

## [MECH01I02] Structure Mechanics

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| <b>Module Code: MECH01I02</b>   | <b>Title: Structure Mechanics</b>  |
| <b>Modular weight: 10</b>   | <b>Examination weighting: 70 %</b> |
| <b>Prerequisite modules: DSGN03C02.</b>                               |                                    |
| <b>Reassessment: No restrictions.</b>                                 |                                    |
| <b>Internal Examiner/Module Leader:</b>                               |                                    |
| <b>Semester taught: Two</b>   |                                    |
| <b>Key words: complex stress, failure, Castigliano's , stability.</b> |                                    |
| <b>Date of latest revision: 2007-08-22</b>                            |                                    |

### **Aims**

The aim of this module is to consolidate and build on the ideas and skills introduced in the Stress Analysis module DSGN03C. Students will be able to carry out strength and deflection analyses for a variety of simple load cases and structures, will understand the simplifications used in such analyses and appreciate the role of stress analysis and failure prediction in the design environment.

### **Intended Learning Outcomes**

#### ***Knowledge and understanding***

*On completion of this module students should be able to demonstrate knowledge and understanding of:*

1. the analysis of stresses and strains in simple structures and the selection of appropriate failure criteria to predict failure;
2. the simplifications made in analysing structures and the simplifying assumptions in the analysis methods studied;

#### ***Subject-specific cognitive skills***

*On completion of this module students should be able to/demonstrate ability in:*

3. use structural analysis techniques to model the mechanical behaviour of a range of structures;
4. produce solutions to engineering problems through the application of engineering knowledge and understanding;

#### ***Subject-specific practical skills***

*On completion of this module students should be able to/demonstrate ability in:*

5. use suitable procedures in mechanical testing to generate appropriate data;
6. collect and interpret data with reference to the relevant scientific principles and draw conclusions;

#### ***Key/transferable skills***

*On completion of this module students should be able to/demonstrate ability in:*

7. analyse a range of structural problems and select appropriate analysis methods and material data to solve the problem.

### **Content**

- multiaxial and complex stresses;
- principal stresses, hydrostatic and deviatoric stresses, stress-strain relationships;
- failure analysis and yielding criteria;

- energy methods and Castigliano's theorems;
- elastic instability, buckling of struts, Euler theory and empirical methods.

### **Methods of Learning, Teaching and Assessment**

Total student effort for the module: 100 hours on average.

#### *Teaching & Learning:*

1. 12, 2 hr lectures. This method informs learning outcomes 1, 2.
2. 12, 1 hr tutorial. This method informs learning outcomes 3, 4, 5, 6, 7.

#### *Assessment:*

1. A 60 minute unseen in-class test. This method carries 30% of the total mark and assesses learning outcomes 1, 2, 3, 4.
2. A 120 minute unseen written examination. This method carries 70% of the total mark and assesses learning outcomes 3, 4, 5, 6, 7.

### **Reading List**

- James Barber, "*Intermediate Mechanics of Materials-ISE*", McGraw Hill Higher Education, ISBN: 0071181474 (2001)