

| Savitribai Phule Pune University                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                      |        |                    |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------|--------------------|------------|
| First Year of Engineering (2024 Pattern)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                      |        |                    |            |
| Course Code: ESC-103-MEC Course Name: Engineering Graphics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                      |        |                    |            |
| Teaching Scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                      | Credit | Examination Scheme |            |
| Theory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | : 02 Hours/Week                                                      | 02     | CCE                | : 30 Marks |
| Practical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | : 02 Hour/Week                                                       | 01     | End-Semester       | : 70 Marks |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                      |        | Term Work          | : 25 Marks |
| <b>Prerequisite Courses, if any:</b> <ul style="list-style-type: none"><li>● Basic Geometric Shapes</li><li>● Basic geometrical measurements (linear and angular), Construction</li><li>● Deviation of line, circle and polygon, Co-ordinate geometry.</li><li>● Computer literacy.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                      |        |                    |            |
| <b>Course Objectives:</b> <p>This course aims to cultivate students' ability to conceptualize physical objects and effectively translate them onto paper for communication in engineering contexts. It focuses on enhancing manual drawing skills, honing drawing interpretation abilities, and fostering a practical understanding of object dimensions. Additionally, the course seeks to introduce students to essential drawing and design software tools for a well-rounded skill set.</p>                                                                                                                                                                                                                                                                                                                                                                           |                                                                      |        |                    |            |
| <b>Course Outcomes:</b> <p>On completion of the course, learner will be able to:</p> <p><b>CO 1 – Explain</b> the fundamentals of Engineering Graphics and basic principles of geometric construction and apply the knowledge of Projections, Methods to prepare the drawings for points and lines.</p> <p><b>CO 2 - Apply</b> the types of Projections, Methods to prepare the drawings for planes.</p> <p><b>CO 3 – Construct</b> the various engineering curves and illustrate the application of various engineering curves and draw the development of the lateral surface of solid.</p> <p><b>CO 4 - Apply</b> the concept of orthographic projection of an object to draw several 2D views for visualizing the physical state of the object.</p> <p><b>CO 5 - Apply</b> the visualization skill to draw an isometric projection from given orthographic views.</p> |                                                                      |        |                    |            |
| Course Contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                      |        |                    |            |
| Unit I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Fundamentals of Engineering Drawing and Projection of Point and Line |        |                    | (06 Hours) |
| <b>Fundamentals of Engineering Drawing:</b> Introduction to drawing instruments and their uses, Drawing sheets sizes and their layouts, Types of Lines, Dimensioning methods, General rules of dimensioning. Projection of Point and Line.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                      |        |                    |            |
| <b>Theory of projection</b> - Projection of points in all possible quadrants. Projection of line when parallel to both the reference planes, Projections of lines when it is perpendicular to one of the reference planes, when line is inclined to one and parallel to other reference plane, Line inclined to both reference planes (first angle projection).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                      |        |                    |            |
| Unit II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Projection of Plane                                                  |        |                    | (06 Hours) |

Introduction, Projection of plane when plane is Parallel to one and perpendicular to other, Projection of plane when plane is inclined to one plane and perpendicular to other Projections of planes when it is inclined to both reference planes.

|                 |                                                               |                   |
|-----------------|---------------------------------------------------------------|-------------------|
| <b>Unit III</b> | <b>Engineering Curves and Development of Lateral Surfaces</b> | <b>(06 Hours)</b> |
|-----------------|---------------------------------------------------------------|-------------------|

**Engineering Curves:** Conic Sections- Ellipse, Parabola and Hyperbola by directrix and focus and rectangle method, Helix (one convolution) on Cylinder and Cone, Cycloid, Involute of a circle, Archimedean spiral (one convolution)

**Development of Lateral Surfaces:** Introduction, Method of development, development of lateral surfaces of right solids, cube, prisms, cylinder, pyramids, and cone.( No sectioned solids )

|                |                                |                   |
|----------------|--------------------------------|-------------------|
| <b>Unit IV</b> | <b>Orthographic Projection</b> | <b>(06 Hours)</b> |
|----------------|--------------------------------|-------------------|

Introduction, Principle of projection, Plane of Projection, Method of Projection, Orthographic Projection First and Third angle method of projection, Hidden features, curved features, circular features. etc. Typical problems by first angle projection method

|               |                             |                   |
|---------------|-----------------------------|-------------------|
| <b>Unit V</b> | <b>Isometric Projection</b> | <b>(06 Hours)</b> |
|---------------|-----------------------------|-------------------|

Introduction of isometric projection, Isometric lines, planes, non-isometric lines and planes, Isometric scale, Isometric projection and view, Construction of isometric view/ projection from given orthographic views.

#### **List of Laboratory Experiments**

Guidelines for Practical Evaluation: Assignment problems to be drawn on A2 size drawing sheet and two problems must be drawn by using any CAD software.

List of Assignments

1. Draw two problems on projection of lines
2. Draw two problems on projection of planes
3. Draw two problems on Engineering curves and development of lateral surfaces
4. Draw two problems on Orthographic projections
5. Draw two problems on Isometric projections

#### **Learning Resources**

##### **Text Books:**

1. Bhatt, N. D. and Panchal, V. M., (2016), “Engineering Drawing”, Charotar Publication, Anand, India
2. K. Venugopal, K, (2015), “Engineering and Graphics”, New Age International, New Delhi
3. Jolhe, D. A., (2015), “Engineering Drawing with introduction to AutoCAD”, Tata McGraw Hill, New Delhi
4. Rathnam, K., (2018), “A First Course in Engineering Drawing”, Springer Nature Singapore Pte. Ltd., Singapore