FACULTY OF ENGINEERING, SCIENCE AND THE BUILT ENVIRONMENT

Unit title:	Mechanics	
Unit number:	BCE/1/221	
Unit level:	1	
Unit value:	1.0	
Unit co-ordinator:	I Kraincanic	
Contact time:	Lectures	30 hours
	Tutorials	30 hours
Private study time:	90 hours	
Unit pre-requisites:	None	

SHORT DESCRIPTION

This unit offers the first introduction to mechanics of structures. Fundamentals of mechanics of statics are explained and numerous worked examples are used to complement the understanding of mechanics. Students are introduced to structural element and associated load types, the various support types and the calculation of structural section properties. Also covered are the axial, shear, bending and torque load distributions in simple determinate structures.

AIMS

To develop an appreciation and understanding of the fundamentals of mechanics of statics.

LEARNING OUTCOMES

The student should be able to:

- appreciate the types of structural elements
- distinguish between unsymmetric, singly symmetric and doubly symmetric sections
- recognise and understand the different load types – axial, shear, bending and torsion
- recognise and appreciate the structural response of simple, pinned, roller and fixed support types
- understand the fundamentals of static equilibrium
- calculate common structural section properties of symmetric and unsymmetric sections
- determine support reactions for determinate beams subjected to a combination of loads
- draw shear force and bending moment diagrams for determinate beams
- calculate the forces in members of a pin jointed frame using the method of joints

TEACHING AND LEARNING PATTERN

Lectures and tutorials supplemented by handouts and worked solutions.

INDICATIVE CONTENT

Load Types
Point loads, uniformly distributed loads, varying loads, axial, shear, bending, and torsion.

Support Types
Simple, pinned, roller, fixed.

Equilibrium
Fundamental principles of static equilibrium, reactions.

Section Properties
Area, centroid, second moment of inertia, parallel axes theorem, radius of gyration, elastic section modulus.

Analysis of Determinate Beams
Reactions, shear force diagrams, bending moment diagrams, location of maximum bending moment.

Pin Jointed Frames
Method of joints to calculate member forces.

ASSESSMENT METHOD

The unit is continuously assessed, based on open book in-class tests, typically of one hour duration.

INDICATIVE SOURCES

Core

Hulse & Cain; Structural Mechanics, Palgrave, 2000.

Megson; Structural and Stress Analysis, Arnold, 1996

Marshall & Nelson; Structures, 3rd Edition, Longman, 1990.

Whitlow; Materials and Structures, 2nd Edition, Longman, 1991.

Durka, Morgan & Williams; Structural Mechanics, 4th Edition, Longman, 1996.

Smith; Materials and Structures, 2nd Edition, Longman, 1986.

Croxton & Martin; Solving Problems in Structures, Volume 1, Longman, 1991.

Smith; Introduction to Structural Mechanics, Palgrave, 2001

Smith; Materials and Structures, 2nd Edition, Longman, 1986.

Montague & Taylor; Structural Engineering For First Year Students, McGraw-Hill, 1989.

Jennings A; Structures – From Theory to Practice, Spon, 2004