

AM SYLLABUS (2008-2010)

ENGINEERING DRAWING

AM 09

SYLLABUS

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| Engineering Drawing Syllabus | AM 09 | (Available in September) Paper I (3 hrs) + Paper II (3 hours) |
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Aims

The aims of the syllabus are to further the ability to visualize and interpret engineering drawings to meet the industrial demands of modern technology by the application of geometrical principles and engineering methods.

It is anticipated that this syllabus will form a two-year course with a time allocation of around 360 hours. This syllabus assumes knowledge of the SEC 29 Graphical Communication syllabus.

The Examination

The examination will consist of two written papers, each of three hours duration. The candidates must satisfy the examiners in both papers.

The criteria of assessment will be those of clarity, proportion and uniformity in presentation. Any examination question can test material from more than one topic.

Candidates are expected to provide their own A2 size drawing board and drafting equipment. Only non-programmable calculators are allowed. The use of drafting aids is permitted.

Questions in both papers will be set in SI units and in accordance with British Standards (B.S.) or their equivalent International Organization Standards (I.S.O.) and in conformity with the following revised editions of B.S.8888:2004; PP8888-1-2005; IEC606172.

Paper I (100 marks)

Paper I is common to both Graphical Communication (AM15) and Engineering Drawing (AM09). It will contain eight questions of which candidates are required to answer any five. All questions will carry equal marks. Candidates will be provided with A2 size drawing sheets. All five questions are to be answered on the A2 size sheets provided.

Questions set in paper I will be based on a core syllabus of plane and solid geometry with elements of engineering drawing.

1. The cone and the conic sections.

Conics regarded as sections of a right cone.

Conics regarded as plane loci of a moving point.

Properties common to all conics.

The construction of a tangent and a normal at a point on the conics.

The construction of a tangent and a normal to the ellipse and parabola from a given point outside the curve.

Use of the focal sphere to find the ratio of eccentricity, the position of the directrix and the focal points of a conic.

Drawing the conics using various methods.

The centre of curvature and evolutes of the ellipse, parabola and hyperbola.

2. Cycloidal curves

The construction of the cycloid, epicycloid, hypocycloid, and their derived curves.

The tangent, normal, and centre of curvature at a point on the curves.

The evolute.

3. Spiral curves

The Archimedean spiral; the tangent and normal at a point on it.

The conical spiral.

4. Helices and screw threads

The helix: right-hand and left-hand; the true length, the helix angle.

Applications: Single and multi- start screw threads, up to triple start; internal and external; Helical vane; Springs (square and round section).

5. Spur Gears

The involute of a circle; the tangent and normal at a point on it.

The construction of a spur gear tooth profile of true involute form.

The analysis and drawing of gears in mesh. The number of teeth to be shown in mesh is limited to five.

The rack and pinion.

6. Coplanar loci of points on moving mechanisms.

Glissette, Folding doors.

Slider - crank; piston displacement diagrams.

Equal and unequal connected cranks.

Watt's straight-line motion.

Quick return mechanism.

Geared link mechanisms.

Compound harmonic motion.

7. Cams

Types of motion: Dwell, Uniform velocity, Simple Harmonic Motion, Uniform Acceleration, Uniform Retardation, and Uniform Acceleration and Retardation.

Types of followers: knife-edged, flat-foot, roller-ended and angled-foot.

Line of action of followers to be in-line or offset to the axis of the Cam.

Types of cams: wedge, disc, and cams with radial arm followers, face, end and cylindrical cams. Problems may be set to draw the cam profile from given cam data or vice versa.

8. Projections

Isometric projection and the use of the isometric scale.

First and second auxiliary projection of shapes and solids.

9. Projection of Lines

Lines inclined to the H.P. and V.P.; the determination of their true lengths, traces and true inclination to the horizontal and vertical planes of reference.

Skew lines; the shortest distance between two straight lines, which neither intersect nor are parallel.

10. Planes

Planes inclined to the H.P. and V.P.; true angles between two planes; the dihedral angle.

Lines of intersection between two triangles or other plane laminae. The determination of the angle between the two planes.

Oblique planes and their traces; the conversion of an oblique plane into an inclined plane by means of auxiliary views; the true inclination to the horizontal and vertical reference planes.

Lines, geometrical shapes and solids resting on, or cut by oblique planes.

11. Intersection of Solids

Interpenetration of the geometrical solids including intersections at different angles and with offset centerlines. The intersection of two pyramids is excluded.

12. Solids in contact

Spheres in mutual contact with each other, other solids and with planes and curved surfaces; the projection of the points of contact.

13. Developments

The development of surfaces of right and oblique truncated prisms, cylinders, cones and pyramids.

The approximate development of the sphere in zones and in lunes.

The approximate development of a tore or anchor ring.

Development by triangulation of transition pieces. The pieces connecting the two ducts may be of different shapes not necessarily parallel to each other.

The pattern drawings for the fabricated components may be produced by standard methods such as parallel line development, radial line development and triangulation.

14. Solids of revolution

The construction of the curve of intersection on palm-ended rods, forked rod ends and eccentric cylinders.

Rods of square, rectangular, pentagonal, and hexagonal sections joining a cone or sphere; the rods may be set eccentrically.

15. Graphical statics

Coplanar concurrent and non-concurrent forces.

The use of Bow's notation, polar diagram and link polygon to determine graphically the resultant/equilibrant of a composition of forces.

Shear Force and bending moment Diagrams for concentrated and uniformly distributed loads applied to:

- a) light and heavy cantilevers,
- b) light and heavy simply supported beams and
- c) light hinged beams - the beam is made of two parts, hinged together.

Framed structures; the use of space and force diagrams to framework problems to determine graphically the reactions; the distinction between struts and ties; dead and wind loads acting together on roof trusses.

Crane frameworks and brackets.

16. Centre of Gravity

The centre of gravity of a given system of masses.

The centre of gravity of common and irregular shapes and solids determined by graphical methods.

The use of graphical integration (the first and second derived curves) to find the centroid is excluded.

Paper II (100 marks)

Paper II will consist of four questions. The first question is compulsory and carries 60% of the total marks. It shall comprise an assembly machine drawing from detail drawings of separate parts or vice versa. Candidates will choose two of the remaining three questions. These two questions share equally the remaining 40% of the marks.

Each candidate will be provided with A2 size drawing sheets.

It is of paramount importance that the candidates be able to interpret and produce engineering drawings to relevant British and equivalent ISO standards. The candidates should be familiar with the application of these standards, regarding them as reference documents to be used when required.

Knowledge of the topics covered in Paper I is assumed. Paper II will cover the following topics:

1. Layout and Presentation

Sheet layout of drawings to modern drawing office practice, including blocks for items such as title, date, drawing and job number, scales, materials and parts list, item (balloon) reference, material specification, treatment and finish and general tolerance. The layout and presentation of drawings should be in accordance with BS 8888 or the equivalent international ISO standard.

2. Orthographic Projection

First and Third angle projections with the use of hidden detail, sectional views and auxiliary views. Conventional practice in sectional drawings. Symbols and abbreviations.

The production of assembly drawings from detail drawings of separate parts or vice versa. The drawings may feature components of engines, compressors, pumps, non-return valves, safety valves and stop valves, couplings and simple clutches, plain and anti-friction bearings, shafting details, common details of machine tools such as lathes and drilling machines, pipes and joints and simple components of electrical machines and switchgear.

3. Dimensioning and tolerances

The dimensioning of drawings from centre and reference lines, machined and datum surfaces.

Limits and fits and the method of indicating tolerances for selected ISO fits using hole basis – candidates should be able to read and apply Data Sheet 4500A, which will be provided if required.

Types of fit: clearance, transition and interference.

Geometrical tolerances covering straightness, flatness, roundness, cylindricity, profile of a line, profile of a surface, parallelism, squareness, angularity, position, concentricity, symmetry and run-out.

4. Symbols and simple circuitry

Machine and surface texture symbols.

Welding symbols (BSEN 22553 1995) and types of welded joints: butt, fillet and lap.

Rivets and types of riveted joints – single lap, double lap, zig-zag lap, double cover butt.

Riveted structures.

Simple electrical diagrams covering the following motor vehicle circuits – the starter motor, the distribution of spark, the fuel tank, the side lamps and the low / high beam, the indicators/hazard lights.

5. Freehand sketches

Freehand sketching of commonly used details to extend knowledge and appreciation of the constructional and operational features of machinery and equipment.

Recommended References:

Simmons & Maguire. Manual of Engineering Drawing. Publisher: Edward Arnold.

Broin, Eanna.O. Technical Draughtsmanship(ISBN 0717116522) 2nd.Ed.
Publisher: Gill and Macmillian.