NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF MECHANICAL ENGINEERING
MECHANICAL ENGINEERING PROGRAM

MC502 – DESCRIPTIVE GEOMETRYI

I. GENERAL INFORMATION

CODE	**:**	MC502 Descriptive Geometry
SEMESTER	**:**	1
CREDITS	**:**	3
HOURS PER WEEK	**:**	4 (Theory - Practice - Laboratory)
PREREQUISITES	**:**	None
CONDITION	**:**	Compulsory

II. COURSE DESCRIPTION

This course is theoretical and practical and is based on creativity. Its aim is to provide students with the practical and conceptual framework of the main aspects related to projection of objects placed in the outer space and represented in a plane based on the drawing. It also encompasses the following: 1) Point, Straight line, Plane, Planes and Straight lines: Distances, angles, parallelism and perpendicularity and intersections. 2) Polyhedron intersections and surfaces of revolution. 3) Volumes formation.

III. COURSE OUTCOMES

At the end of the course, students:

1. Project in two-dimensions three-dimensional objects considering visibility and refining techniques and criteria.
2. Project lines and planes in two dimensions from different points of view.
3. Represent the intersection of polyhedrons and revolution surfaces.
4. Visualize and conceptualize objects in three-dimensions.
5. Understand and apply the principles of projection in one plane and the concepts of descriptive geometry.
6. Understand and apply the concepts of geometric constructive drawings.
7. Allow the conceptual and practical development of the main aspects as the projection of objects as rational and creative framework for other courses.
8. Organize the imagination to express through creativity two-dimensional and three-dimensional technical objects.
9. Determine the constructive drawing regarding the necessary size conveniently using the scale and establishing the need.
10. Apply national and international standards in the representation of engineering drawings..

IV. LEARNING UNITS

1. POINT, STRAIGHT LINE, PLANE, PLANES AND STRAIGHT LINES: DISTANCES, ANGLES, PARALLELISM AND PERPENDICULARITY AND INTERSECTIONS / 42 HOURS

The point / Definition / Application of the orthogonal projection principles to the descriptive geometry / Plan view of a point / Drawing of a point using coordinates / Relative positions of 2 points / Consecutive position of a point or geometric solids in space / Visibility rule / The straight line / Positions: particular and particulars of straight lines, cases: oblique, horizontal, in profile, normal and vertical / relative positions of two straight lines in space: concurrent parallel, crossing and perpendicular / Distance from a point to a straight line / Straight line: real length, orientation and slope / The oblique line and its consecutive views:

Auxiliary views or direct method and the contour differences method / The plane / representation of a plane surface. For two concurrent straight lines, for two parallel straight lines, for a straight line and a external point and for 3 noncollinear points / Particular positions of a plane: Horizontal plane, frontal plane, profile plane, normal plane and vertical plane. Plan view of an oblique plane / Notable lines in a plane / Inclination angle of a plane / Oblique plane / Orientation of any plane / Edged projection of a plane / Slope and real magnitude of any plane / Lines and planes distances: Shortest distance between two crossing points and their technical characteristics / Angles: straight, plane and dihedral / Lines and planes: Parallelism and perpendicularity conditions / For an external point to a given plane, stroke a line or plane parallel to it / Bisector plane / For an external point to a given plane, stroke a line or plane perpendicular to it / Lines and planes: Intersections and visibility / line-plane intersection. Methods: Edged view and sectioning plane / Planes intersection. Cases: Limited and unlimited planes. Methods. Edged plane and sectioning planes.

2. POLYHEDRONS INTERSECTION AND SURFACES OF REVOLUTION / 24 HOURS

Polyhedrons, their representation / Points I the face of a polyhedron / Intersection and visibility of a line and a polyhedron. Cases: Prisms and pyramids / Sectioning plane and edged plane methods / Polyhedrons intersection and visibility: Intersection in particular positions and numeral systems / Surfaces of revolution and their representation / Points in the surface of revolution / Visibility / Intersection of a line and a surface of revolution, cases. With cylinder and sphere / Sectioning plane method. Application in engineering / Intersection of surfaces of revolution / Types of intersections in particular positions / Cones intersection, cylinders intersection and intersection between a cone and a cylinder. Method: Sectioning plane / Application in civil engineering.

3. VOLUMES FORMATION / 18 HOURS

Formations: Definition / Methods: triangulation and others / Oblique and right prism formation / Oblique and right pyramid formation / Oblique and right cone formation / Application in designing and formation of a civil engineering container or module and its multiple use / Formation of the intersection of two polyhedrons / Formation of the intersection of two surfaces of revolution / Application in designing and formation of a civil engineering container or module and its multiple use / Conference: Modern structures (filmic projection, in the classroom). Cases: Buildings and bridges. Speaker: Instructor of the course.

V. LABORATORY EXPERIENCES

Lab. 1. Software for graphic representation.
Lab. 2. Point and line.
Lab. 3. Plane. Intersections.
Lab. 4. Polyhedrons.
Lab. 5. Revolution surfaces.
Lab. 6. Angles and rotations.
Lab. 7. Distances and tangent surfaces.
Lab. 8. Final project.

VI. METHODOLOGY

The course is carried out in theory and practice sessions. In theory sessions, the instructor introduces and explains concepts and definition of the subjects. In practice sessions, the instructor applies concepts and definitions of the subjects studied in theory sessions. Likewise, these practical works are exercises and the others are graded using drawing engineering materials. There will also be five quizzes and the lowest grade will be eliminated, all quizzes worth the same.

VII. EVALUATION FORMULA

The average grade PF is calculated as follows:

PF = 0.25 EP + 0.50 EF + 0.25 PP + 0.25 TE

EP: Mid-Term Exam
EF: Final Exam
PP: Average of three quizzes
TE: Average of three projects

VIII. BIBLIOGRAPHY

1. **DESKREP, C.L.**
   Descriptive Geometry
   University Library Editions, 2011

2. MINOR CLYDE HAWK
Descriptive Geometry
Mc Graw – Hill Editorial, Mexico, 2002