University of Engineering and Technology, Taxila
Department of Civil Engineering

Course Title: Engineering Mechanics (CE-102)

Pre-requisite(s):   Basic Knowledge of Mathematics & Physics

Credit Hours: 2 + 1

Contact Hours: 2 + 3

Text Book(s):   **1.** Engineering Mechanics by R.C. Hibbeler, 9th Edition.

Reference Book(s):   **1.** Engineering Mechanics Statics and Dynamics, *J.L. Mariam & L.G. Kraige,* 6th Edition.

2. Vector Mechanics for Engineers, *Ferdinand P. Beer and E. Russel Johnston Jr,* 7th Edition.

Catalog Data:
Basic concepts; System of forces; Equilibrium of rigid bodies; Kinematics: Rigid bodies ; Friction ;Application of principles of dynamics.

Course Objectives:
- To learn basic concepts and system of forces.
- To enable students to understand relationship of physical processes, kinetics and kinematics.
- To develop skills to use the basic principles of mechanics in engineering applications.

Course Learning Outcomes:
At the end of this course, the student will:

CLO:1 Have knowledge related to the concepts of equilibrium and its applications in civil engineering.

CLO:2 Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple practical problems.

CLO:3 Demonstrate the skills to use scalar and vector analytical techniques for analyzing forces in statically determinate structures.

CLO:4 Apply basic knowledge of Maths and physics to solve real-world problems

Course Contents:

Basic Concepts
- Concepts of space, time, mass, velocity, acceleration and force
- Scalar and vector quantities
- Newton's law of motion
- Law of gravitation

System of Forces
- Resultant and resolution of co-planer forces using parallelogram, triangle & polygon law and funicular polygon
- Simple cases of resultant and resolution of forces in space
- Conditions of equilibrium of co-planar forces, analytical and graphical formulations

Equilibrium of Rigid Bodies
- Free body concept, conditions of support and attachment to other bodies
- Support reactions under different types of loading
- Introduction to shear force and bending moment diagrams
- Degree of restraint and static determinacy
- Statically determinate problems especially of civil engineering importance, equilibrium of two-force and three-force bodies

Kinematics
- Work, energy and power
- Virtual work formulation of equilibrium of coplanar force
- Potential energy, energy criterion for equilibrium, stability of equilibrium, application to simple cases

Rigid Bodies
- Geometrical properties of plane areas
- First moment of area, centroid, second moment of area, principal axes, polar second moment of area and radius of gyration

Friction
- Coulomb's theory of friction
- Problems involving friction on flat and curved surfaces

Application of Principles of Dynamics
- Rectilinear and curvilinear motion
- Newton's equation of motion, dynamic equilibrium
- Introduction to practical use of the above principles and properties.

Grading Policy:

Sr. No.	Grading	% of Total Marks
1	Assignments	10
2	Quizzes	10
3	Midterm Exam	20
4	Practical	20
5	Final Exam	40
	Total	**100**

Students Learning Outcome:

Students who pass the course will be able to use scalar and vector analytical techniques for analyzing forces in statically determinate structures.

Course Professional Outcome/Industrial Usage:

Students learn basic ideas and concept of basic knowledge of maths and physics to solve the real-world problems.

PLOs	CLOs			
	CLO-1 (Knowledge)	**CLO-2** (Application of fundamental Concepts)	**CLO-3** (skills Demonstration)	**CLO-4** (Application of Knowledge)
PLO 1 (Engineering Knowledge)	✔	✔		
PLO 2 (Problem Analysis)			✔	✔
PLO 3 (Design/Development of Solutions)				
PLO 4 (Investigation)				
PLO 5 (Modern Tool Usage)				
PLO 6 (The Engineer and Society)				
PLO 7 (Environment and Sustainability)				
PLO 8 (Ethics)				
PLO 9 (Individual and Team work)				
PLO 10 (Communication)				
PLO 11 (Project Management)				
PLO 12 (Lifelong Learning)				

Assessment Modules	CLOs			
	CLO 1	**CLO 2**	**CLO 3**	**CLO 4**
Assignments		✔	✔	
Quizzes	✔		✔	
Midterm Exam	✔	✔		
Final Exam	✔	✔	✔	✔