



KAMALDNP

kamaldnp.com • IT Training, Varanasi

PDF created by Raj Kamal using AI

Short Notes — Engineering Graphics

BTEUP Diploma • 1st Semester (First Year — Common Curriculum, All 41 Branches) •

Short Notes

Session 2026-27

Short Revision Notes — prepared by KAMALDNP Academy from the official BTEUP 2026-27 syllabus. This is NOT a BTEUP board paper or publication.

These **short revision notes** cover the four units of Engineering Graphics from the official BTEUP 2026-27 syllabus for the first year. Engineering Graphics is a drawing subject, so the notes give the theory points you must write and, for each topic, exactly what to practise with pencil and instruments.

Use them **alongside drawing practice**: read a point, then draw the example described in words — a projection, a section or a development — until you can do it neatly without help. These are revision notes only; in the exam, neatness, correct line types and proper dimensioning carry as much weight as the theory.

Drawing Basics

Topics: Drawing instruments; lines and lettering; dimensioning; scales.

Drawing instruments

Good drawing starts with correct instruments, used properly. The standard set for this subject is:

- **Drawing board and sheet:** board gives a flat, firm surface; sheet sizes follow the A-series, A0 being the largest.

- **T-square / mini-drafter:** for drawing horizontal lines and, with set squares, vertical and inclined lines at standard angles.
- **Set squares (45° and 30°-60°), protractor:** for standard angles and measuring angles.
- **Compass and divider:** compass for circles and arcs; divider for transferring and stepping off distances.
- **Pencils:** hard grades (H, 2H) for light construction lines, medium (HB) for outlines and lettering; keep points sharp.
- **Scale, eraser, French curves:** scale for measurement, soft eraser for clean correction, French curves for irregular curves.

Practise: set up a full sheet with border, title block, and one horizontal, vertical and 45° line of each line type.

Lines and lettering

Lines are the language of drawing — each type has a fixed meaning and thickness, so learn them as a table.

- **Continuous thick:** visible outlines and edges.
- **Continuous thin:** dimension lines, extension lines, hatching and leader lines.
- **Dashed (thin):** hidden edges not visible in that view.
- **Chain thin (long dash-dot):** centre lines and axes of symmetry.
- **Chain thick at ends:** cutting-plane line showing where a section is taken.

Lettering means all writing on the drawing — titles, notes and dimensions. It is done in single-stroke capital letters, either vertical or inclined, neat and uniform without decorative styles. Standard letter heights are 3, 5, 7 and 10 mm: main titles are largest, dimensions and notes smaller. **Practise:** one full sheet of A-Z and 0-9 at 7 mm and 5 mm height using light guide lines.

Dimensioning

Dimensioning gives the exact sizes of an object so it can be manufactured without measuring the drawing. Every size needed must be shown once, clearly, and in millimetres — the unit symbol is normally not written.

Key rules:

- Place dimensions outside the view as far as possible; keep them clear of outlines and of each other.
- Use thin dimension lines with arrowheads touching the extension lines; write the value above the line or in a gap, readable from bottom or right side.
- Dimension circles by diameter ($\varnothing$) and arcs by radius (R); show centre lines crossing at circle centres.
- Do not repeat a dimension and do not dimension a hidden edge if a visible view can carry it.

- Give overall size first in your checking, then the smaller detail sizes.

Practise: draw a rectangle 60 × 40 with a central circle of $\varnothing 20$ and dimension length, width, circle diameter and centre position fully.

Scales

A **scale** is the ratio between the size of an object on the drawing and its actual size. It is expressed by the **Representative Fraction: $RF = \text{length on drawing} / \text{actual length}$** , both in the same unit.

- **Full scale ($RF = 1$):** drawing is actual size, e.g. 1:1 — used when the object fits the sheet.
- **Reducing scale ($RF < 1$):** drawing is smaller, e.g. 1:2, 1:50 for buildings and large machines.
- **Enlarging scale ($RF > 1$):** drawing is bigger, e.g. 2:1, 10:1 for small parts like screws and instrument components.

Types by construction: plain scale (reads two units), diagonal scale (reads three units accurately), vernier scale and scale of chords. **Example:** 5 cm on the drawing represents 1 m actual, so $RF = 5 / 100 = 1/20$, i.e. scale 1:20. Always write the scale in the title block.

Likely question: List the standard drawing instruments and their uses. Explain the types of lines used in engineering drawing and the rules of dimensioning.

Projections

Topics: Orthographic projections; first-angle and third-angle projection; isometric views.

Orthographic projections

Orthographic projection represents a 3D object by 2D views obtained by projecting perpendicular rays from the object onto planes. Imagine transparent planes in front of, above and beside the object: the view on the vertical plane is the **front view (elevation)**, on the horizontal plane the **top view (plan)**, and on the side plane the **side view**.

Rules for drawing:

- Front and top views align vertically — same width, projectors vertical.
- Front and side views align horizontally — same height.
- Top and side views have the same depth (length on paper).
- Draw visible edges thick, hidden edges dashed, and mark centres with chain lines.

Practise: take a simple block 60 (length) × 40 (width) × 30 (height): draw a rectangle 60 × 30 as front view, project down/up to draw the 60 × 40 top view, then the 40 × 30 side view, keeping all projectors light and aligned.

First-angle and third-angle projection

Both methods give the same three views — only their **positions** on the sheet differ. This comparison is a favourite short question, so learn it in words and by symbol.

- **First-angle (used in India / BIS):** the object is placed between the observer and the plane. The view from above is placed **below** the front view; the view from the right side is placed on the **left** of the front view. Symbol: frustum of a cone with its circular view on the left side pattern taught in class.
- **Third-angle (used in USA and some other countries):** the plane is between the observer and the object. The top view is placed **above** the front view; the right-side view is placed on the **right**.

Memory line: in first-angle, views fall on the **opposite** side; in third-angle, on the **same** side as seen.

Isometric views

An **isometric view** is a single pictorial view that shows length, width and height together, as the eye sees the object roughly. The object is turned so that its three axes are equally inclined — the isometric axes are 120° apart, with the two receding axes at 30° to the horizontal.

- **Isometric scale:** lengths along the axes are foreshortened to about 0.816 of true length. A drawing made with this scale is an isometric projection; a view drawn with true lengths is an isometric view and looks slightly larger — know this difference.
- Vertical edges stay vertical; horizontal edges are drawn at 30° .
- Circles appear as ellipses in isometric view — draw them by the four-centre method.

Practise: draw the block $60 \times 40 \times 30$ as an isometric view: start with the front corner, go 30° left for one horizontal edge and 30° right for the other, keep height vertical.

Likely question: Explain orthographic projection. Differentiate between first-angle and third-angle projection with the position of views in each method.

Sections & Development

Topics: Sectional views; development of surfaces.

Sectional views

A **sectional view** shows the inside of an object as if it were cut by an imaginary cutting plane. It is used when hidden details are too many or confusing to show with dashed lines.

Rules and types:

- The cut surface is shown by **section lining (hatching)** — thin lines at 45° , equally spaced. Different parts in an assembly are hatched at different angles or spacing.

- **Full section:** the cutting plane passes through the whole object and one half is removed; the entire view is in section.
- **Half section:** used for symmetrical objects — one half shows the section (inside) and the other half shows the normal outside view, separated by a centre line.
- Shafts, bolts, ribs and spokes are conventionally **not hatched** even when the plane passes along them.
- Mark the cutting plane with a chain line, arrows showing viewing direction, and capital letters, e.g. Section A-A.

Practise: section the 60 × 40 block with a central through-hole and hatch only the cut material.

Development of surfaces

Development is the flat, true-size pattern obtained by opening out and unrolling all surfaces of a solid on one plane. It is used in sheet-metal work to cut the exact shape before folding or rolling — for ducts, hoppers, tanks and cones.

Steps (common to all solids):

- Draw the front and top views of the solid first.
- Open the surfaces one by one in correct order and true size; every edge on the development must be its true length.
- Add the top and bottom bases where they exist, and leave allowance for joints if asked.

Standard results: **Prism** — a rectangle of height equal to prism height, divided into strips equal to each base edge, with bases attached. **Cylinder** — one rectangle: length $2\pi r$ (circumference) × height of cylinder. **Cone** — a sector of a circle of radius equal to slant height, with arc length equal to base circumference $2\pi r$.

Likely question: What is a sectional view and why is it used? Differentiate between full section and half section, and describe the development of a cylinder.

Computer-Aided Drawing

Topics: Introduction to CAD tools for engineering drawing.

Introduction to CAD tools for engineering drawing

CAD (Computer-Aided Design/Drafting) means preparing engineering drawings with computer software instead of pencil and board. The same drawing principles apply — projections, line types, lettering and dimensioning follow the same standards — only the tools change.

Basic workflow and tools:

- **Drawing tools:** line, circle, arc, rectangle, polygon and text — used to create geometry with exact coordinates and sizes.
- **Editing tools:** move, copy, rotate, mirror, trim, extend, offset and erase — used to correct and reuse work without redrawing.
- **Support features:** layers to organise outlines, dimensions and centre lines separately; snap and grid for accuracy; zoom for fine detail; blocks/library for repeated symbols; automatic dimensioning styles.

Advantages: high accuracy, neat and uniform output, very fast editing and copying, easy storage and sharing, and direct use for printing and manufacturing. **Limitations:** needs computer, software and training, and a CAD file cannot replace drawing understanding.

Practise: redraw your manual plate of the 60 × 40 block with hole in CAD using layers.

Likely question: What is CAD? State the advantages of computer-aided drawing over manual drawing and name the common drawing and editing tools used.

Quick Revision — One Line Each

- Use H for outlines, 2H/HB graded pencils by line type; keep the sheet clean and titled.
- Continuous thick = visible outline; dashed = hidden edge; chain thin = centre line.
- Lettering is single-stroke, vertical or inclined; heights commonly 3, 5, 7 and 10 mm.
- Dimension in mm without writing 'mm'; keep dimensions outside the view where possible.
- RF = drawing length / actual length. Enlarging, full and reducing scales.
- First-angle: top view below XY, right-side view on left. Third-angle is opposite.
- Isometric scale is about 0.816 of true length; isometric view uses true lengths.
- Full section cuts the whole object; half section shows half section, half outside view.
- Development is the flat pattern of a surface — draw it true size, face by face.
- Prism development: rectangle strip divided into faces plus two end bases.
- Cylinder development: rectangle of width $2\pi r$ and height equal to cylinder height.
- CAD gives accuracy, easy editing, layers and reuse — but drawing sense comes first.

KAMALDNP • kamaldnp.com • support@kamaldnp.com • +91 8318013442 • Varanasi, UP
Prepared by KAMALDNP Academy from the official BTEUP 2026-27 syllabus topics. Short explanations are the author's own plain-English summaries, not syllabus text. Please confirm with your own polytechnic for any local changes.