INDUSTRIAL TECHNOLOGY

TECHNICAL DRAWING
LEVEL 8

Topic	Skills	Knowledge	Understanding	Attitude	Content	Materials	Method/ Strategies	Projects	Evaluation	Area of Integration
Preparation of Drawing Sheets- Border	Drawing horizontal and vertical	State the procedure involved in drawing a	Recognise that all drawing sheets must first be prepared by	Drawing border lines which are neat and accurate	The border line or margin forms the drawing boundary.	Drawing equipment.	Demonstrate the drawing of border lines state the exact		Students to prepare all drawing sheets with	Building Technology, Mechanical

Lines.	lines using tee square and set squares.	border.	drawing border lines.	with the aid of instruments.	It is usually drawn 10 mm and parallel to the edges of the drawing sheet.		measurement from the edge of the paper state the function of border lines.		borders.	Engineering, Technology, Mathematics.

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Title Block	Manipulating drawing instruments to produce a title block.	List the information given in a title block.	Recognise the uses of a title block in Technical Drawing.	Drawing title blocks neatly and accurately using instruments.	The title block gives general information such as name, scale, title, date and projection. It should be large enough to be easily read. The letters and numbers are usually 5 mm high.	Drawing Equipment examples of title blocks.	Demonstrate the preparation of a title block. Let students practice.		Let students design and draw title blocks.	Building Technology, Mechanical Engineering Technology.

Topic	Skills	Knowledge	Understanding	Attitude	Content	Materials	Method/ Strategies	Projects	Evaluation	Area of Integration
Construction of Triangles. To construct a triangle given its	Manipulating ruler and compasses drawing parallel lines.	State the definition of ratio eg. 2:3:4 . State the definition of perimeter.	Formulate the procedure for constructing the triangle.	Working accurately and neatly in constructing the triangle.	Procedure Draw the perimeter as one straight-line XY. Divide the perimeter into the ratio of the sides	Drawing Instruments	Demonstrate the method/procedure for the construction. Students		Set problems for additional practice	Mathematics Building Technology, Mechanical

perimeter and the ratio of its sides.					XA, AB, BY. Let radii AX and BY intersect at C. Join A to C to B. ABC is the required triangle.		practice step by step			Engineering, Technology Mathematics

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To construct a triangle given the perimeter and base angles.	Manipulating ruler and compasses - Drawing angles - Bisecting angles - Drawing parallel lines	State the definition of perimeter Identify base angles.	Analyse the given data. Formulate the procedure for the construction of the Triangle.	Working with neatness, clarity and accuracy in the construction of the triangles.	Procedure Draw the perimeter XY. At X and Y draw angles. Let the arms drawn from X and y meet at z. Draw bisectors of angles at x and y to meet at A. through A draw AB parallel to zy to meet xy at B. Draw AC parallel to zy to meet xy at c. ABC is the required triangle.	Drawing Instruments.	Demonstrate the procedure for the construction. Students practice step by step.		Set problems for additional practice.	Mathematics Building Technology Mechanical Engineering Technology Mathematics

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To construct an Isosceles Triangle given the perimeter altitude.	Drawing straight lines Bisecting straight lines.	State the definition of isosceles triangle Identify isosceles triangle.	Analyses the given data. Formulate the procedure for the construction of the isosceles triangle.	Working with neatness, clarity and accuracy in constructing the triangle.	Procedure Draw the perimeter xy. Bisect xy, the perpendicular bisector cutting xy at D. Mark the altitude DP on the bisector. Join PX Bisect PX. Let this bisector cut XY at Q. Using P as centre and radius PQ draw an arc to cut XY at R. Join P to Q and P to R.	Drawing Instruments.	Discuss the problem with the class. Demonstrate and let students practice each step. Recapitulate the steps Give more practice.		Give problems stating perimeters and altitudes of separate isosceles triangles to be constructed.	Building Technology Mechanical Engineering Technology Mathematics.

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To construct a triangle given the altitude and two base angles.	Using instruments -Draw parallel lines -Construct angles	State the definition of altitude Identify the altitude and base angles of a triangle	Analyse the given data Formulate the procedure for constructing the triangle	Working with neatness, accuracy and clarity to construct the triangle	Draw two parallel straight lines AB and xy to the required altitude given. At any given point on AB mark P and draw one of the base angles so that the arm meets xy at Q At Q draw angle YQR equal to the size of the other angle and produce the arm to meet AB at R PQR is the required angle.	Drawing instruments	Discuss the problems with the class Demonstrate the stages Let students do each step after it is demonstrated.		Give similar problems to be solved by students	Building Technology Mechanical Engineering Technology Mathematics

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Construction of Quadri-laterals. To construct a quadri-lateral given the lengths of three sides and diagonals	Drawing a straight line. Construct-ing areas with compasses.	State the definition of a quadrilateral Identify sides and diagonals of the quadrilateral.	Analyse the data given. Formulate the procedure for constructing the quadrilateral.	Working with neatness, clarity and accuracy to construct the quadri-lateral.	Procedure Draw the base as to the given length with centre A and length of one diagonal draw an arc. With centre B and radius equal to the second diagonal side draw an arc to cut the diagonal at C. With centre A and radius the length of the third side scribe an arc on the same side of AB as the first two arcs. With centre B and the length of the other diagonal scribe an arc to cut the first arc at D. Join D to A, D to C and C to B to form the quadrilateral.	Drawing instruments	Write the problem on the chalk board Let individual students read the problem Discuss the given data Demonstrate the steps Let students practice after each step.		Let students solve problems of drawing quadrilaterals when given the lengths of three sides and the diagonals.	Building Technology Mechanical Engineering Technology Mathematics

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To construct a quadri-lateral given the lengths of the diagonal one side and the angles on the side.	Man-ipulating instru-ments to - Draw straight lines. - - Con-struct angles.	Identify the diagonals, side and angles of the quadrilateral.	Analyse the given data. Formulate the procedure for the construction of the quadrilateral.	Working with neatness clarity and accuracy in constructing the quadrilateral	Procedure Draw the given side AB. Set out the angles at A and B. with centre A and radius of one diagonal scribe an arc to cut the other arm of angles B at C. with centre B and radius the other diagonal cut the arm of angle A at D. join D to C to form the quadrilateral.	Drawing instruments	Let students study the given data. Discuss the data Demonstrate the procedure so that students can practice one step at a time.		Give similar problems as assignments.	Mathematics

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To construct a trapezium given the lengths of the parallel sides, the perpendicular distance between them and one base angle.	Manipulating instruments to - Draw straight lines - Draw parallel lines - Draw angles.	State the definition of a trapezium. Identify parallel sides.	Analyse the given data. Formulate the procedure for the construction of the trapezium.	Working with neatness, clarity and accuracy in constructing a trapezium.	Procedure Draw two parallel straight lines the given distance apart. On the lower parallel mark the length of a side. At one end of the same line draw the given angle to meet other parallel. Measure the length of the other parallel side. Join the other ends of the parallel sides to complete the trapezium.	Drawing instrument	Demonstrate each step and let students practice each step one at a time. Discuss the reason for each step.		Set problems for additional practice.	Mathematics

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To construct a parallelo-gram given the lengths of its diagonals and an angle between them.	Manipulating instruments to -Draw and bisect straight lines. -Draw angles.	State the definition of a parallelo-gram. Identify the diagonals Identify the angles between the diagonals.	Analyse the given data. Formulate the procedure for the construction of the parallelogram.	Working with clarity and accuracy in construct-ing the parallelo-gram.	Procedure Draw the diagonal AC and locate the midpoint E. Draw the given angle CED and produce DE in opposite directions. Mark EB and ED each half of the other diagonal. Join A, B, C and D to form the parallelogram.	Drawing instruments.	Let students study the given data Discuss the procedure Demonstrate and let students practice each step one at a time.		Give a test after the assignment involving all the construction of quadrilateral.	Mathematics

Topic	Skills	Knowledge	Understanding	Attitude	Content	Materials	Method/ Strategies	Projects	Evaluation	Area of Integration
Polygons Definition of a Polygon.	Drawing / sketching of polygons with the aid of instruments.	State the definition of a polygon. List the properties of polygons - Sides - Angles.	Recognise the importance and uses of polygons.	Using polygons in the constructi on of projects.	A polygon is a plane figure bounded by more than four straight lines.	Drawing instruments.	Discuss the definition of a polygon. Let students draw / sketch examples of polygons.		Students to state the definition of a polygon orally and in writing.	Building Technology Mechanical Engineering Technology Mathematics

Topic	Skills	Knowledge	Understanding	Attitude	Content	Materials	Method/ Strategies	Projects	Evaluation	Area of Integration
Types of Polygons	Manipulating instruments to draw / sketch the types of polygons.	State the definition of - Regular polygon - Irregular polygon - Re-entrant polygon - - Convex polygon.	Differentiate between the types of polygons.	Working with the aid of instruments to draw/sketch the types of polygons.	A regular polygon has all its sides equal. An irregular polygon has its sides of different lengths A re-entrant polygon has one or more interior angles pointing inwards A convex polygon has all its interior angles pointing outwards.	Drawing instruments	Discussion on the definitions of the types of polygons.		Students to state the definitions of the types of polygons orally and in writing	Mathematics

Topic	Skills	Knowledge	Understanding	Attitude	Content	Materials	Method/ Strategies	Projects	Evaluation	Area of Integration
Naming of Polygon by number sides.	Drawing / sketching polygons with a given number of sides -Pentagon -Hexagon -Heptagon -Octagon -Nonagon.	List the names of Polygons when given the number of sides.	Differentiate between the polygons given the number of sides.	Working with clarity and accuracy to draw / sketch polygons.	Sides / Polygons 5 – Pentagon 6 – Hexagon 7 – Heptagon 8 – Octagon 9 – Nonagon 10 – Decagon 11 – Undecagon 12 – Dodecagon	Drawing Instruments.	Sketch each type of polygon and state its name.		Let students match names to randomly placed polygons.	Mathematics Building Technology Mechanical Engineering Technology

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Angles of Polygons.	Drawing with the aid of instruments angles of a Polygon.	List the categories of angles which polygons contain - Interior angles - Exterior angles - Angles at the centre.	Differentiate between the three categories of angles of a polygon.	Drawing accurately the angles of a polygon.	Polygons have - Interior angles are those formed inside adjacent sides. - Exterior angles are those formed by extending or producing the sides - - Angles at the centre are formed by joining the centre to the vertices.	Drawing instruments.	Draw any convex polygon. Point out the categories of angles. Discuss why they are so called. Let students identify each categories and write the names. Calculate the sizes of angles of the polygon.		Give a test where students - Name the categories of angles on a drawing of a polygon - Calculate the sizes of angles of the polygon.	Mathematics

Topic	Skills	Knowledge	Understanding	Attitude	Content	Materials	Method/ Strategies	Projects	Evaluation	Area of Integration
Construction of Polygons. To inscribe any regular Polygon within a given circle.	Measuring straight lines. Dividing lines into equal parts.	State the definitions of -Inscribe -Regular Polygon.	Analyse the given data. Formulate the procedure for inscribing a regular polygon in a given circle.	Working with neatness speed and accuracy in constructing regular polygons.	Procedure Draw the diameter AE and divide it into the same number of equal parts as the figure has sides with A and E as centres and radius AE draw arcs to intersect at C. Draw a straight line from C through the POINT 2 on the diameter to meet the circumference at G. Using AG as one side at the polygon scribe the sides around the circumference.	Drawing instrument	Let students read the problem and study it. Demonstrate one step at a time and let students practice each step until the solution is reached.		Give assignments for students to inscribe various regular polygons in given circles.	Building Technology Mathematics

Topic	Skills	Knowledge	Understanding	Attitude	Content	Materials	Method/ Strategies	Projects	Evaluation	Area of Integration
To construct a regular Polygon given the length of one side.	Drawing and bisecting straight lines Drawing angles Drawing circles with compasses.	State the number of sides for specific polygons Identify the bases of the regular polygon.	Analyse the given data. Formulate the procedure for constructing the regular polygon.	Working with neatness clarity and accuracy to construct a regular polygon	Procedure Draw the given line AB and bisect it. From A draw angles of 45^{o} and 60^{o} to intersect the perpendicular. Bisect the space between 4 and 6 to locate point 5. Point 5 and 6 will be the centres of circles to produce a pentagon and a hexagon. With radius equal to the space from 4 to 5 from point 6 step off 7, 8, 9 etc. to give centres of a heptagon, octagon nonagon. Draw the circles, step off the sides on its circumference. Join the points to complete the required polygon	Drawing Instruction	Demonstrate each step. Explain the reason for each step. Let students do the steps.		Give exercise for students to construct regular polygons given the length of one side.	Building Technology Mechanical Engineering Technology Mathematics

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To Construct a regular Hexagon given the length of one side using T-square and Set square..	Manipulating instruments to -Draw straight lines to given lengths. -Layout angles.	State the number of sides of a hexagon. State the size at one interior angle of a Hexagon.	Analyse the data select and use the convect set square to construct a hexagon.	Working neatly and accurately in the construct-ion of a regular hexagon.	Procedure Set out the given side AB. Since interior angle is 120^{o}. Set out at A and B exterior angles of 60^{o} using the set square. Mark BC and AF equal to the given side. Set out angles of 120^{o} at C and F. Mark CD and FE equal to the given side. Join D to E to complete the hexagon.	Drawing Instruments.			Let students complete similar exercises	Building Technology Mechanical Engineering Technology Mathematics

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Tangents Definition of tangent.	Drawing circles and arcs with a pair of compasses.	State the definition of Tangent. State the definition of the normal.	Recognise that the tangent and normal are parts of a circle.	Drawing tangents clearly and accurately using instruments.	A tangent is a straight line that touches the circumference of a circle at one point. A tangent when produced in either direction does not cut the circumference of the circle. The normal is the straight line that passes through the point of tangency and always forms angles of 90^{o} to the tangent.	Diagram showing circle, tangent and the normal.	1.Display diagram showing circle, tangent and normal. 2. Let the students list what they observe 3. Allow the students to form a definition of tangent. 4. Give the correct definition and discuss key words in the definition. Let the students draw and identify tangent and normal by label.		Ask students to state the definitions of the tangent and the normal Let students draw tangents and normal in various position	Building Technology Mechanical Engineering Technology Mathematics

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Tangents Construction of tangent to a circle from a point on the circumference of the circle.	Drawing tangents with the aid of geometrical instruments.	State the operations to construct tangent to a circle from a point on the circumference	Selecting and using the correct instruments for the construction of tangents.	Working neatly and accurately to construct tangents.	Operations: 1. Draw circle using the given radius and label the centre. 2. Locate and label the point on the circumference. 3. Produce a straight line from the centre of the circle through the point on the circumference. 4. Construct an angle of 90^{o} from the point.	Technical Drawing chalk board instrument.	List the operations and let the students discuss each operation. Demonstrate each operation. Allow the students to practice the operations.		Ask individual students to explain the operations to construct the tangent.	Building Technology Mechanical Engineering Technology Mathematics

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Construction of tangent to a circle from a point outside the circle.	Constructing tangents using drawing Instruments.	State the Definition of the tangent.	Follow the correct sequence of operations to construct the tangent.	Working with neatness and accuracy to construct the tangent.	1. Using the specific radius and with centre O draw the circle. 2. Identify the point P outside the circle. 3. Produce a straight line from centre O to P and bisect distance OP at and label intersection of lines Q. 4. With centre Q and radius O, draw semi circle to cut the given circle at S. 5. Produce a line from P to C to obtain the required tangent.	Technical Drawing Chalkboard instruments.	Demonstrate the procedure for constructing tangent to circle from point outside the circle Let the students practice the operations Ask the students to list the sequence of operations.		Examples involving the construction of tangents.	Building Technology Mechanical Engineering Technology Mathematics

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Construction of a common external tangent to two circles of unequal diameter.	Manipulating instruments to construct common external tangents.	Identify an external tangent.	Select and use the correct instruments to construct an external tangent. Follow the correct procedure for constructing an external tangent.	Using the appropriate technique to construct an external tangent.	Draw the two circles to the specified distance apart using centre A for larger circle, centre B for smaller 1. Bisect the distance AB and draw semi circle to touch centres AB. 1. 2 Using the radius of the small circle pivot at centre A and draw an arc to cut semi circle at C. 3. Produce a line from A through C to cross-circle A at D. 4. Draw a line parallel to AD from B to cut circle B at E. 5. Produce a line DE to form the tangent.	Technical Drawing Chalkboard instruments.	Demonstrate the operations for construction of the external tangent. Ask the students to explain the steps in the construction after the demonstration. Allow the students to practice the operations. Supervise the students as they work and give directions.		Give examples of external tangents for the students to complete.	Building Technology Mechanical Engineering Technology Mathematics

Topic	Skills	Knowledge	Understanding	Attitude	Content	Materials	Method/ Strategies	Projects	Evaluation	Area of Integration
Construction of a common internal tangent to unequal circles.	Drawing an internal common tangent with the aid of instruments.	Identify the internal tangent.	Follow the correct procedure in the construction of an internal common tangent.	Using the appropriate technique to construct an internal common tangent.	Draw the two circles using the given radii, with centre O for larger and centre D for lesser circle. 1. Bisect the distance OD and draw semi circle to touch centres OD 2. Add the radius of the smaller circle D to the radius of the larger circle O. 3. Draw an arc radius OP from centre O to cut the semi circle at Q 4. Join O to Q. Construct a parallel to OQ form D to cut the circle D at R. Produce the tangent to touch QR.	Technical Drawing Chalkboard instruments.	Demonstrate the full procedure for constructing the internal tangent. Allow the students to practice the operations.		Give assignments involving the construction of the internal tangent	Building Technology Mechanical Engineering Technology Mathematics

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Geometric Solids.	Drawing and sketching of geometric solids - Cube - Cone - Cylinder - Prisms - Pyramid - Sphere	Identify the geometric solids. State the names of the various geometric solids.	Recognise the application / uses of geometrical solids in plumbing and related trades.	Working neatly and accurately in drawing / sketching various geometrical solids.	Geometric solids may be right or oblique. A geometric solid may be termed as right when it is symmetrical about the. vertical axis. Geometric solids fall in various categories: cube, cone, cylinder, prism, pyramid and sphere.	Diagram showing the various geometric solids.	Demonstrate using squared paper to achieve symmetry how to make sketches of geometric solids. Allow the students to practice. Let the students label the solids.	Let the students make replicas of each solid and create a showcase (Suggest the use of wood, clay or Styrofoam).	Let the students state the names of the solids.	Building Technology Mechanical Engineering Technology Mathematics

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Pictorial Drawing. Definition of Pictorial Drawing.	Sketching a pictorial drawing in good proportion using ruler and pencil.	State the definition of pictorial drawing Identify pictorial drawings - Isometric - Oblique -perspective.	Recognise that pictorial drawings are three dimensional representations of solid objects.	Working neatly and accurately to produce pictorial sketches of various solids.	A pictorial drawing is a three dimensional graphic representation of objects like or of the nature of a picture. A pictorial drawing shows three sides of the object	Diagram showing pictorial drawing	1. Display diagram of pictorial drawing. 2. Discuss with the students pictorial drawing. 3. Discuss the elements of pictorial drawing. 4. Allow the students to form a definition of pictorial drawing. 5. Assist in forming the definition.		Ask the students to state definition of pictorial drawing.	Art Geometry Building Technology Mechanical Engineering Technology.

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The types of Pictorial Drawings	Drawing/ sketching the types of pictorial drawing with the aid of drawing instruments.	Identify the types of pictorial drawings - Isometric - Oblique - Perspective.	Differentiate between the types of pictorial drawing.	Working neatly and accurately to produce pictorial drawings of various solid objects.	Pictorial drawings include three main types: isometric, oblique and perspective.	Diagram showing the types of pictorial drawing.	1. Display the diagram showing the types of pictorial drawings. 2. Discuss each type of pictorial drawings. 3. Allow the students to write definitions of each type. 4. let the students make sketches to illustrate each type of pictorial drawing.		Ask the students to explain the types of pictorial drawing.	Mechanical Engineering Technology Building Technology

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Isometric	Manipulating drawing equipment to produce Isometric drawings of various solid objects.	State the definition of isometric drawing.	Recognise that the receding axes of isometric drawing are at 30^o to the horizontal.	Using the appropriate technique to draw various solids objects in isometric drawing.	Isometric drawings are revolved so that one corner is towards the viewer. This is then tilted forward at an angle of 35^o, this causes the side faces to rise to an angle of 30o to the horizontal. The axes are drawn at 30^o, 90^o and 30^o to the horizontal	Squared paper diagram showing isometric drawing.	Explain the isometric axes. Demonstrate by use of squared paper the method of sketching an isometric drawing. Allow the students to identify the axes.		Give simple solids for the students to draw in isometric.	Building Technology Mechanical Engineering Technology.

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Oblique Drawing.	Manipulate drawing equipment to produce oblique drawings of various solid objects.	State the definition of oblique drawing.	Recognise that on an oblique drawing one face of an object is showing in its true shape.	Using appropriate techniques to neatly and accurately represent solid objects in oblique drawing.	In this system of oblique, the object is revolved so that one face is parallel to the frontal plane and the other two on oblique. The three axes are: vertical, horizontal and receding. The receding axes are drawn at 30o or 45o to the horizontal The two forms of oblique are: - (i) Cavalier, on which the lines on the receding axes are drawn to their true length on the drawing & (ii) Cabinet, on which the receding axes are shortened by half the length.	Diagram showing oblique drawing and the forms of oblique.	Explain oblique drawing Demonstrate how to draw simple objects in oblique Explain the forms of oblique Demonstrate the construction of both forms Give the students examples to practice.		Let the students state the difference between oblique and isometric.	Building Technology Mechanical Engineering Technology Mathematics

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Perspective Drawing.	Drawing and sketching geometrical solids in perspective with the aid of drawing instruments.	State the definition of perspective drawing. List the elements of perspective drawing. - Picture Plane - Station Point - Vanishing Point - Ground Line.	Follow the correct procedure in drawing geometrical solids in perspective.	Working accurately to represent geometrical solids in perspective drawing.	A perspective is made by the intersection of the picture plane with lines of sight converging from points on the object to the point of sight located at a finite distance from the picture plane. The elements of a perspective are the picture plane, the station point, the horizon, the vanishing point and the ground line.	Chart showing perspective drawing and the elements of perspective.	Display chart illustrating perspective drawing Discuss with the students the elements of perspective Allow the students to write descriptions of each element Have the students draw and label all the elements of the perspective Demonstrate how to make one point perspective Allow the students to practice.		Let the students explain perspective.	Building Technology Mechanical Engineering Technology Mathematics

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Ortho-graphic Project-ion.	Manipulating drawing equipment to draw / sketch in good proportion orthographic views of various solid objects.	State the definition of orthographic projection. List the planes of orthographic projection - Horizontal - Vertical.	Recognise that an orthographic projection represents three views of objects on different planes.	Working with speed accuracy and neatness to produce orthographic projection of various solid objects.	Orthographic projection is a multi-view representation of objects. The planes of projection are: vertical and horizontal. The vertical planes are perpendicular to each other and to the horizontal plane. These planes intersect and meet to form quadrants of angles. The faces of objects are projected on planes in first or third angle.	Model of the planes of projection.	Using the model illustrate the planes of projection. Explain and illustrate the projection of the views on the planes. Allow the students to project views of the planes. Use various solids for the students to project views.		Ask the students to identify the planes of projection. Let students draw orthographic projection of geometrical solids - Cube - Prism - Cylinder - Cone.	Building Technology Mechanical Engineering Technology Mathematics