



NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ELECTRICAL AND ELECTRONICS ENGINEERING
ELECTRICAL ENGINEERING PROGRAM

SYLLABUS - AU521 DESCRIPTIVE GEOMETRY

I. GENERAL INFORMATION

CODE	: AU521
SEMESTER	: 2
CREDITS	: 4
HOURS PER WEEK	: 5 (Theory – Practice)
PREREQUISITES	: AU511 Technical Drawing
CONDITION	: Compulsory
INSTRUCTOR	: Enrique Almora

II. COURSE DESCRIPTION

This theoretical and practical course is based on creativity. Its purpose is to provide students with the conceptual and practical frame of main aspects related to projection of objects in space and represented in a plane, based in technical drawing. Likewise, it encompasses the following learning units: 1. projections, points, straight line and planes. 2. Plane and volume intersections, 3. Development of polyhedra and volumes of revolution.

III. COURSE OUTCOMES

Be creative and rational. Design planes related to engineering design.

IV. LEARNING UNITS

1. PROJECTION, POINT, STRAIGHT LINE AND PLANE / 20 HOURS

The point / Orthogonal projection / Plan view / Coordinate drawing of a point in space / Relative positions of 2 points / Successive views of a point or a solid / Visibility rules / Straight line / Fundamental views of a straight line: horizontal, frontal, profile, vertical, plan, or perpendicular profile / Relative views of 2 straight line in space: concurrent, parallel, crossed, perpendicular and plan / True length, slope and bearing oblique straight line / Methods with auxiliary elevation views / Difference of dimension lines / Projection of a point on a line / Shortest Distance from a Point to a Line / The plane / Representation of a flat surface using 2 concurrent straight lines, 2 parallel straight lines, a line and a point outside it, and three noncollinear points / Fundamental views of a plane: horizontal, frontal, profile, plan, vertical and perpendicular profile / Plan view of a oblique plane / Special straight lines in a plane / Horizontal, frontal, maximum slope and bearing straight lines / Oblique plane / Bearing of a plane / Edge projection / Slope / True size of a plane / Shortest Distance from a Point to a plane.

2. STRAIGHT LINES AND PLANES: INTERSECTIONS, CONDITIONS FOR PARALLELISM, PERPENDICULARITY AND DISTANCES / 12 HOURS

Straight lines and planes / Intersections / Visibility / Straight line-plane intersection / Edge-view and cutting-plane methods / Plane intersection / Case of limited and unlimited planes / Edge-plane and cutting-plane methods / Straight lines and planes / Conditions for parallelism and perpendicularity among straight lines and planes / Applications / To draw a plane through a given point and perpendicular to a given line / Perpendicular bisector plane / To draw a straight line through a given point and perpendicular to a given plane / Distances / Straight lines and planes / Shortest distance between two concurrent straight lines / methods / Shortest distance between two concurrent straight

lines with given slope and bearing / Shortest distance from a point to a plane and to a angle straight line between two straight lines.

3. POLYHEDRONS AND VOLUMS OF REVOLUTION, INTERSECTIONS AND DEVELOPMENT / 24 HOURS

Polyhedrons / Its representation / Points contained in the faces of a polyhedron / Visibility rules / Intersection among straight lines and polyhedra / Prism and pyramid / Cutting-plane method / Intersection among planes and polyhedra / Methods: edge-view and cutting-plane / Intersection between polyhedra / types of intersections in special positions / Penetration (complete intersection) and partial intersection / Construction of polygonal surface of intersection / Intersection of two prisms / Edge-view and cutting-plane methods / Surfaces of revolution / Their representation / Points contained in a surface of revolution / Visibility rules / Intersection of straight lines with surface of revolution / Cone / Cylinder / Sphere / Cutting-plane method / Intersection of surfaces of revolution / Types of intersection in special positions / Penetration (complete intersection) and partial intersection / Construction of the curve of intersection / Intersection between cones / Intersection between cylinders / Cutting-plane method / Intersection between cone and cylinder / Cutting-plane method / Development / Definition and methods / Development of pyramids / Straight line developments / Development of transition pieces or adapters / Triangulation method / Development of the intersection of two polyhedra in special positions / Construction of scale models / Oblique / Truncated / Development of a right, oblique and truncated cone / Development of a right, oblique and truncated prism.

V. LABORATORIES AND PRACTICAL EXPERIENCES

VI. METHODOLOGY

This course is carried out in theory, practical and lab sessions. In theory sessions, the instructor introduces concepts, theorems and applications. In practice sessions, several problems are solved and their solutions are analyzed. In lab sessions, Minitab software is used to solve problems and analyze their solution. In all sessions, students' active participation is encouraged.

VII. EVALUATION FORMULA

The average grade PF is calculated as follows:

$$PF = 0.33 EP + 0.33 EF + 0.33 PP$$

EP: Mid-Term Exam

EF: Final Exam

PP: Quizzes average

VIII. BIBLIOGRAPHY

1. **WELLMAN B. MINOR**
Descriptive Geometry (Spanish)
Reverte Editorial (2008)
2. **E. G. PARE / ROBERT OLIN / OTHERS**
Descriptive Geometry (Spanish)
Interamericana S.A. Editorial (1996)