

AM SYLLABUS (2008-2010)

GRAPHICAL COMMUNICATION

AM 15

SYLLABUS

**Graphical Communication AM 15
Syllabus**

(Available in September)
Paper I (3 hrs) + Paper II (3 hrs)

Aims

The aims of the syllabus are to further the ability to communicate information by graphical means. This will be achieved through the ability to visualise and understand spatial relationships; the ability to select and use appropriate graphical methods for communicating information and representing design concepts.

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 Organisation Standards (ISO) and in conformity with the following revised editions of BS 8888:2004; PP8888-1:2005; BS EN ISO 11091:1999; IEC 606172.

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 five questions of which candidates are expected to answer four, one of which may be compulsory. Candidates will answer the questions on the A2 drawing sheets provided except for the computer graphics question(s) if any, for which a pre-printed A3 answer sheet will be provided. Specialised knowledge will not be assumed, as case studies will include the necessary information.

1. The General environment

Graphical presentations of: Town and Road maps; Logograms; Ideograms and trade symbols; Simple local architectural plans of habitats; Advertising and display of products and artifacts.

2. Graphical analysis and information presentation

An understanding of the values of diagrams, graphs and charts for the rapid communication of comparative information and statistics. The appropriate selection and design of the following:

- Diagrams: Block; Schematic; Sociograms; Statistical; Network.
- Charts: Flow; Layout, Computer; Sequential and procedural; Bar; Pie.
- Graphs: Line; Block.

3. Methods of graphical illustration

Planometric drawing, isometric drawing, oblique drawing, estimated single and two point perspective drawing. Freehand drawing using all types of pictorial drawing indicated in syllabus.

4. Computer graphics

The use of computers as an aid to drafting. Candidates will be expected to:

- a. Be familiar with common terminology and techniques: rotate, copy, array, zoom, window, mirror, scale, quadratic, cubic and bezier meshes. Phong and Gouroud rendering ASCII characters.
- b. Be familiar with methods for inputting graphical data by the use of keyboard and mouse; graphics tablet and scanner. Methods for storing graphical data: disk, CD-ROM, pen drive. Executing graphical data using printers.
- c. Be familiar with cartesian, polar, relative and user co-ordinate system.
- d. Be familiar with the types of computer display used in graphics up to a resolution of 1280 x 1024 pixels with 16.7M colours.

5. Presentation

The following competences are required:

- The effective use of colour. Drawing with aids and stencils; tracing in pencil and ink. Overlay tracings and emphasis on outline. Numbering, storing and filing of drawings.
- Develop good graphical techniques and a high degree of skill.
- Be capable of understanding and using judgment in the choice of drawing materials and methods best suited for the work in hand.
- Understand the variety of possibilities for graphic representation: portrait and landscape formats, detail drawing, part drawings, freehand drawing as used in showing design synthesis.
- Be familiar with the basic proportions commonly used in face, hand and figure drawing in order to draw humanoid figures.

6. Design

Candidates will be expected to show an understanding and appreciation of graphical communication as an essential part of the design process.

Recommended Textbook

Broin Eanna. O. Technical Draughtsmanship. Publisher: Gill and Macmillan.
ISBN: 0717116522

Reference Text

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