| 22ME160 | ENGINEERING GRAPHICS |
|---|---|

| Category | L | T | P | Credit |
|---|---|---|---|---|
| ES | 3 | 0 | 2 | 4 |

## Preamble

Engineering Graphics is referred as language of engineers. An engineer needs to understand the geometry of any object through its orthographic or pictorial projections. The knowledge on engineering graphics is essential in proposing new product designs through drawings and in reading or understanding the existing drawings. This course covers orthographic and pictorial projections, sectional views, development of surfaces and use of computer aided drafting tools.

## Prerequisite

- Basic knowledge about geometry of objects.

## Course Outcomes

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

| CO Number | Course Outcomes | TCE Proficiency Scale | Expected Proficiency in % | Expected Attainment Level % |
|---|---|---|---|---|
| C01 | Draw the orthographic views of objects from the given isometric views and draw the orthographic projections of points. | TPS 3 | 70 | 70 |
| CO2 | Draw the orthographic projections (Elevation and Plan) of straight lines inclined to both reference planes. | TPS 3 | 70 | 70 |
| CO3 | Draw the orthographic projections (Elevation and Plan) of plane surfaces inclined to both reference planes. | TPS 3 | 70 | 70 |
| CO4 | Draw the orthographic projections (Elevation and Plan) of regular solids (Prisms, Pyramids, Cylinder and Cone) with axis inclined to any one-reference plane. | TPS 3 | 70 | 70 |
| CO5 | Draw the orthographic projections (Elevation and Plan) of sectioned solids (Prisms, Pyramids, Cylinder and Cone) and true shape of the sections. | TPS 3 | 70 | 70 |
| CO6 | Draw the development of surfaces (base and lateral) of sectioned regular solids (Prisms, Pyramids, Cylinder and Cone). | TPS 3 | 70 | 70 |
| CO7 | Draw the isometric projections of regular solids and combined solids (Prisms, Pyramids, Cylinder, Cone and Sphere) and convert the orthographic projections into isometric views. | TPS 3 | 70 | 70 |
| CO8 | Create computer-aided 3D models for the given drawing (2D/3D) and draw orthographic views for the 3D model with appropriate dimensioning using CAD package (Continuous Assessment only). | TPS 3 | Continuous Assessment only | |

## Mapping with Programme Outcomes

| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 | PSO 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1. | S | M | S | M | M | _ | _ | _ | M | M | _ | _ | M | _ | _ |
| CO2. | S | M | S | M | M | _ | _ | _ | M | M | _ | _ | M | _ | _ |
| CO3. | S | M | S | M | M | _ | _ | _ | M | M | _ | _ | M | _ | _ |
| CO4. | S | M | S | M | M | _ | _ | _ | M | M | _ | _ | M | _ | _ |
| CO5. | S | M | S | M | M | _ | _ | _ | M | M | _ | _ | M | _ | _ |
| CO6. | S | M | S | M | M | _ | _ | _ | M | M | _ | _ | M | _ | _ |
| CO7. | S | M | S | M | M | _ | _ | _ | M | M | _ | _ | M | _ | _ |
| C08. | S | M | S | M | S | _ | _ | _ | M | M | _ | _ | M | _ | _ |

S- Strong; M-Medium; L-Low

## Assessment Pattern

| Bloom's Category / TPS Scale | Continuous Assessment Test | Terminal Examination |
|---|---|---|
| Remember / 1 | | |
| Understand / 2 | | |
| Apply / 3 | 100 | 100 |
| Analyse / 4 | | |
| Evaluate / 5 | | |
| Create / 6 | | |

**Marks Allocation for Continuous Assessment:**

| Sl. No | Description | Marks |
|---|---|---|
| 1 | Submission of Plates (Drawing sheets) and Computer Aided Drafting (CAD) Exercises | 60 |
| 2 | Continuous Assessment Test (CAT) | 40 |
| **Total** | | **100** |

**Question Pattern for Terminal Examination:**

| Question Number | Description | Type | Marks |
|---|---|---|---|
| 1 | Orthographic views from isometric view<br>Or<br>Projection of Points | Either or type | 10 |
| 2 | Projection of lines | Either or type | 15 |
| 3 | Projection of planes | Either or type | 15 |
| 4 | Projection of solids | Either or type | 15 |
| 5 | Section of solids | Either or type | 15 |
| 6 | Development of surfaces | Either or type | 15 |
| 7 | Isometric projections of combined solids<br>Or<br>Conversion of orthographic views into isometric view | Either or type | 15 |
| **Total** | | | **100** |

**Note:**

1. **One test or two tests will be conducted locally by respective Faculty In - charges during regular class hours to account for continuous assessment test (CAT) marks.**

2. **Terminal examination (3 hrs) will be conducted centrally by the office of Controller of examinations.**

## Syllabus

Introduction - Significance of engineering graphics, Use of drawing instruments, Standards, Lettering and dimensioning, Scales.

Orthographic Projection - Principles of orthographic projections, First angle projection, Orthographic projection of objects from pictorial views. Projection (Elevation and Plan) of points located in all quadrants.

Projection (Elevation and Plan) of straight lines in first quadrant, inclined to both reference planes by rotating line method.

Projection (Elevation and Plan) of plane surfaces in first quadrant, inclined to both reference planes by rotating object method.

Projection (Elevation and Plan) of regular solids (Prisms, Pyramids, Cylinder and cone) in first quadrant, by rotating object method when the axis is inclined to one of the reference planes.

Projection (Elevation and Plan) of sectioned solids (Prisms, Pyramids, Cylinder and cone) and true shape of the sections, when the axis of the solid is perpendicular to horizontal plane.

Development of base and lateral surfaces of sectioned regular solids (Prisms, Pyramids, Cylinder and Cone) with cutting plane inclined to HP only.

Isometric projection – Principle, isometric scale, Isometric views and Isometric projections of single simple solids. Combination of solids (Prisms, Pyramids, Cylinder, Cone and sphere - in simple vertical positions only). Conversion of orthographic projections (Elevation, Plan and Side view) of solid parts / engineering components into isometric views.

Computer Aided Drafting (For Continuous Assessment only):

Overview of Computer Graphics, list of computer technologies, impact on graphical communication. Demonstrating knowledge of the theory of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Cross hairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Command Line, Status Bar, Different methods of zoom as used in CAD, Select and erase objects. Setting up of units and drawing limits. Dimensioning – Guidelines – ISO and ANSI standards for coordinate dimensioning - Defining local coordinate systems. Orthographic and isometric views.

Practice on drawing of 2 dimensional geometric patterns consisting of entities such as lines, arcs and circles. Practice on creation of 3 dimensional wire-frame and shaded models. Dimensioning in isometric and orthographic views.

**Text Book**

1. Bhatt N.D., Panchal V.M. and Ingle P.R., (2014) “Engineering Drawing”, Charotar Publishing House.

**Reference Books**


1. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2012.
2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2019.
3. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2011.
4. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Publications, Bangalore, 2017.
5. Shah M.B, and Rana B.C (2009) “Engineering Drawing and Computer Graphics”, Pearson Education.
6. CAD Software Theory and User Manuals.


## Course Contents and Lecture Schedule

| Sl.No | Topic | Lecture Hours | Practice Hours |
|---|---|---|---|
| 1 | **Introduction**- Significance of engineering graphics, Use of drawing instruments –Standards, Lettering and dimensioning, Scales | 2 | 1 |
| 2 | **Orthographic Projection-** Principles of orthographic projections, First angle projection, **Orthographic projection of objects from pictorial views.** | 2 | 2 |
| 3 | **Projection (Elevation and Plan) of points** located in all quadrants. | 2 | 1 |
| 4 | **Projection (Elevation and Plan) of straight lines** in first quadrant, inclined to both reference planes by rotating line method. | 4 | 2 |
| 5 | **Projection (Elevation and Plan) of plane surfaces** in first quadrant, inclined to both reference planes by rotating object method. | 5 | 3 |
| 6 | **Projection (Elevation and Plan) of regular solids** (Prisms, Pyramids, Cylinder and cone) in first quadrant, by rotating object method when the axis is inclined to one of the reference planes. | 5 | 3 |
| 7 | **Projection (Elevation and Plan) of sectioned solids** (Prisms, Pyramids, Cylinder and cone) and true shape of the sections, when the axis of the solid is perpendicular to horizontal plane. | 4 | 2 |
| 8 | **Development of surfaces** (base and lateral) **of sectioned regular solids** (Prisms, Pyramids, Cylinder and Cone) with cutting plane inclined to HP only. | 4 | 2 |
| 9 | **Isometric projection** – Principle, isometric scale, Isometric views and Isometric projections of single simple solids. Combined solids (Prisms, Pyramids, Cylinder, Cone and sphere - in simple vertical positions only). **Conversion of orthographic projections** (Elevation, Plan and Side view) of solid parts / engineering components into isometric views. | 4 | 2 |

| | | | |
|---|---|---|---|
| **10** | **Computer Aided Drafting** (For Continuous Assessment only)**:** **10.1** Overview of Computer Graphics, list of computer technologies, impact on graphical communication. Demonstrating knowledge of the theory of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Cross hairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects. Setting up of units and drawing limits. Dimensioning – Guidelines – ISO and ANSI standards for coordinate dimensioning - Defining local coordinate systems. Orthographic and isometric views. | 1 | 1 |
| | **10.2** – Practice on drawing of 2 dimensional geometric patterns consisting of entities such as lines, arcs and circles. Practice on creation of 3 dimensional wire-frame and shaded models. Dimensioning in isometric and orthographic views. | 3 | 5 |
| | **TOTAL** | **36** | **24** |

## Course Designers:

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