FACULTY OF ENGINEERING SCIENCE AND THE BUILT ENVIRONMENT

Unit title:	Design of Structu	ral Elements
Unit number:	BCE/2/207	
Unit value:	1.0	
Unit co-ordinator:	P Mellow	
Contact time:	Lectures	39 hours
	Tutorials	13 hours
Private study time/Group work time:	98 hours	
Unit pre-requisites:	BCE/2/1203	

SHORT DESCRIPTION

This unit develops students' practice with structures into the design of the concrete, steel and timber elements and structures. It uses a brief to produce a design statement and develop this into design options. Recycling of materials, whole life costing, sick buildings are covered and the safety of building work during construction including CDM Regulations are addressed. Drawing and freehand sketching skills are taught.

AIMS

- To introduce students to the design of structures in steel and concrete.
- To develop qualitative skills in the presentation of structural options
- To develop students' abilities in the presentation of information
- To provide a practical context for environmental and safety issues.

LEARNING OUTCOMES

The student should be able to:

- interpret rules from codes of practice into design
- recognise load paths and take down structural loading
- students will be able to design simple reinforced concrete, timber and steel elements
- communicate design ideas by using annotated drawings and digital representation is to be fostered
- appreciate sources of risk and their duties of care for safety in the design process
- students will have knowledge of whole life costing of buildings

TRANSFERABLE SKILLS

DEVELOP DESIGN AND DETAILING DRAWING SKILLS	٠
UTILISE ENGINEERING SCIENCES IN THE PRODUCTION OF DESIGN	•
APPLY CODES TO DESIGN WORK	•
FURTHER DEVELOP THE ABILITY TO SYNTHESISE	•
APPLY IT PROGRAMS	•
WORK SEPARATELY AND IN GROUPS TO A COMMON GOAL	•

TEACHING AND LEARNING PATTERN

A series of lectures covering a diverse range of materials will be delivered. These will be supported by practical exercises in regular, weekly tutorials. In these tutorials the coursework will be presented, critiqued and marked.

INDICATIVE CONTENT

The following topics will be addressed by the Unit:

- The philosophy of limit state design
- Assessment of structures loads (dead, imposed and wind) •
- The assembly of components •
- Steel element design
- Concrete element design •
- Reinforced concrete detailing •
- Sustainable Development

ASSESSMENT METHOD

Continuous Assessment

The principal coursework comprises three pieces of work and a multiple-choice test.

Part One: Procurement of a multi-storey car park. Students will visit a multi storey car park. They will prepare a plan of the layout including bays, aisles and circulation routes. They will prepare a small portfolio of photographs and freehand sketches of significant structural details and elements. Mark 25% Mark 30%

Part Two: A piece of RC design

Part Three: A piece of structural steel design

Mark 30%

The submissions for parts 2 and 3 will include drawing office standard rc. and structural details and schedules, together with supporting design calculations prepared in accordance with British Standards.

Test - 15%

An interim test will be held to evaluate the students understanding.

INDICATIVE SOURCES

Core

Anon. Manual for the Design of Steelwork Buildings Structures. IStructE/ICE 1990. Extracts from British Standards for Students of Structural Design, 2002

Background

Arya, Ch. (2002). "Design of Structural Elements", Chapman and Hall. McKenzie, W (2004). "Design of Structural Elements", Palgrave Higgins, J.B. & Rogers B.R., (2003) Designed and Detailed (BS8110) C&CA

Optional

Eurocode 2; Design of Concrete Structures, Part 1. General Rules for Buildings; BSI 1992 Eurocode 3; Design of Steel Structures, Part 1.1. General Rules for Buildings; BSI 1992, QSE, CSC Fastrack and SAND STRAND 7 Computer Manuals Manual for the Design of RC Structures. IStructE/ICE 1988 Manual for the Design of Steelwork Structures. IStructE/ICE 1990. Standard Method of Detailing Structural Concrete IStructE/ICE 1989 Joyce, R. The CDM Regulations Explained Thomas Telford 1995

Davis, L., Guide to the Building Regulations 1991 for England and Wales, Butterworth, 1992, Salvadori, M. Why Buildings Stand Up, Norton 1990 Hughes, B.P. Limit State Theory for Reinforced Concrete Design. Pitman 1988 Jacobs, M The Green Economy: Environmentally Sustainable Development and the Politics of the Future, Pluto, London, 1991 Steel Design Guide to BS5950: Part 1 Vol 1, Publn No 202. Steel Construction Institute 1996