

STATICS

Course code:	28261
Credits:	3
Course Type:	Theoretical
Prerequisites:	Mathematics 1, Physics 1
Corequisite:	-
Course Length:	51 hours

1-Introduction

Introduction to Statics, Review of scalar and vector quantities, Vector Algebra, Newton's laws, systems of units,

2-Force Systems

Force, Moment of force, Couple, Components, Varignon's Therorem, 2D force systems and their resultants, 3D force systems, Wrench definition.

3-Equilibrium

Free body diagrams, Equilibrium of rigid bodies, Equations of equilibrium, Alternative equilibrium equations, Determination of reaction forces, static indeterminacy and constraints, Equilibrium in 3D Problems.

4-Structures

Trusses, Method of joints, Method of sections, Frames and machines.

5-Distributed forces

Centers of gravity, Center of mass, Centroid of volumes, Areas and Lines. Composite bodies, volumes, areas and lines and their centroids. Theorems of Pappus.

6- Area Moment of Inertia

Definitions of rectangular and polar moments of area, radius of gyration, Transfer of axes, rotation of axes, principal axes, Mohr's circle.

7-Beams

Equations of axial and shear forces and bending moment and their diagrams for the beams under concentrated and distributed loads.

8-Cables

Flexible cables under concentrated and distributed transverse loads. Parabolic cables, Catenary cables.

9-Friction

Dry friction laws, Friction angle, Friction in wedges, screws, bearings, dry disk clutches and belts. Rolling resistance.

10-Virtul work and Energy Method

Virtual displacement, Principle of virtual work and its application in machines. Method of potential energy and stability.

References

- 1- J. L. Meriam, L. G. Kraige, J. N. Bolton, Engineering Mechanics-Statics, John Wiley & Sons.
- 2- F. Beer, E. Johnston, D. Mazurek, Vector Mechanics for Engineers: Statics, McGraw-Hill.