**ANNEXURE – I**

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU**

**DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS**

**N - SCHEME**

(Implements from the Academic year 2019-2020 onwards)

Course Name : All branches of Diploma in Engineering and Technology and Special

Programmes except DMOP, HMCT and film & TV.

Subject Code : 40015

Semester : I Semester

Subject Title : **ENGINEERING GRAPHICS**

**TEACHING AND SCHEME OF EXAMINATION:**

**No. of weeks per semester: 15 weeks**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Subject | Instructions | | Examination | | | |
| Hours / Week | Hours / Semester | Marks | | | Duration |
| ENGINEERING GRAPHICS | 6 Hrs | 90 Hrs | Internal  Assessment | Board Examination | Total |
| 25 | 75 | 100 | 3 Hrs |

**Topics and Allocation of Hours:**

|  |  |  |
| --- | --- | --- |
| **Sl. No.** | **Topic** | **Time** |
| 1 | Drawing Office Practice and Dimensioning | 15 Hrs |
| 2 | Geometric Constructions and Construction of Conics | 18 Hrs |
| 3 | Construction of Polygons and Special Curves | 18 Hrs |
| 4 | Orthographic Projections | 27 Hrs |
| 5 | Revision and Tests | 12 Hrs |
|  | **Total** | **90 Hrs** |

**RATIONALE:**

Engineering graphics is a basic subject for all branches of Diploma in Engineering and Technology. Since engineering drawing is considered as the language of engineers, the proper understanding and practice is required with proper use of instruments.

This subject is aimed at providing basic understanding of the fundamentals of Engineering Graphics; mainly visualization, graphics theory, standards of drawings, the tools of drawing and the use of drawings in engineering applications.

The topics covered are based on the syllabus for Diploma studies in engineering. The subject is planned to include sufficient practices which would help the student in visualization of two dimensional objects and developing the drawing.

The chapters are arranged in sequence and starts from the basic concepts of lettering, dimensioning, geometrical constructions, conic sections and engineering curves, proceeds to the orthographic projection techniques. By the end of the subject, it is expected that the students would be matured to visualize engineering components by reading an engineering drawing.

**OBJECTIVES:**

At the end of the subject, the students will be able to,

* Understand the importance of drawing.
* Identify and use the drawing instruments.
* Practice the rules and methods of dimensioning.
* Acquire knowledge about geometric constructions.
* Construct conic curves.
* Acquire knowledge about the construction of special curves.
* Draw orthographic views from the given pictorial drawing.

**Note:** While practicing in drawing sheets (A2 size), use of drawing instruments like drawing board, mini drafter, compass, divider, drawing clips / cello tape, H, 2H and HB grade drawing pencils, eraser etc., are mandatory for class work and examinations.

**40015 ENGINEERING GRAPHICS**

**DETAILED SYLLABUS**

**Theory contents**

|  |  |  |
| --- | --- | --- |
| **Unit** | **Name of the Topic** | **Hours** |
| **1** | **DRAWING OFFICE PRACTICE AND DIMENSIONING**  **1.1 DRAWING OFFICE PRACTICE**  Importance of engineering drawing as a graphic communication – drawing practice as per BIS code – drawing instruments: drawing board, mini drafter, compass, divider, protractor, drawing sheets, drawing pencils, set squares etc., – title block – layout and folding of drawing sheets.  Lettering and numbering as per BIS – importance of legible lettering and numbering – single stroke letters – upper case and lower case letters – slanting letters – general procedures for lettering and numbering – height of letters – guidelines – practices.  Scales – Study of scales – full size scale, reducing scale and enlarging scales.   |  |  | | --- | --- | | Minimum criteria for class assessment | | | No. of Drawing sheets | No. of Exercises | | 1 | Upper case, lower case, slanting letters and numerals – each 5 sentences with different heights |   **1.2 DIMENSIONING**  Dimensioning – need for dimensioning – dimensioning terms and notations as per BIS – dimension line, extension line and leader line – dimensioning systems – methods of placement of dimensions – uni-directional and aligned systems – Important dimensioning rules – dimensioning of common features – diameters, radii, holes, chamfers – addition of letters and symbols – parallel, chain and progressive dimensioning – practice of dimensioning the given drawing as per BIS code (one view of the object).   |  |  | | --- | --- | | Minimum criteria for class assessment | | | No. of Drawing sheets | No. of Exercises | | 1 | 8 - 2D drawings | | **06 Hrs**  **09 Hrs** |
| **2** | **GEOMETRIC CONSTRUCTIONS AND CONSTRUCTION  OF CONICS**  **2.1 GEOMETRIC CONSTRUCTIONS**  Bisect a straight line – bisect an arc – bisect an angle – divide a straight line into any number of equal parts – divide the circle into number of equal divisions – construct an arc touching two lines at any angle – construct an arc touching two arcs – construction by inscribe and circumscribe a circle and by angle.   |  |  | | --- | --- | | Minimum criteria for class assessment | | | No. of Drawing sheets | No. of Exercises covering all methods | | 1 | 12 |   **2.2 CONSTRUCTION OF CONICS**  Conic sections – definition of locus, focus, directrix, axis, vertex and eccentricity – practical applications of ellipse, parabola and hyperbola.  Ellipse: Construction of ellipse by concentric circle method, rectangular method when major and minor axis are given and eccentricity method when focus and directrix are given – drawing tangent and normal – exercises in practical applications.  Parabola: Construction of parabola by rectangular method, parallelogram method when major and minor axis are given and eccentricity method when focus and directrix are given – drawing tangent and normal – exercises in practical applications.  Hyperbola: Construction of hyperbola by eccentricity method when focus and directrix are given – drawing tangent and normal – exercises in practical applications.   |  |  | | --- | --- | | Minimum criteria for class assessment | | | No. of Drawing sheets | No. of Exercises covering all methods | | 2 | 7 | | **06 Hrs**  **12 Hrs** |
| **3** | **CONSTRUCTION OF POLYGONS AND SPECIAL CURVES**  **3.1 CONSTRUCTION OF POLYGONS**  Construction of regular polygon: triangle, square, pentagon and hexagon – various positions – side of the polygon is parallel, perpendicular and inclined to principal planes.   |  |  | | --- | --- | | Minimum criteria for class assessment | | | No. of Drawing sheets | No. of Exercises covering all methods | | 1 | 12 |     **3.2 CONSTRUCTION OF SPECIAL CURVES**  Geometric curves: Definition, practical applications and construction of cycloid – epicycloid – hypocycloid – involute – archimedean spiral – helix – exercises.   |  |  | | --- | --- | | Minimum criteria for class assessment | | | No. of Drawing sheets | No. of Exercises covering all methods | | 2 | 6 | | **06 Hrs**  **12 Hrs** |
| **4** | **ORTHOGRAPHIC PROJECTIONS**  **4.1** Introduction – projection terms – orthographic projection – planes of projection – principal orthographic views – designation of views – four quadrants – first angle projection – third angle projection – symbols for the first and the third angle projections – comparison of first and third angle projections – arrangement of views in the first and the third angle projections – Simple exercises in first and third angle projections with minimum three views of simple components.   |  |  | | --- | --- | | Minimum criteria for class assessment | | | No. of Drawing sheets | No. of Exercises | | 1 | 4 |   **4.2** Draw the projections of the simple engineering components using first angle projection – exercises in drawing orthographic views – three views – front view, top view and right / left side views in full size / half size. (For Board Examinations only two views can be asked)   |  |  | | --- | --- | | Minimum criteria for class assessment | | | No. of Drawing sheets | No. of Exercises | | 3 | 12 | | **06 Hrs**  **21 Hrs** |

**Text Books:**

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edn, 2010.

2. Gill P.S., “Engineering drawing”, S.K.Kataria & Sons, 11th Edition, 2012..

**Reference Books:**

1. Gopalakrishna.K.R., "Engineering Drawing", (Vol.I and II combined), Subhas Publications, 2014.

2. Venugopal.K, Prabhu Raja. V, “Engineering Graphics”, NewAge International Publishers, 11th Edn, 2011.

3. Nataraajan K V “A Text Book of Engineering Drawing and Graphics”

4. Shah M B, Rana B C, “Engineering Drawing”, Second Edition, 2009, Pearson.

5. Besant Agrawal, C M Agrawal “Engineering drawing”, Tata McGraw Hill Education Pvt. Ltd., 2010.

6. Barkinson & Sinha, "First Year Engineering Drawing", Pitman Publishers.

7. Thomas E. French, Charles J. Vierck, “Fundamentals of Engineering Drawing”, McGraw Hill Book

Company.Inc

**BOARD EXAMINATION**

**QUESTION PAPER PATTERN**

**Time: 3 Hrs Max. Marks: 100**

Note: (i) Answer all the questions only in the drawing sheet.

(ii) Assume missing dimensions suitably, if required.

**PART – A** 4 X 5 = 20

*Answer any four questions. Each question carries five marks.*

Note: Five questions will be asked (Sl. No: 1 to 5). At least one question can be asked from each unit. (Chapters: 1.1, 2.1, 3.1 , 4.1)

**PART – B** 4 X 20 = 80

*Answer any four questions. Each question carries twenty marks.*

Note: Six questions will be asked (Sl. No: 6 to 11). At least one question can be asked from each unit. (Chapters: 1.2, 2.2, 3.2 , 4.2)

**TOTAL 100 Marks**

**Internal Marks:**

|  |  |  |
| --- | --- | --- |
| **Sl. No** | **Particulars** | **Marks** |
| 1 | Evaluation of class work - ( Minimum 10 plates) | 10 |
| 2 | Continuous assessment tests (Average of two tests) (2 Hours duration) | 05 |
| 3 | Model examination (Board Examination pattern) (3 Hours duration) | 05 |
| 4 | Attendance | 05 |
|  | **Total** | **25** |

**STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU**

**DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS**

**COMPARISON OF FIRST SEMESTER M-SCHEME ENGINEERING GRAPHICS - I WITH N - SCHEME ENGINEERING GRAPHICS**

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT** | **M - SCHEME** | **PROPOSED N - SCHEME** | **ADDITION / DELETION** |
| **ENGINEERING GRAPHICS - I** | **ENGINEERING GRAPHICS** |
| **UNIT 1** | **1. 1. Drawing office practice:** Importance of engineering drawing - drawing instruments: drawing board, mini drafter, compass, divider, protractor, drawing sheets, drawing pencils, set squares etc.,- title block – folding of drawing sheets.  Lettering and numbering as per BIS 9609 - importance - single stroke letters – slanting letters - upper case and lower case letters - general procedures for lettering and numbering - height of letters – guidelines - practices. Scales - full scale, reduced scale and enlarged scale. | **1.1 Drawing office practice:** Importance of engineering drawing as a graphic communication – drawing practice as per BIS code – drawing instruments: drawing board, mini drafter, compass, divider, protractor, drawing sheets, drawing pencils, set squares etc., – title block – layout and folding of drawing sheets.  Lettering and numbering as per BIS – importance of legible lettering and numbering – single stroke letters – upper case and lower case letters – slanting letters – general procedures for lettering and numbering – height of letters – guidelines – practices.  Scales – Study of scales – full size scale, reducing scale and enlarging scales. | No changes |
| **1. 2. Dimensioning**  Dimensioning – terms and notations as per BIS -requirement of dimensioning - Dimension line, Extension lines and Leader lines – Dimensioning systems - Methods of dimensioning – Important dimensioning rules – Exercises (One view of the object). | **1.2 Dimensioning**  Dimensioning – need for dimensioning – dimensioning terms and notations as per BIS – dimension line, extension line and leader line – dimensioning systems – methods of placement of dimensions – uni-directional and aligned systems – Important dimensioning rules – dimensioning of common features – diameters, radii, holes, chamfers – addition of letters and symbols – parallel, chain and progressive dimensioning – practice of dimensioning the given drawing as per BIS code (one view of the object). | Dimensioning of common features such as diameters, radii, holes, chamfers, symbols & letters are Added  Parallel, progressive, and chain dimensioning is Added |
| **UNIT 2** | **2.1 Geometric Constructions**  Geometric constructions: Bisect a line – bisect an arc – bisect given angle – divide straight line into number of equal parts – divide the circle into number of equal divisions – draw an arc touching two lines at any angle – draw an arc touching two arcs. | **2.1 Geometric Constructions**  Bisect a straight line – bisect an arc – bisect an angle – divide a straight line into any number of equal parts – divide the circle into number of equal divisions – construct an arc touching two lines at any angle – construct an arc touching two arcs – construction by inscribe and circumscribe a circle and by angle. | Construction by inscribe and circumscribe a circle and by angle shifted from II semester |
| **2.2 Constructions of conics**  Conics: Cone – conic sections - Definition of locus, focus, directrix, axis, vertex and eccentricity. Definition: ellipse, parabola and hyperbola.  Ellipse: Construction of ellipse by concentric circle method, rectangular method and Eccentricity method when focus and directrix are given – Exercises. Parabola: Construction of parabola by rectangular method, parallelogram method and eccentricity method when focus and directrix are given– exercises. Hyperbola: Construction of hyperbola by rectangular method and eccentricity method when focus and directrix are given – exercises. | **2.2 Construction of Conics**  Conic sections – definition of locus, focus, directrix, axis, vertex and eccentricity – practical applications of ellipse, parabola and hyperbola.  Ellipse: Construction of ellipse by concentric circle method, rectangular method when major and minor axis are given and eccentricity method when focus and directrix are given – drawing tangent and normal – exercises in practical applications.  Parabola: Construction of parabola by rectangular method, parallelogram method when major and minor axis are given and eccentricity method when focus and directrix are given – drawing tangent and normal – exercises in practical applications.  Hyperbola: Construction of hyperbola by eccentricity method when focus and directrix are given – drawing tangent and normal – exercises in practical applications. | Drawing tangent and normal – exercises in practical applications for all sections is Added |
| **UNIT 3** | **3.1 Projection of points.**  Projection of points – points on the different quadrants and on the reference planes. | **3.1 Construction of Polygons**  Construction of regular polygon: triangle, square, pentagon and hexagon – positions: side of the polygon is parallel, perpendicular and inclined to principal planes. | Construction of Polygons is shifted from II semester |
| **3.2 Projection of straight lines.** Projection of straight lines – Line in the first quadrant and on the reference planes - perpendicular to one plane and parallel to other plane – inclined to one plane and parallel to the other plane – parallel to both the planes – inclined to both the planes – Exercises. | **3.2 Construction of Special Curves**  Geometric curves: Definition, practical applications and construction of cycloid – epicycloid – hypocycloid – involute – archimedean spiral – helix – exercises. | Construction of Special Curves is shifted from II semester |
| **UNIT 4** | **4.1. Orthographic projection**  Introduction – Orthographic projection - terms - First angle projection - Third angle projection – Draw symbols – Compare first and third angle projections. | **4.1** Introduction – projection terms – orthographic projection – planes of projection – principal orthographic views – designation of views – four quadrants – first angle projection – third angle projection – symbols for the first and the third angle projections – comparison of first and third angle projections – arrangement of views in the first and the third angle projections – Simple exercises in first and third angle projections with minimum three views of simple components | Simple exercises in first and third angle projections with minimum three views of simple components is Added |
| Draw the projection of the simple isometric objects using first angle projection only – Draw front view / top view / right / left side view.(Any two views only) | Draw the projections of the simple engineering components using first angle projection – exercises in drawing orthographic views – three views – front view, top view and right / left side views in full size / half size. (For Board Examinations only two views can be asked) |