## MODULE DESCRIPTION FORM

**DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING**

# 16327 STRUCTURAL MECHANICS

| | | |
|---|---|---|
| **Module Registrar: Dr M. Wheel** marcus.wheel@strath.ac.uk | **Taught To (Course): All third year undergraduate degree courses delivered by MAE** | |
| **Other Lecturers Involved:** | **Credit Weighting: 10 (ECTS 5)** | **Semester: 1** |
| **Compulsory class** | **Academic Level: 3** | **Suitable for Exchange: Y** |

## Required prerequisites

**Note: It is the responsibility of ALL students to ensure that they satisfy the prerequisite knowledge for this module BEFORE adding as part of curriculum selection. If unsure, please contact the Module Registrar or discuss with your Programme/Year Adviser of Studies.**

**Understanding of solid mechanics fundamentals:**
- equilibrium of rigid bodies in two dimensions;
- concepts of stress, stress transformation, graphical representation of stress transformation using Mohr's circle;
- concept of unidirectional direct straining and extensional deformation;
- relationship between unidirectional stress and strain;
- shear force and bending moment distributions in transversely loaded beams and their graphical representation.

**Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):**

| Lecture | Tutorial | Laboratory | Groupwork | External | Online | Project | Assignments | Private Study | **Total** |
|---|---|---|---|---|---|---|---|---|---|
| | 20 | | | | 20 | | | 60 | 100 |

**Educational Aim**

This class is a direct continuation of the solid mechanics element of class 16232 and aims to extend the students' knowledge and understanding of the mechanical behaviour of materials and structures under a variety of loading conditions.

**Learning Outcomes**

On completion of the module the student is expected to be able to:

LO1 fully understand the central principle of solid mechanics, namely, the application of equilibrium, compatibility and constitutive relations to determining the deformation of loaded materials and demonstrate this understanding through successful mathematical analysis of various problems of relevance.

LO2 determine the deformation of various common structural elements, namely cylinders, beams and columns under various loading conditions, and be competent in analytically analysing relevant structural analysis problems.

**Syllabus**

The module will teach the following:

Solid Mechanics: Two-dimensional stress and strain; multiaxial elastic constitutive relations; multiaxial yield criteria; general equations of elasticity leading to solutions for thick and thin cylindrical structures.

Structural Mechanics: Equations and analysis of continuous beams, both determinate and indeterminate; introduction to energy methods of analysis; superposition and dynamic loading effects; introduction to instability and buckling, including end-loaded columns with imperfections; design analysis of columns using British Standards or Euro-Codes.

**Assessment of Learning Outcomes**

**Criteria**

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1
C1 Demonstrate understanding of solid mechanics principles and ability to analyse problems involving the deformation of loaded materials.

LO2
C1 Demonstrate understanding of structural mechanics principles and ability to analyse problems involving the behaviour of loaded structures.

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

**Principles of Assessment and Feedback**
*(within Assessment and Feedback Policy at: https://www.strath.ac.uk/professionalservices/staff/policies/academic/ )*

Formative feedback will be provided at tutorial sessions primarily through individual or group discussion of exercises prepared in advance by students. Note:- to receive this feedback students should participate in these tutorials but attendance is not mandatory.

Summative feedback will be provided by the return of examination marks to students after the December exam.

**Assessment Method(s) Including Percentage Breakdown and Duration of Exams *(individual weightings)***

| Examination | | | | Coursework | | Practical | | Project | |
|---|---|---|---|---|---|---|---|---|---|
| Number | Month(s) | Duration | ***Weighting*** | Number | ***Weighting*** | Number | ***Weighting*** | Number | ***Weighting*** |
| 1 | Dec | 2 hours | 100% | | | | | | |
| LO1 &LO2 | | | | * | | * | | * | |

* ***L/Os:*** *Indicate which Learning Outcomes (L01, L02, etc) are to be assessed by exam/coursework/practical/project as required.*

**Coursework / Submission deadlines (*academic weeks*):**
None

**Resit Assessment Procedures:**
2hr examination in August diet

**PLEASE NOTE:**
**Students must gain a summative mark of 40% to pass the module. Students who fail the module at the first attempt will be re-assessed during the August diet. This re-assessment will consist entirely of an exam. No marks from any previous attempts will be transferred to a new resit attempt.**

**Recommended Reading**

*****Purchase recommended **Highly recommended reading *For reference**

** Mechanics of Engineering Materials" 2nd edition, by Benham, Crawford & Armstrong, Addison Wesley Longman

**Additional Student Feedback**
*(Please specify details of when additional feedback will be provided)*

| Date | Time | Room No |
|---|---|---|
| TBA | | Check timetable webpages for details |

Session: 2021/22

**Approved:**

**Course Director Signature: Dr E Henderson (SG)**

**Date of Last Modifications: September 13, 2021**

(Updated July 2021-MAE)

# MODULE TIMETABLE

| **Module Code:** | **16327** | **Module Title:** | **Structural Mechanics** |
|---|---|---|---|

**Brief Description of Assessment:**

2 hour exam in December exam period

## Assessment Timing

Indicated on the table below are the start/submission dates for each assignment/project and the timing of each exam/assessment. Dropdowns may be left blank. Add extra notes below the dropdowns where relevant.

**Please note: Timings can and will change, this should only be used as a guide.**

| **Semester One** | W&D Wk | WK1 | WK2 | WK3 | WK4 | WK5 | WK6 | WK7 | WK8 | WK9 | WK10 | WK11 | Exam Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Choose an item. Choose an item. | Choose an item. Choose an item. | Choose an item. Choose an item. | Choose an item. Choose an item. | Choose an item. Choose an item. | Choose an item. Choose an item. | Choose an item. Choose an item. | Choose an item. Choose an item. | Choose an item. Choose an item. | Choose an item. Choose an item. | Choose an item. Choose an item. | Choose an item. Choose an item. | Exam |

| **Semester Two** | C&D Wk | WK1 | WK2 | WK3 | WK4 | WK5 | WK6 | WK7 | WK8 | WK9 | WK10 | WK11 | Exam Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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