Contours.<br>Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel – Timber – Modern materials – Thermal and acoustic insulating materials – Decorative panels – Waterproofing materials – Uses of gypsum – Prefabricated building components.                                                                                                        |                                                         |            |
| <b>Unit 3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Building Components and Infrastructure</b>           | <b>(9)</b> |
| Building plans – Setting out of buildings – Foundations and types – Bearing capacity and settlement – Brick and stone masonry – Beams – Columns – Lintels – Roofing – Flooring – Plastering – Types of bridges and dams – Water supply network – Rainwater harvesting – Solid waste management – Introduction to highways and railways – Green buildings.                                                                                                                                                    |                                                         |            |
| <b>Unit 4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Internal Combustion Engines and Power Plants</b>     | <b>(9)</b> |

|                                                                                                                                                                                                                                                                                                                                                                                                      |                                           |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------|
| Classification of power plants – Working principles of Steam, Gas, Diesel, Hydroelectric and Nuclear power plants – Internal combustion engines – Petrol and Diesel engines – Two-stroke and Four-stroke cycles – Comparison – Boilers and turbines – Single-acting and double-acting reciprocating pumps – Centrifugal pumps – Hybrid engines – Industrial safety practices and protective devices. |                                           |            |
| <b>Unit 5</b>                                                                                                                                                                                                                                                                                                                                                                                        | <b>Refrigeration and Air Conditioning</b> | <b>(9)</b> |
| Basic terminology – Principle of refrigeration – Vapour Compression and Vapour Absorption systems – Layout of domestic refrigerator – Window and Split air conditioners – Properties of air-water mixture – Introduction to psychrometry – Basic psychrometric processes.                                                                                                                            |                                           |            |

**Total Hours: 45**

|                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books:</b>                                                                                                                                                                                                                                                                                                                                         |
| <ol style="list-style-type: none"> <li>1. Rajput, R. K. A Textbook of Basic Civil Engineering. S. Chand Publishing, 2020.</li> <li>2. Ramamrutham, S. Basic Civil Engineering. Dhanpat Rai Publishing Company, 2013.</li> <li>3. Khurmi, R. S., and J. K. Gupta. A Textbook of Thermal Engineering. S. Chand Publishing, 2023.</li> </ol>                  |
| <b>Reference:</b>                                                                                                                                                                                                                                                                                                                                          |
| <ol style="list-style-type: none"> <li>1. Bansal, R. K. A Textbook of Fluid Mechanics and Hydraulic Machines. 11th ed., Laxmi Publications, 2023.</li> <li>2. Ganesan, V. Internal Combustion Engines. 4th ed., McGraw Hill Education, 2017.</li> <li>3. Arora, C. P. Refrigeration and Air Conditioning. 4th ed., McGraw Hill Education, 2021.</li> </ol> |
| <b>Web / NPTEL Resources:</b>                                                                                                                                                                                                                                                                                                                              |
| <ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in/courses/105/106/105106206/">https://nptel.ac.in/courses/105/106/105106206/</a></li> <li>2. <a href="https://nptel.ac.in/courses/112103617">https://nptel.ac.in/courses/112103617</a></li> </ol>                                                                                     |

### CO-PO Mapping

| Cos        | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| <b>CO1</b> | 3   | 2   | 2   | 1   | 1   | 2   | 1   | 1   | 1   | 1    | 1    | 2    | 1    |
| <b>CO2</b> | 3   | 3   | 2   | 2   | 2   | 1   | 1   | 1   | 1   | 1    | 1    | 2    | 2    |
| <b>CO3</b> | 3   | 3   | 3   | 2   | 2   | 2   | 2   | 1   | 2   | 1    | 1    | 2    | 2    |
| <b>CO4</b> | 3   | 3   | 2   | 3   | 2   | 1   | 1   | 1   | 1   | 1    | 2    | 2    | 2    |
| <b>CO5</b> | 3   | 2   | 2   | 3   | 2   | 2   | 2   | 1   | 1   | 1    | 1    | 2    | 2    |

| Assessment Methodology |                     |       |
|------------------------|---------------------|-------|
| Assessment Methodology | Assessment Tools    | Marks |
| Internal Test I        | Written Examination | 10    |
| Internal Test II       | Written Examination | 10    |
| Internal Test III      | Written Examination | 10    |
| Assessment             | Assignment          | 5     |
| Attendance             | Performance         | 5     |
| Total                  |                     | 40    |

|                 |                                          |                 |          |          |          |           |               |
|-----------------|------------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
| <b>CSL26201</b> | <b>PYTHON PROGRAMMING<br/>LABORATORY</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|                 |                                          | ESC             | 0        | 0        | 2        | 1         | 1.5           |

### Course Prerequisite / Preamble

- Basic programming language concepts and logic building.
- This laboratory course introduces students to problem solving using Python programming language.
- The course emphasizes hands-on programming skills through real-life, scientific, and technical applications.
- Students gain knowledge in Python syntax, control structures, functions, file handling, exception handling, modules, libraries, and game development using Pygame.
- The course enables students to develop logical thinking, computational skills, and
- programming proficiency for engineering applications.

### Course Objective

- To develop applications using Python programming concepts and standard libraries.
- To develop problem-solving ability using conditional statements and iterative loops.
- To implement functions, strings, modules, and file handling techniques in Python.
- To demonstrate exception handling and real-time programming applications.
- To explore Pygame tool for developing interactive gaming applications.

### Course Outcome

|     |                                                                                         |    |
|-----|-----------------------------------------------------------------------------------------|----|
| CO1 | Develop applications for simple real-life problems using Python.                        | K3 |
| CO2 | Write programs using Python statements, expressions, conditionals, and iterative loops. | K3 |
| CO3 | Write programs by implementing functions, strings, and Python standard libraries.       | K3 |
| CO4 | Demonstrate applications by dealing with exceptions and file handling.                  | K4 |
| CO5 | Explore Pygame tool by developing an interactive gaming application.                    | K5 |

| Exp. No. | Title                                       | Description / Problem Statements                                                                                                                                                     | CO  |
|----------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Ex.1     | Real-Life / Scientific / Technical Problems | Identification and solving of simple real-life or scientific or technical problems – Electricity Billing, Retail Shop Billing, Sin Series, etc.                                      | CO1 |
| Ex.2     | Simple Statements and Expressions           | Python programming using simple statements and expressions – exchange values of two variables, circulate values of n variables, distance between two points.                         | CO2 |
| Ex.3     | Conditionals and Iterative Loops            | Scientific problems using conditionals and iterative loops – Number Series, Number Patterns, Pyramid Pattern.                                                                        | CO2 |
| Ex.4     | Lists and Tuples                            | Implementing real-time / technical applications using Lists and Tuples.                                                                                                              | CO2 |
| Ex.5     | Sets and Dictionaries                       | Implementing real-time / technical applications using Sets and Dictionaries – language components, automobile elements, civil structure elements; operations of Sets & Dictionaries. | CO2 |
| Ex.6     | Functions                                   | Implementing programs using Functions – Factorial, largest number in a list, area of shapes.                                                                                         | CO3 |
| Ex.7     | Strings                                     | Implementing programs using Strings – reverse, palindrome check, character count, replacing characters.                                                                              | CO3 |
| Ex.8     | Modules and Python Standard Libraries       | Implementing programs using written modules and Python Standard Libraries – Pandas, NumPy, Matplotlib, SciPy.                                                                        | CO3 |
| Ex.9     | File Handling                               | Implementing real-time / technical applications using File Handling – copy from one file to another, word count, longest word.                                                       | CO4 |
| Ex.10    | Exception Handling                          | Implementing real-time / technical applications using Exception Handling – divide by zero error, voter's age validity, student mark range validation.                                | CO4 |
| Ex.11    | Pygame – Gaming Application                 | Exploring Pygame tool; developing a game activity using Pygame – bouncing ball, car race, etc.                                                                                       | CO5 |

**Total Hours : 45**

|                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Text Books</b>                                                                                                                                                                                                                                                      |
| 1. Downey, Allen B. Think Python: How to Think Like a Computer Scientist. 3rd ed., O'Reilly Media, 2024.<br>2. Lutz, Mark. Learning Python. 6th ed., O'Reilly Media, 2025.<br>3. Chun, Wesley J. Core Python Applications Programming. 3rd ed., Prentice Hall, 2012.   |
| <b>Reference</b>                                                                                                                                                                                                                                                       |
| 4. van Rossum, Guido. Python Reference Manual. Network Theory Ltd., 2011.<br>5. Lubanovic, Bill. Introducing Python: Modern Computing in Simple Packages. 3rd ed., O'Reilly Media, 2025.<br>6. McKinney, Wes. Python for Data Analysis. 3rd ed., O'Reilly Media, 2022. |
| <b>Web / NPTEL Resources</b>                                                                                                                                                                                                                                           |
| 1. <a href="https://nptel.ac.in/courses/106106145">https://nptel.ac.in/courses/106106145</a><br>2. <a href="https://docs.python.org/3/tutorial/">https://docs.python.org/3/tutorial/</a><br>3. <a href="https://www.pygame.org/docs/">https://www.pygame.org/docs/</a> |

| <b>CO PO Mapping</b> |            |            |            |            |            |            |            |            |            |             |             |             |             |
|----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>Cos</b>           | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| CO1                  | 3          | 2          | 2          | 1          | -          | 1          | -          | -          | 2          | 1           | -           | 3           | 2           |
| CO2                  | 3          | 3          | 2          | 1          | -          | -          | -          | -          | 2          | -           | -           | 3           | 2           |
| CO3                  | 3          | 3          | 2          | 2          | -          | -          | -          | -          | 2          | 1           | -           | 3           | 3           |
| CO4                  | 3          | 2          | 2          | 3          | 1          | -          | -          | -          | 1          | 1           | -           | 3           | 2           |
| CO5                  | 2          | 2          | 3          | 2          | 2          | 1          | -          | -          | 2          | 1           | -           | 3           | 2           |

| <b>Assessment Methodology</b>                     | <b>Assessment Tools</b> | <b>Marks</b> |
|---------------------------------------------------|-------------------------|--------------|
| Objective                                         | Observation             | 10           |
| Record Work                                       |                         | 10           |
| Model Exam                                        |                         | 15           |
| Virtual Lab Assignment / Online Coding Assessment | Review                  | 10           |
| Model Creation                                    | Presentation            | 05           |
| Attendance                                        |                         | 10           |
| Total                                             |                         | 60           |

|                 |                                                             |                 |          |          |          |           |               |
|-----------------|-------------------------------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
| <b>MEL26202</b> | <b>ENGINEERING<br/>WORKSHOP PRACTICE<br/>LABORATORY – I</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|                 |                                                             | <b>ESC</b>      | <b>0</b> | <b>0</b> | <b>2</b> | <b>1</b>  | <b>1.5</b>    |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                           |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------|
| <b>Course Prerequisite / Preamble</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                           |             |
| <ul style="list-style-type: none"> <li>This laboratory course provides practical exposure to basic manufacturing and workshop practices used in engineering applications.</li> <li>Students gain hands-on training in fitting, welding, carpentry, sheet metal, and lathe operations with emphasis on safety and skill development.</li> </ul>                                                                                                                                        |                                                                                           |             |
| <b>Course Objective</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                           |             |
| <ul style="list-style-type: none"> <li>To familiarize students with common workshop tools and equipment.</li> <li>To develop practical skills in fitting, welding, carpentry, sheet metal, and lathe operations.</li> <li>To train students in safe handling of workshop machines and materials.</li> <li>To enhance fabrication and assembly skills through practical exercises.</li> <li>To provide exposure to basic manufacturing processes and engineering practices.</li> </ul> |                                                                                           |             |
| <b>Course Outcome</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                           |             |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Identify and use workshop tools and measuring instruments safely.                         | <b>(K3)</b> |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Perform fitting and carpentry operations for simple engineering jobs.                     | <b>(K3)</b> |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Carry out basic welding and sheet metal fabrication operations                            | <b>(K3)</b> |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Operate basic lathe machines for simple machining processes.                              | <b>(K3)</b> |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Demonstrate teamwork, safety practices, and professional ethics in workshop environments. | <b>(K4)</b> |

|                                                        |                  |
|--------------------------------------------------------|------------------|
| <b>SYLLABUS</b>                                        |                  |
| <b>FITTING SHOP (ANY THREE EXPERIMENTS)</b>            | <b>(9 Hours)</b> |
| 1. Introduction to fitting tools and safety practices. | (3 Hours)        |
| 2. Marking, sawing, filing, and drilling operations.   | (3 Hours)        |
| 3. Preparation of fitting joints and assemblies.       | ( 3Hours)        |
| 4. Inspection and finishing operations.                | (3Hours)         |

|                                                              |                  |
|--------------------------------------------------------------|------------------|
| <b>WELDING SHOP (ANY THREE EXPERIMENTS)</b>                  | <b>(9 Hours)</b> |
| 1. Introduction to welding equipment and safety precautions. | (3 Hours)        |
| 2. Arc welding practice on mild steel plates.                | (3 Hours)        |
| 3. Preparation of lap joint and butt joint.                  | (3 Hours)        |
| 4. Finishing and inspection of welded joints.                | (3 Hours)        |

|                                                                |                  |
|----------------------------------------------------------------|------------------|
| <b>CARPENTRY SHOP (ANY THREE EXPERIMENTS)</b>                  | <b>(9 Hours)</b> |
| 1. Introduction to carpentry tools and wood working practices. | (3 Hours)        |
| 2. Marking, cutting, planning, and chiseling operations.       | (3 Hours)        |
| 3. Preparation of wooden joints.                               | (3 Hours)        |
| 4. Finishing and inspection of carpentry work.                 | (3 Hours)        |

|                                                             |                  |
|-------------------------------------------------------------|------------------|
| <b>SHEET METAL SHOP (ANY THREE EXPERIMENTS)</b>             | <b>(9 Hours)</b> |
| 1. Introduction to sheet metal tools and safety procedures. | (3 Hours)        |
| 2. Sheet metal cutting, bending, and folding operations.    | (3 Hours)        |
| 3. Preparation of simple sheet metal models.                | (3 Hours)        |
| 4. Riveting and finishing operations.                       | (3 Hours)        |

|                                                        |                  |
|--------------------------------------------------------|------------------|
| <b>LATHE SHOP (ANY THREE EXPERIMENTS)</b>              | <b>(9 Hours)</b> |
| 1. Introduction to lathe machine and machining safety. | (3 Hours)        |
| 2. Facing and turning operations.                      | (3 Hours)        |
| 3. Knurling, drilling, and threading operations.       | (3 Hours)        |
| 4. Inspection and finishing operations.                | (3 Hours)        |

**Total Hours : 45**

|                                                                                                      |
|------------------------------------------------------------------------------------------------------|
| <b>Text Books</b>                                                                                    |
| 1. Choudhury, Hajra, et al. Workshop Technology Vol. I & II. Media Promoters and Publishers, 2012.   |
| 2. Rao, P. N. Manufacturing Technology. 5th ed., McGraw-Hill, 2019.                                  |
| 3. John, K. C. Mechanical Workshop Practice. 2nd ed., PHI Learning, 2010.                            |
| <b>Reference</b>                                                                                     |
| 1. Choudhury, S. K. Hajra, et al. Elements of Workshop Technology. 15th ed., Media Promoters, 2012.  |
| 2. Raghuwanshi, B. S. A Course in Workshop Technology. 10th rev. ed., Dhanpat Rai and Company, 2009. |
| 3. Chapman, W. A. J. Workshop Technology. 4th ed., Edward Arnold Publications, 1972.                 |
| <b>Web / NPTEL Resources</b>                                                                         |
| 1. <a href="https://nptel.ac.in/courses/112107145">https://nptel.ac.in/courses/112107145</a>         |
| 2. <a href="https://nptel.ac.in/courses/112104224">https://nptel.ac.in/courses/112104224</a>         |
| 3. <a href="https://www.vlab.co.in/">https://www.vlab.co.in/</a>                                     |

### CO-PO Mapping

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| CO1 | 3   | 2   | -   | -   | -   | -   | 2   | -   | -   | -    | -    | 1    | 1    | 2    |
| CO2 | 3   | 2   | 1   | 1   | -   | 1   | -   | -   | 1   | -    | -    | 1    | 2    | 2    |
| CO3 | 3   | 2   | 1   | 1   | -   | 1   | -   | 1   | -   | -    | -    | 1    | 2    | 2    |
| CO4 | 3   | 2   | 1   | 1   | -   | 1   | -   | -   | -   | 2    | -    | 1    | 3    | 2    |
| CO5 | 3   | 2   | 1   | 1   | -   | 1   | -   | -   | -   | -    | 1    | 1    | 3    | 2    |

| <b>Assessment Methodology</b>                     | <b>Assessment Tools</b> | <b>Marks</b> |
|---------------------------------------------------|-------------------------|--------------|
| Objective                                         | Observation             | 10           |
| Record Work                                       |                         | 10           |
| Model Exam                                        |                         | 15           |
| Virtual Lab Assignment / Online Coding Assessment | Review                  | 10           |
| Model Creation                                    | Presentation            | 05           |
| Attendance                                        |                         | 10           |
| Total                                             |                         | 60           |

|                 |                                                           |                 |          |          |          |           |               |
|-----------------|-----------------------------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
| <b>MEL26203</b> | <b><i>DESIGN THINKING<br/>AND IDEA<br/>LABORATORY</i></b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|                 |                                                           | <b>ESC</b>      | <b>0</b> | <b>0</b> | <b>2</b> | <b>1</b>  | <b>1.5</b>    |

|                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                             |                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------|
| <b>Course Prerequisite / Preamble</b>                                                                                                                                                                                                                                                                                                                                                                              |                                                                                             |                    |
| <ul style="list-style-type: none"> <li>This laboratory introduces students to the basic steps of Design Thinking and simple idea development.</li> <li>Students gain hands-on practice in identifying problems, generating ideas, making simple prototypes, testing solutions, and presenting results.</li> </ul>                                                                                                  |                                                                                             |                    |
| <b>Course Objective</b>                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                             |                    |
| <ul style="list-style-type: none"> <li>To understand the basic principles and stages of Design Thinking.</li> <li>To identify user needs and define simple engineering or societal problems.</li> <li>To generate and select useful ideas using simple ideation methods.</li> <li>To develop and test basic prototypes or models.</li> <li>To improve teamwork, communication, and presentation skills.</li> </ul> |                                                                                             |                    |
| <b>Course Outcome</b>                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                             |                    |
| <b>CO</b>                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Course Outcome</b>                                                                       | <b>K<br/>LEVEL</b> |
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                | Understand the principles and stages of design thinking.                                    | (K2)               |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                | Identify user needs and define simple problems using basic design tools.                    | (K3)               |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                | Generate and select suitable ideas using simple ideation techniques.                        | (K4)               |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                | Develop and test a basic prototype for a selected problem.                                  | (K3)               |
| CO5                                                                                                                                                                                                                                                                                                                                                                                                                | Demonstrate teamwork, communication, and presentation skills through an idea-based project. | (K4)               |

|                                                                                           |
|-------------------------------------------------------------------------------------------|
| 1. Introduction to design thinking and innovation process.                                |
| 2. Observation, empathy, and user needs – simple empathy map.                             |
| 3. Problem identification and problem statement.                                          |
| 4. Brainstorming and mind mapping for idea generation.                                    |
| 5. Idea screening and selection based on usefulness and feasibility                       |
| 6. Concept sketching and simple solution planning.                                        |
| 7. Low-cost prototype development using paper, cardboard, foam, or simple digital models. |
| 8. Prototype testing and collection of user feedback.                                     |
| 9. Iteration and improvement of the prototype.                                            |
| 10. Select an engineering or societal problem and prepare an idea proposal.               |
| 11. Develop and document a simple model or demonstration prototype.                       |
| 12. Demonstrate the project and present the outcome with viva voce.                       |
| 13. Simple product improvement and sustainable idea development                           |
| 14. Idea communication using poster, pitch, or storyboard.                                |
| 15. Final presentation and peer evaluation                                                |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |            |            |            |            |            |            |            |            |             |             |             |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |            |            |            |            |            |            |            |            |             |             |             |             |
| 1. Kelley, Tom, and Jonathan Littman. The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm. 1st ed., Currency/Doubleday, 2001.<br>2. Mootee, Idris. Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School. John Wiley & Sons, 2013.<br>3. Kumar, Vijay. 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization. 1st ed., Wiley, 2012.                            |            |            |            |            |            |            |            |            |            |             |             |             |             |
| <b>Reference</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |            |            |            |            |            |            |            |            |            |             |             |             |             |
| 1. Thiel, Peter, and Blake Masters. Zero to One: Notes on Start-ups, or How to Build the Future. 1st ed., Crown Business, 2014.<br>2. Christensen, Clayton M. The Innovator's Dilemma, with a New Foreword: When New Technologies Cause Great Firms to Fail. Harvard Business Review Press, 2024.<br>3. Brown, Tim, and Barry Katz. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation. Revised and updated ed., Harper Business, 2019. |            |            |            |            |            |            |            |            |            |             |             |             |             |
| <b>Web / NPTEL Resources</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |            |            |            |            |            |            |            |            |            |             |             |             |             |
| 1. <a href="https://nptel.ac.in/courses/109104073">https://nptel.ac.in/courses/109104073</a><br>2. <a href="https://nptel.ac.in/courses/110106124">https://nptel.ac.in/courses/110106124</a><br>3. <a href="https://www.ideatovalue.com/">https://www.ideatovalue.com/</a>                                                                                                                                                                                                  |            |            |            |            |            |            |            |            |            |             |             |             |             |
| <b>CO PO Mapping</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |            |            |            |            |            |            |            |            |             |             |             |             |
| <b>COs</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| <b>CO1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2          | 3          | 2          | 1          | 1          | -          | 1          | -          | 2          | 2           | 1           | 2           | 1           |
| <b>CO2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2          | 3          | 3          | 2          | 2          | -          | 1          | -          | 2          | 2           | 1           | 2           | 2           |
| <b>CO3</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 3          | 3          | 3          | 2          | 2          | -          | 1          | -          | 2          | 2           | 1           | 2           | 2           |
| <b>CO4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2          | 2          | 2          | 1          | 1          | 1          | -          | 1          | 3          | 3           | -           | 1           | 1           |
| <b>CO5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2          | 3          | 3          | 2          | 2          | 1          | 1          | 1          | 2          | 3           | 2           | 2           | 2           |

| <b>Assessment Methodology</b>                     | <b>Assessment Tools</b> | <b>Marks</b> |
|---------------------------------------------------|-------------------------|--------------|
| Regular Laboratory Conduction                     | Observation             | 10           |
| Record Work                                       |                         | 10           |
| Model Exam                                        |                         | 15           |
| Virtual Lab Assignment / Online Coding Assessment | Review                  | 10           |
| Model Creation                                    | Presentation            | 05           |
| Attendance                                        |                         | 10           |
| <b>Total</b>                                      |                         | <b>60</b>    |

|                 |                                          |                 |          |          |          |           |               |
|-----------------|------------------------------------------|-----------------|----------|----------|----------|-----------|---------------|
| <b>CDC26201</b> | <b>CAREER DEVELOPMENT<br/>SKILL – II</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>SL</b> | <b>CREDIT</b> |
|                 |                                          | CDS             | 0        | 0        | 2        | 1         | 1             |

|                                                                                                                                                                                                                                                                                                                                                                                            |                                                |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----|
| <b>Course Prerequisite / Preamble</b>                                                                                                                                                                                                                                                                                                                                                      |                                                |    |
| <ul style="list-style-type: none"> <li>• Engineering Graphics</li> <li>• Basic Computer Knowledge</li> <li>• Interest in CAD drafting and design applications.</li> </ul>                                                                                                                                                                                                                  |                                                |    |
| <b>Course Objective</b>                                                                                                                                                                                                                                                                                                                                                                    |                                                |    |
| <ul style="list-style-type: none"> <li>• To understand the fundamentals of Computer Aided Design (CAD).</li> <li>• To develop ENGINEERING drawings using AutoCAD.</li> <li>• To create 2D and 3D mechanical component models.</li> <li>• To generate manufacturing drawings with standards and tolerances.</li> <li>• To prepare students for industrial drafting applications.</li> </ul> |                                                |    |
|                                                                                                                                                                                                                                                                                                                                                                                            | <b>Course Outcome</b>                          |    |
| <b>CO1</b>                                                                                                                                                                                                                                                                                                                                                                                 | Develop engineering drawings using AutoCAD.    | K3 |
| <b>CO2</b>                                                                                                                                                                                                                                                                                                                                                                                 | Create 2D and 3D CAD models.                   | K3 |
| <b>CO3</b>                                                                                                                                                                                                                                                                                                                                                                                 | Apply dimensioning and drafting standards.     | K4 |
| <b>CO4</b>                                                                                                                                                                                                                                                                                                                                                                                 | Generate manufacturing drawings.               | K4 |
| <b>CO5</b>                                                                                                                                                                                                                                                                                                                                                                                 | Utilize AutoCAD in industrial design projects. | K3 |

|                                                                                                                                                                           |                                         |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------|
| <b>Syllabus</b>                                                                                                                                                           |                                         |            |
| <b>Unit I</b>                                                                                                                                                             | <b>Introduction to CAD and Auto CAD</b> | <b>(6)</b> |
| Introduction to CAD, CAD Hardware and Software, AutoCAD Interface, Coordinate Systems, Limits and Units, Drawing Setup, Object Selection Methods, Basic Drawing Commands. |                                         |            |
| <b>Unit II</b>                                                                                                                                                            | <b>Engineering Drawing Creation</b>     | <b>(6)</b> |
| Line, Circle, Arc, Polygon, Ellipse, Hatch, Modify Commands, Trim, Extend, Offset, Mirror, Fillet, Chamfer, Dimensioning, Text and Annotations.                           |                                         |            |
| <b>Unit III</b>                                                                                                                                                           | <b>Advanced Drafting Techniques</b>     | <b>(6)</b> |
| Layers, Blocks, Dynamic Blocks, Attributes, Templates, External References, Layouts, Plotting and Printing Standards.                                                     |                                         |            |
| <b>Unit IV</b>                                                                                                                                                            | <b>3d Modeling</b>                      | <b>(6)</b> |
| Wireframe Modeling, Surface Modeling, Solid Modeling, UCS Concepts, Rendering and Visualization.                                                                          |                                         |            |
| <b>Unit V</b>                                                                                                                                                             | <b>Industrial Applications</b>          | <b>(6)</b> |
| Machine Components Drawing, Assembly Drawings, Fabrication Drawings, GD&T Standards, Industrial Case Studies.                                                             |                                         |            |

|                                                                                                                                                                                                                                                                                                                                                                                        |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>Total Hours : 30</b>                                                                                                                                                                                                                                                                                                                                                                |  |
| <b>Text Books</b>                                                                                                                                                                                                                                                                                                                                                                      |  |
| <ol style="list-style-type: none"> <li>1. Tickoo, Sham. AutoCAD 2026 with Videos: A Problem-Solving Approach, Basic and Intermediate. 32nd ed., CADCIM Technologies, 2026.</li> <li>2. Omura, George, and Brian C. Benton. Mastering AutoCAD 2019 and AutoCAD LT 2019. Sybex, 2018.</li> <li>3. Rao, P. N. CAD/CAM Principles and Applications. 4th ed., McGraw Hill, 2025.</li> </ol> |  |
| <b>Reference</b>                                                                                                                                                                                                                                                                                                                                                                       |  |
| <ol style="list-style-type: none"> <li>1. Autodesk AutoCAD Official User Guide. Autodesk Inc., 2026.</li> <li>2. Zeid, Ibrahim, and R. Sivasubramanian. CAD/CAM Theory and Practice. 2nd ed., McGraw Hill Education, 2017.</li> <li>3. McMahon, Chris, and Jimmie Browne. CAD Principles, Practice and Manufacturing Management. 2nd ed., Addison-Wesley, 1998.</li> </ol>             |  |
| <b>Web / NPTEL Resources</b>                                                                                                                                                                                                                                                                                                                                                           |  |
| <ol style="list-style-type: none"> <li>1. <a href="https://nptel.ac.in">https://nptel.ac.in</a></li> <li>2. <a href="https://www.autodesk.com/education">https://www.autodesk.com/education</a></li> </ol>                                                                                                                                                                             |  |

| <b>COPPO Mapping</b> |            |            |            |            |            |            |            |            |            |             |             |             |             |
|----------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|-------------|-------------|-------------|
| <b>Cos</b>           | <b>PO1</b> | <b>PO2</b> | <b>PO3</b> | <b>PO4</b> | <b>PO5</b> | <b>PO6</b> | <b>PO7</b> | <b>PO8</b> | <b>PO9</b> | <b>PO10</b> | <b>PO11</b> | <b>PSO1</b> | <b>PSO2</b> |
| CO1                  | 3          | 2          | 1          | -          | 2          | -          | -          | -          | 1          | 1           | -           | 3           | 1           |
| CO2                  | 2          | 2          | 3          | 1          | 3          | -          | -          | -          | 1          | 1           | -           | 3           | 2           |
| CO3                  | 2          | 3          | 2          | 1          | 2          | -          | -          | 1          | 1          | 1           | -           | 2           | 2           |
| CO4                  | 2          | 2          | 3          | 2          | 3          | -          | -          | -          | 1          | 1           | -           | 3           | 3           |
| CO5                  | 1          | 2          | 2          | 1          | 2          | 1          | -          | 1          | 2          | 2           | 1           | 2           | 3           |

| <b>Assessment Methodology</b>                     | <b>Assessment Tools</b> | <b>Marks</b> |
|---------------------------------------------------|-------------------------|--------------|
| Regular Laboratory Conduction                     | Observation             | 10           |
| Record Work                                       |                         | 10           |
| Model Exam                                        |                         | 15           |
| Virtual Lab Assignment / Online Coding Assessment | Review                  | 10           |
| Model Creation                                    | Presentation            | 05           |
| Attendance                                        |                         | 10           |
| <b>Total</b>                                      |                         | <b>60</b>    |

|                 |                                                       |                 |          |          |          |               |
|-----------------|-------------------------------------------------------|-----------------|----------|----------|----------|---------------|
| <b>NSC26201</b> | <b>NATIONAL SOCIAL SERVICE / VILLAGE CAMP / RALLY</b> | <b>CATEGORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>CREDIT</b> |
|                 |                                                       | <b>NSS</b>      | 0        | 0        | 1        | -             |

### Course Prerequisite / Preamble

- This course provides students with opportunities to participate in community service activities, rural development programs, social awareness campaigns, village camps, and public welfare initiatives.
- The course aims to develop social responsibility, leadership qualities, teamwork, communication skills, and awareness about societal issues through active participation in extension and outreach activities.

### Course Objective

- To promote social responsibility and community service among students.
- To create awareness about rural development, environmental protection, and social welfare activities.
- To develop leadership qualities, teamwork, and communication skills.
- To encourage active participation in village camps, rallies, and social awareness programs.
- To inculcate ethical values, discipline, and national integration.

### Course Outcome

|     |                                                                                                         |      |
|-----|---------------------------------------------------------------------------------------------------------|------|
| CO1 | Understand the importance of community service and social responsibility.                               | (K2) |
| CO2 | Participate actively in village camps, rallies, and social awareness programs.                          | (K3) |
| CO3 | Develop leadership, teamwork, and interpersonal communication skills.                                   | (K3) |
| CO4 | Apply ethical values and social commitment in community development activities.                         | (K3) |
| CO5 | Demonstrate discipline, environmental awareness, and national integration through extension activities. | (K4) |

### LIST OF ACTIVITIES

1. Orientation programme on National Social Service, social responsibility, and community engagement.
2. Campus cleanliness and environmental awareness activities.
3. Tree plantation and green campus initiatives.
4. Participation in village survey and rural development activities.
5. Health awareness rally and community interaction programme.
6. Awareness programmes on hygiene, sanitation, and public health.
7. Blood donation awareness / road safety / anti-drug awareness rally.

8. Village camp activities including teamwork, leadership, and social service.

|                                                                                                   |
|---------------------------------------------------------------------------------------------------|
| 9. Participation in national festivals, social campaigns, and public welfare programmes.          |
| 10. Preparation of activity report, reflection, and presentation of community service activities. |

|                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TextBook</b>                                                                                                                                                                                                                                                                                      |
| 1. Government of India, Ministry of Youth Affairs and Sports. National Service Scheme Manual. Government of India, 2009.<br>2. Basic Concept of National Service Scheme. Manipal University Jaipur, 2023.                                                                                            |
| <b>Reference</b>                                                                                                                                                                                                                                                                                     |
| 1. National Service Scheme Manual. Ministry of Human Resource Development, Govt. of India, 1987. Youth Red Cross and Community Service Handbooks.<br>2. Environmental and Rural Development Awareness Materials. National Service Scheme, Ministry of Youth Affairs and Sports, Government of India. |

|                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Web / NPTEL Resources</b>                                                                                                                                                                     |
| 1. <a href="https://nss.gov.in/">https://nss.gov.in/</a><br>2. <a href="https://www.india.gov.in/">https://www.india.gov.in/</a><br>3. <a href="https://www.mygov.in/">https://www.mygov.in/</a> |

| <b>CO-PO Mapping</b> |     |     |     |     |     |     |     |     |     |      |      |      |      |
|----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| COs                  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PSO1 | PSO2 |
| CO1                  | 1   | 1   | -   | -   | -   | 3   | 3   | 3   | 1   | 1    | 1    | 1    | 1    |
| CO2                  | 1   | 1   | -   | -   | -   | 3   | 3   | 3   | 2   | 2    | 1    | 1    | 1    |
| CO3                  | 1   | 1   | -   | -   | -   | 2   | 2   | 2   | 3   | 3    | 1    | 1    | 1    |
| CO4                  | 1   | 1   | -   | -   | -   | 3   | 3   | 3   | 2   | 2    | 1    | 1    | 1    |
| CO5                  | 1   | 1   | -   | -   | -   | 3   | 3   | 3   | 2   | 2    | 1    | 1    | 1    |

| <b>Assessment Methodology</b>   |                                                     |       |
|---------------------------------|-----------------------------------------------------|-------|
| Assessment Methodology          | Assessment Tools                                    | Marks |
| Participation and Involvement   | Community Service Activities / Village Camp / Rally | 40    |
| Activity Record and Report      | Field Diary / Documentation / Reflection Report     | 30    |
| Presentation and Teamwork Group | Participation and Communication Skills              | 20    |
| Discipline and Attendance       | Regularity and Conduct                              | 10    |
| Total                           |                                                     | 100   |