#97

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: DESCRIPTIVE GEOMETRY

Code No.: DRF 220-3

Program: MECHANICAL TECHNOLOGY/TECHNICIAN

Semester: THIRD

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APPROVED: _____ _____

Chairperson Date

DESCRIPTIVE GEOMETRY
Course Name

DRF 220-3
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PHILOSOPHY/GOALS:

Visualization of an object from a multi-view drawing can pose problems for some. A "lack of imagination" makes it difficult for a student to draw certain views of an object. With this in mind the course is taught and developed from a realistic, practical point of view. Problems found in industry, etc. are solved based on a progression of steps, beginning with elementary concepts and progressing by easy stages to more complex problems. The course is based on sound facts and is taught from a logical reasoning approach.

METHOD OF ASSESSMENT:

- See Attached Sheet -

COURSE OBJECTIVE:

To develop in the student the ability to think entirely in terms of the object and the logical relationships between the views of a drawing; and to visualize the object from a multi-view drawing based on logical conclusions derived from observations and accurate analytical thinking.

TEXT: Technical Descriptive Geometry -- Wellman

REFERENCES: Applied Descriptive Geometry -- Warner

Practical Descriptive Geometry -- Grant

DESCRIPTIVE GEOMETRY
DRF 220-3

NUMBER	PERIODS	TOPIC DESCRIPTION	REFERENCE
1	4	Multi-view Engineering Drawings - Review	
2	6	Auxiliary Views - Review third principal view - Reference line - Auxiliary views - Visibility	
3	20	Points and Lines - Location of a point - Bearing of a line - Location of a line - Location of a point on a line - True length of a line - Slope of a line - Lines appearing as a point - Parallel lines - Location of a line through a given point parallel to a given line - True distance between two parallel lines - Perpendicular lines - Location of a perpendicular at a given point on a line - Shortest line from a point to a line - Shortest line between two show lines SKEW	
4	15	Plane Surfaces - Location of points and lines in a plane - Strike - Plane as an edge - Slope of a plane - Shortest line problems - True size of a plane - Figure on a plane	
5	10	Revolution - Revolve a point about an oblique axis - Revolve a line about an oblique axis - Revolve a line/point about an assumed axis - Finding T.L. of a line using revolution - Finding slope of a line using revolution - Finding T.S. of a plane using revolution	

DESCRIPTIVE GEOMETRY

Part #1 - "Multi-view Engineering Drawing"

GENERAL OBJECTIVE:

To review multi-view drawings.

SPECIFIC OBJECTIVES:

1. To be able to draw the top view, front view and right side view of objects.

2. To be able to state and comprehend that:

    (a) Surfaces that are perpendicular to the lines of sight for a given view appear in true size and shape in that view.

    (b) The lines of sight for each view are perpendicular to the lines of sight for each of the other two views.

    (c) Each view shows only two of the three dimensions of the object.

    (d) Taken separately, no one of the three views can provide a complete description of the object.

3. To be able to state that:

    (a) Any two views placed side by side to align their common dimension shall be designated as "ADJACENT VIEWS".

    (b) The parallel lines connecting and aligning adjacent views shall be called "PARALLELS".

    (c) All views adjacent to the same view shall be designated as "RELATED VIEWS".

4. To be able to state:

    (a) Rule #1 - The lines of sight for any two adjacent views must be perpendicular.

    (b) Rule #2 - Every point on the object in one view must be aligned on a parallel directly opposite the corresponding point in any adjacent view.

Part #1 - Continued ...

(c) Rule #3 - The distance between two points on the object measured along the parallels must be the same in all related views.

(d) Rule #4 - Every plane surface, regardless of shape, always appears either as an edge or as a figure of similar configuration.

(e) Rule #5 - No two contiguous areas can lie in the same plane.

5. To be able to state and use the following rules of visibility for solids:

(a) The outside lines of every view will be visible.

(b) The corner or edge of the object nearest to the observer will be visible.

(c) The corner or edge farthest from the observer will usually be hidden if it lies within the outline of the view.

(d) Crossing edges that are approximately equidistant from the observer must be tested for visibility at the crossing point.

(e) If a point in an adjacent view lies on a parallel that does not pass through any part of the adjacent view, then that point will be visible in the new view.

(f) Visibility of the inside line in any view is primarily determined by references to an adjacent view.

Part #2 - "Auxiliary Views"

SPECIFIC OBJECTIVES:

1. The student will be able to define the term auxiliary view
2. The student will be able to construct a third principal view using the four stages common to an auxiliary view construction.
3. The student will be able to define the term reference line.
4. The student will be able to construct an auxiliary view with the use of a reference line.
5. The student will be able to define the term top-adjacent auxiliary view.
6. The student will be able to construct a top-adjacent auxiliary view using drafting equipment.
7. The student will be able to identify the common features of all top-adjacent auxiliary views.
8. The student will be able to define the term front-adjacent auxiliary view.
9. The student will be able to construct a front-adjacent auxiliary view.
10. The student will be able to identify the common features for all front-adjacent auxiliary views.
11. The student will be able to define the term side-adjacent auxiliary view.
12. The student will be able to construct a side-adjacent auxiliary view using drafting equipment.
13. The student will be able to identify the common features for all side-adjacent auxiliary views.
14. The student will be able to define the term auxiliary-adjacent auxiliary view.
15. The student will be able to construct auxiliary-adjacent auxiliary views using drafting equipment.

Part #2 - Continued ...

16. The student will recall Rule #3 in constructing all auxiliary views.

17. The student will be able to determine, by means of a vertical line in the front view, which point of the object is higher in any auxiliary view.

18. The student will be able to state correctly the Rules of Visibility for solids.

Part #3 - "Points and Lines"

GENERAL OBJECTIVE:

To review true length lines, slope, parallel, intersecting and perpendicular lines.

SPECIFIC OBJECTIVES:

1. To be able to use the Cartesian rectangular coordinate system as applied to multi-view drawings.

2. To be able to locate points on the TOP, FRONT and adjacent view in a multi-view drawing.

3. To be able to use a topographic map to find the elevation of points.

4. To be able to state that the Bearing of a line is the angle by which the line deviates east or west from a north-south line as shown in the top, or map, views.

5. To be able to state that the bearing of a line is entirely independent of its slope or inclination.

6. To be able to locate any line by locating two points on it.

7. To be able to locate a point on a line, i.e. if a point actually lies on a line, then it must appear on that line in all views.

8. To be able to state that a point on a line divides the line, and all views of that line, into two segments whose ratio is always the same.

9. To be able to state the "TRUE LENGTH" of a line is the actual straight-line distance between its two ends.

Part #3 - Continued ...

10. To be able to state the RULE OF TRUE LENGTHS and use it to solve for true length.

    i.e. (a) If a line appears as a point in one view, it will appear true length and perpendicular to the reference line in any adjacent view.

    (b) If a line appears parallel to the reference line in one view, it will appear true length in the adjacent view.

11. To be able to use the idea that a true-length view can be drawn adjacent to any other view by choosing the new reference line parallel to the line in the given view.

12. To be able to state that the "SLOPE" of a line is the tangent of the angle that the line makes with a horizontal plane.

13. To be able to state and use the RULE FOR SLOPE OF A LINE: i.e. the slope angle of a line can be seen true size only in THAT ELEVATION VIEW which shows the line in its TRUE LENGTH.

14. To be able to state that the percent grade of a line is the tangent of the slope angle multiplied by 100.

15. To be able to locate an oblique line in two views given the horizontal distance, the bearing, and the percent grade.

16. To be able to locate a line given the bearing, slope and true length.

17. To be able to draw a point view of a line using the RULE OF POINT VIEWS; i.e. a point view of a line must be adjacent to a true-length view, and the direction of sight must be parallel to the line.

18. To be able to draw parallel lines using the RULE OF PARALLEL LINES; parallel lines will appear parallel in all views.

19. To be able to draw a line through a given point parallel to a given line.

20. To be able to state that the true distance between two parallel lines is the perpendicular distance between them. This distance will appear in its true length in the view that shows the given parallel lines as points.

Part #3 - Continued ...

intersection must be a point that lies on both of the lines.

22. To be able to state and use the following rule to check for perpendicular lines: i.e. perpendicular lines appears perpendicular in any view which shows either or both of the lines as a true length.

23. To be able to construct a perpendicular at a given point on a line.

24. To be able to draw the shortest line from a point to a line using the "LINE METHOD"; i.e. show the given line as a true length.

25. To be able to draw the shortest line between two skew lines using the line method: i.e. the shortest line connecting two skew lines must be a perpendicular to both the given lines. Show one of the skew lines as a true length and then as a point.

26. To be able to locate a line through a point and intersecting two skew lines: i.e. show either of the given skew lines as a point.

27. To be able to draw the principal views of objects with inclined axes.

Part #4 - "Plane Surfaces"

GENERAL OBJECTIVE:

To be able to draw planes, find their true size, locate point of intersection between a line and a plane, etc.

SPECIFIC OBJECTIVES:

1. To be able to define a plane as a surface in which any two points may be connected by a straight line and the straight line will lie entirely within the surface.
2. To be able to locate lines in a given plane.
3. To be able to locate True-Length lines in a given plane.
4. To be able to define and solve for the "STRIKE OF A PLANE". The strike of a plane is the bearing of a horizontal line in the plane.
5. To be able to locate a point in a plane.

Part #4 - Continued ...

6. To be able to draw a plane in an edge view using the rule of edge views: i.e. any plane will appear as an edge in that view which shows any line in the plane as a point.

7. To be able to state that the slope angle of a plane is the angle that the plane makes with a horizontal plane.

8. To be able to use the Rule for Slope of a Plane: i.e. the slope angle of a plane can be seen only in THAT ELEVATION VIEW which shows the plane as an EDGE.

9. To be able to state that the "DIP" of a plane is the slope angle of a plane.

10. To be able to find the shortest line from a point to a plane: i.e. show the given plane as an edge.

11. To be able to locate the shortest grade line from a point to a plane: i.e. show the plane as an edge in an elevation view.

12. To be able to draw a true-size view of a plane, using the rule of true-size views. i.e. A true-size view of a plane must be adjacent to an edge view, and the direction of sight must be perpendicular to the plane.

13. To be able to draw a true-size view of an angle between two intersecting lines.

14. To be able to draw the shortest line from a point to a line using the Plane Method.

15. To be able to draw a line through a given point and intersecting a given line at a given angle.

16. To be able to locate given plane figure in a given plane.

17. To be able to draw a circle on a plane using the edge-view method.

18. To be able to draw a circle on a plane using the two-view method.

19. To be able to locate a plane through one line and parallel to a second line.

20. To be able to locate a plane through a given point and parallel to two given lines.

Part #4 - Continued ...

21. To be able to locate the shortest line between two skew lines using the Plane Method.

22. To be able to locate the shortest grade line between two skew lines.

23. To be able to locate the point of intersection of a line and a plane using the edge-view method.

24. To be able to locate the line of intersection between two planes using the edge-view method.

25. To be able to locate the point of intersection of a line and a plane using the cutting-plane method.

26. To be able to locate the line of intersection of two planes using the individual-line method.

27. To be able to locate the line of intersection of two planes using the auxiliary cutting-plane method.

28. To be able to draw the intersection of a plane and a polyhedron using the edge-view method.

29. To be able to draw the intersection of a plane and a polyhedron using the cutting-plane method.

30. To be able to locate a line perpendicular to a plane using the rule of perpendiculars to a plane. i.e. A line perpendicular to a plane will appear perpendicular to any line in the plane which appears true length in that same view.

31. To be able to locate a plane perpendicular to a line.

32. To be able to locate a plane through a given line and perpendicular to a given plane.

33. To be able to locate a plane through a given point and perpendicular to two given planes.

34. To be able to draw the projection of a point on a plane.

35. To be able to draw a projection of a line on a plane.

36. To be able to show the dihedral angle between two planes true-size when the line of intersection between the two planes is given.

37. To be able to show the dihedral angle true-size when the line of intersection between the planes is not given.

Part #4 - Continued ...

38. To be able to find the size of the angle between a line and a plane using the edge-view method.

39. To be able to find the size of the angle between a line and a plane using the complementary-angle method.

40. To be able to locate a solid on a plane surface.

DESCRIPTIVE GEOMETRY - MD3, MTY3

Part #5 - Revolution

GENERAL OBJECTIVE:

The student will be able to revolve and counter-revolve different objects about a definitely located axis for the purpose of finding true lengths, slope angles and true sizes of planes.

SPECIFIC OBJECTIVES:

1. To be able to state and use the rule of revolution. i.e. The circular path of any point revolving about any axis always appears as a circle in the point view of the axis and as a line perpendicular to the axis in the true-length of the axis.

2. To be able to revolve a point about an oblique axis.

3. To be able to revolve a line about an oblique axis.

4. To be able to revolve a point or a line about an assumed axis.

5. To be able to find the true length of a line using revolution.

6. To be able to find the slope of a line using revolution.

7. To be able to locate in a top and front view a line of a given bearing, slope, and true length, by revolution.

8. To be able to show the plane as an edge using revolution.

9. To be able to show the true size of a plane using revolution.