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Title: STRUCTURES AND MATERIALS  
Status: Definitive  
Code: **4119BEUG** (118131)  
Version Start Date: 01-08-2016

Owning School/Faculty: Civil Engineering  
Teaching School/Faculty: Civil Engineering

Team	Leader
William Atherton	Y
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**Academic Level:** FHEQ4      **Credit Value:** 24      **Total Delivered Hours:** 98  
**Total Learning Hours:** 240      **Private Study:** 142

### Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	48
Practical	24
Tutorial	24

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1		70	2
Report	AS2		15	
Test	AS3		15	

### Aims

*To introduce the concepts of structural mechanics to enable the analysis of beams, columns, frameworks and retaining structures of a statically determinate nature.*

*To apply mathematical and geometrical calculations to the determination of structural properties of sections.*

*To develop the learners ability to analyse simple statically determinate structures.*

*To examine and explore the structural behaviour of materials, the relationship between ultimate stress and working stress and the likely modes of failure.*

*To develop an ability to size up sections to resist imposed loadings and relate this to both permanent and temporary works.*

## **Learning Outcomes**

After completing the module the student should be able to:

- 1 Identify the behaviour of various structural elements applying concepts of resolution of forces.
- 2 Analyse simply supported beams subject to point loads and UDLs, calculate reactions, shearing force, bending moment values and deflections.
- 3 Analyse various shapes of cross section to determine: cross sectional area, centre of gravity, second moment of area and section modulus.
- 4 Calculate the position and magnitude of forces produced by liquids or soils on vertically retaining walls, determine the stability and use appropriate factors of safety against sliding and overturning.
- 5 Explain the properties of materials justifying the reasons for their selection and their effect on the design of buildings and installations.
- 6 Consider the effects of material selection on the environment and discuss suitable alternatives and possibilities for recycling.
- 7 Perform laboratory experiments safely and deal with recording, analysing and interpretation of results.

## **Learning Outcomes of Assessments**

The assessment item list is assessed via the learning outcomes listed:

EXAMINATION	3	4	5	6
REPORT	1	2		
TEST	7			

## **Outline Syllabus**

*The structures element will consist of materials used in structures, resolution of forces, principles of equilibrium, pin jointed frames, moments of inertia, shear force and bending moment calculations, retaining walls and columns, use of timber and steel beams and determination of deflection.*

*The materials element considers the important properties, design criteria and the specification of materials including concrete, metals, alloys, timber (including engineered timbers), clay products, insulation materials and polymers including vapour and damp-proofing barriers. The use of protective coatings including paints, stains and renders will be considered. The need for maintenance and replacement of building components will be considered along with an introduction to sustainability*

*and environmental issues relating to construction.  
Health and Safety, both in terms of laboratory work and the use and of materials on Site.*

## **Learning Activities**

The module is based on a lecture and tutorial programme including video and Power-Point presentations together with a number of practical sessions.

Students should develop a competence in using scientific equipment adopting an active learning approach.

Laboratory work will have an emphasis on the manipulation, interpretation and analysis of the data, which should allow reasoned conclusions and recommendations to be made.

The material will wherever possible be related to problems of a practical nature which occur in a construction environment.

Assignments will be formulated to link the selection of materials to suitable applications within the construction industry.

## **Notes**

The module develops the concepts of structural mechanics, and applies mathematical and geometrical calculations, to the determination of structural properties of sections. It also develops an understanding of the structural behaviour of materials. The module is designed to provide the student with a sound basic understanding of the behaviour of the principal materials used in construction. The module explains the principles on which the properties of materials are founded and the factors relating to behaviour and selection for use in construction. The practical aspect of the module includes the tests required to assess the most important properties and qualities of the principal materials. In terms of the environmental issues, consideration is given to the impact of the selection of certain materials in relation to others along with the health and safety implications.