FACULTY OF ENGINEERING SCIENCE AND THE BUILT ENVIRONMENT

Unit title:	Structural Design	
Unit number:	BCE/3/223	
Unit value:	1.0	
Unit co-ordinator:	P J Mellow	
Contact time:	Lectures	39 hours
	Tutorials	10 hours
	Assessment	3 hours
Private study time:	98 hours	
Unit pre-requisites:	BCE/2/207 or equivalent	

SHORT DESCRIPTION

This unit extends the students' knowledge of steel and concrete material use, analysis of structural form, and ability in design in both qualitative and quantitative directions. Problems from the AM I StructE papers are selected so that students can develop their analytical confidence to choose appropriate solutions, and presentations are given on a wider range of subjects and discussed in critical peer review.

AIMS

To develop an ability to produce structural designs and details in accordance with appropriate standards and good practice, for a variety of structural forms and using various materials. To develop an understanding of load transmission through various forms of structure and the effects these loads may cause on a structure. To study and investigate a range of additional topics relative to design in its wider context.

LEARNING OUTCOMES

On successfully completing this unit, students will be able to:

- understand the theory and principles of structural analysis;
- identify components of a structure and the forces for which they should be designed;
- explain and illustrate the principles of structural design in steel, concrete, masonry and timber, using calculations and sketches of structural details;
- identify the load paths through a structure;
- identify any special effects the loadings and geometry of the structure may create;
- suggest preventative measures against these effects;
- produce design calculations and details in accordance with appropriate standards and regulations;
- analyse the link between the intended type of structure and the site restrictions;
- produce the relevant sequence and method of construction;
- communicate design solutions and information through written reports, letters and seminars;.

TRANSFERABLE SKILLS

- STUDENTS WILL IMPROVE THEIR INDIVIDUAL CONFIDENCE IN VERBAL PRESENTATION OF ENGINEERING TOPICS
- STUDENTS WILL IMPROVE THEIR CRITICAL ANALYSIS SKILLS
- THEY WILL BE ABLE TO SYNTHESIZE SOLUTIONS TO REAL DESIGN PROBLEMS
- THEY WILL INCREASE THEIR ABILITY TO APPLY DESIGN PRINCIPLES TO PROBLEM SOLVING

- DEVELOP THEIR DRAUGHTING SKILLS
- ENHANCED EXPOSURE TO THEIR PROFESSIONAL RESPONSIBILITY FOR SAFETY

TEACHING AND LEARNING PATTERN

Lectures and tutorials supplemented by seminars and project work with peer critique sessions.

INDICATIVE CONTENT

General
Philosophy of Design. Stability. Robustness. Environmental Loading. Bracing and Shear Walls. Foundations

Concrete
Alternative span patterns and formats for beams and slabs,

Steelwork Design
Moment connections, Portal frames,

Masonry and Timber
Code requirements, Building Regulations, simple structures

Structural Form
Alternative design approaches, materials, techniques

ASSESSMENT METHOD

The unit is continuously assessed through a series of project designs covering a range of structural types and materials and a group seminar presentation on an allocated topic supported by a written report.

66%	2 design projects, one in steel, one in RC.
34%	Seminar presentation on a related subject

NOTE: All the design exercises will be taken from Past I Strut E Exam Questions.

INDICATIVE SOURCES

Core

Arya, Ch. (2002). "Design of Structural Elements", Chapman and Hall.
McKenzie, R (2004). "Design of Structural Elements", Palgrave
BSI - Extracts from British Standards for Students of Structural Design.
Hayward, A. and Weave, F. (1992). "Steel Detailer's Manual", Blackwell.
Reynolds, C.E. and Steedman, J.C. (1988). "Reinforced Concrete Designer's Handbook", Spon.
Owen G, (2003) "Steel Designers Manual", Steel Construction Institute,
Seward D (1998) "Understanding Structures" Macmillan

Background

Barrie, R. (1986). "The Construction of Buildings 4", BSP Professional Books.
BSI 8004: 1986 - Foundations.
Jennings A, (2004). "Structures from Theory to Practice" - Spon
Chudley, R. (1990). "Building Construction Handbook", Newness (Butterworth Heinemann Ltd).
Reid, E. (1984). "Understanding Building", Construction Press.
Schueller W (1995) "The Design of Building Structures" Prentice Hall
Tomlinson, M. J. (1986). "Foundation Design and Construction", Longman UK.
Whitlow, R. (1996). "Materials and Structures" - Longman UK