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## FACULTY OF ENGINEERING SCIENCE AND THE BUILT ENVIRONMENT

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Unit title:	Masonry and Timber Engineering
Unit number:	BCE/M/430
Unit value:	1.0
Unit co-ordinator:	P J Mellow
Contact time:	Lectures 30 hours
	Tutorial/Seminars 13 hours
	Laboratories 9 hours
Private study time:	98 hours
Unit pre-requisites:	None

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### SHORT DESCRIPTION

This course introduces students to the materials, properties and design processes using timber and masonry construction. Both load factor and limit state codes are used and some experimental work is undertaken. Proprietary computer programmes are used alongside hand calculations. New techniques are introduced and discussed.

### AIMS

To introduce the students to the properties of materials used in masonry and timber structures and to acquaint them with the principles and methods in the design of structural elements in these materials both historically and in newer techniques.

### LEARNING OUTCOMES

The student should be able to:

- Understand the significant properties of the materials used in masonry and timber construction,
- Understand the structural properties of such materials
- Design structural elements in these materials
- Source information for future design requirements and work from first principles if needed.
- Assess existing work built in these materials, and their safe use.

### TRANSFERABLE SKILLS

- BECOME MORE AWARE OF THEIR RESPONSIBILITY FOR THEIR OWN LEARNING
- DEVELOP THE ABILITY TO SYNTHESISE AND TEST SOLUTIONS AGAINST GIVEN CRITERIA
- DEVELOP PATIENCE AND THE NEED TO LISTEN TO AND INTERPRET CLIENT NEEDS
- ABILITY TO UTILISE ENGINEERING SCIENCE IN SOLVING PROBLEMS
- PRACTICAL TEAMWORK SKILLS INCLUDING BUILDING MASONRY WALLS
- DEAL WITH AND MANAGE A NUMBER OF DIVERSE TASKS IN THE SAME TIME FRAMEWORK
- EXTEND KNOWLEDGE AND PRACTICAL USE OF CODES OF PRACTICE

### TEACHING AND LEARNING PATTERN

Lectures by experienced engineers with appropriate handouts and seminars intended to encourage discussion and further self-study, assisted by self-tutoring computer assisted learning packages as appropriate.

## INDICATIVE CONTENT

The following topics will be addressed by the Unit:

### MASONRY

#### Material

Dimensions and properties of clay, calcium silicate, and concrete bricks and concrete blocks. Mortars. Behaviour of a masonry wall as a composite material.

#### Axially Loaded Members

Partial safety factors. Effective height and thickness. Slenderness ratios. Stress reduction factors. Eccentric loading.

#### Laterally Loaded Walls

One-way and two-way spanning walls. Use of flexural strength and membrane action. Diaphragm and Fin walls.

#### Miscellaneous Items

Shear Walls. Accidental damage. Reinforced masonry  
Safety in building with masonry.

### TIMBER

#### Materials

Botanical species. Strength reducing characteristics. Stress grading. Composite sections.

#### General Design

Modification factors for design. Load duration, depth, load sharing and wet conditions.

#### Axial Loaded Members

Columns, ties, trusses. Nailed, screwed, and bolted joints. Mechanical connections

#### Members in Bending

Solid and laminated beams. Deflection criteria. Portals. Stability

### ASSESSMENT METHOD

The Unit is assessed by a combination of examination and coursework with the proportion of marks allocated to each component given below:-

- |     |      |   |
|-----|------|---|
| 70% | -    | 3 hour end of unit, closed book, written examination<br>This is an unseen paper and students will be required to attempt four out of six questions, not more than two from either the Masonry or the Timber Sections. |
| 30% | -    | The coursework consists of two separate parts.  |
|     | (i)  | 15% A set of Laboratory experiments and tests, fully reported and analysed.   |
|     | (ii) | 15% A design project involving elements of both materials.  |

### INDICATIVE SOURCES

#### Core

Manual for the Design of Masonry Structures, The Institution of Structural Engineers, 1999  
Extracts from British Standards for Students of Structural Design, BSI, incl Euro-codes  
Various Publications from the Brick Development Association and Timber Research and Development Association

#### Background

McKenzie W, Design of Structural Timber, Macmillan, 2000  
Roberts JJ, Concrete Masonry Designers Handbook, Spon, 1983  
Curtin, W.G et al, Structural Masonry Designers Handbook, BSP Professional Books, 2<sup>nd</sup> Edition 1987  
Hendry, AW Structural Masonry, Macmillan 1990  
Mettam, CS, Structural Timber Design and Technology, Longmans, 1986  
Orton A, Structural Design of Masonry, Longman, 1992  
Ozelton EC, Baird, JA, Timber Designers Manual, BSP Professional Books, 3<sup>rd</sup> Edition  
Students should be familiar with the use of QSE and SAND programs and have access to the manuals.