

MODULE CODE: M4X01305
TITLE: Engineering Mathematics and Structures
DATED: 25/09/2017

LEVEL: 4
CREDITS: 20

JACS CODE: G120
LECTURER: Dr Keerthi Ranasinghe (k.ranasinghe@uwtsd.ac.uk)

AIM(S)

"To provide students with the requisite knowledge and understanding of mathematics to assess the properties of structural components and their behaviour".

"To provide the students with the requisite knowledge and understanding of structural mechanics to be able to undertake the design of various elements of a structure".

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

1. Calculate bending moments and shear forces for simply supported beams and cantilevers and determine forces in pin-jointed framework.
2. Design columns under axial loading and examine the design methods for simply supported beams in steel, reinforced concrete and timber.
3. Explore the behavior of gravity retaining walls.

INDICATIVE CONTENT

- Differentiate sums, products and quotients and use function of a function.
- Maximum and minimum values and location of stationary points.
- Determining areas under a curve, volume of revolution, centroids, second moment of area and moment of inertia using integration techniques.
- Calculation of bending moments and shear forces in simply supported and cantilever beams with point loading and draw the bending moment and shear force diagrams.
- Calculation of forces in pin jointed frames using resolution of forces.
- Valid design for a steel section column and beam.
- Valid design for a short reinforced concrete column and beam.
- Design for a timber column and beam.
- Designs for soil and water retaining walls to satisfy sliding and ground bearing capacity requirements.

LEARNING AND TEACHING STRATEGY

Formal lectures will be used to introduce the basic concepts but **emphasis will be on students working individually with lecturer's assistance**. Designs of the structural elements should fully comply with the relevant Standards.

The allocation of teaching to deliver the module is:

Activity type	Hours	Percentage
Scheduled learning	60	30%
Independent learning	140	70%
Placement learning	0	0%
TOTAL	200	100%

ASSESSMENT

Assessment Component 1 – 50%

Coursework will be the design of a structural framework consisting of columns and beams or the design of a retaining wall suitable for the retention of soil or water. Each student will be provided with different design data. (Max 2000 words)

Assessment Component 2 – 50%

Two hour examination allowing reference to relevant Standards.

Assessment Summary

Activity type	Percentage
Written	50%
Coursework	50%
Practical	0%
TOTAL	100%

BIBLIOGRAPHY

Essential

Arya, C., (2009), "*Design of Structural Elements*", 3rd Edition, SPON
Stroud, K. A. (2013) "*Engineering Mathematics*", 7th Edition, Palgrave Macmillan

Recommended

Utku, C. S. and Norris, C., (1991), "*Elementary Structural Analysis*", McGraw-Hill

Background

Gere J. *et. al.*, (2002), "*Mechanics of Materials*", 5th Edition, Nelson Thornes
McKenzie, W., (2006), "*Examples in Structural Analysis*", Taylor & Francis
Seward, D., (2009), "*Understanding Structures: Analysis Materials and Design*", 4th Edition, Palgrave, Macmillan

Journals

Educational Studies in Mathematics
The Mathematical Gazette

Websites

www.icevirtuallibrary.com/
www.open.ac.uk/Mathematics
www.bgstructuralengineering.com/