



Module Definition Form (MDF)

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| Module code: MOD007044 | Version: 4 Date Amended: 03/Jul/2024 |
| 1. Module Title | |
| Structural Analysis | |
| 2a. Module Leader | |
| Mariantonietta Morga | |
| 2b. School | |
| School of Engineering and the Built Environment | |
| 2c. Faculty | |
| Faculty of Science and Engineering | |
| 3a. Level | |
| 5 | |
| 3b. Module Type | |
| Standard (fine graded) | |
| 4a. Credits | |
| 15 | |
| 4b. Study Hours | |
| 150 | |

| 5. Restrictions | | | |
|--|------------------------------|---------------------------------|------------|
| Type | Module Code | Module Name | Condition |
| Pre-requisite: | MOD007035 | Applied Engineering Mathematics | Compulsory |
| Pre-requisite: | MOD009161 | Structural Mechanics | Compulsory |
| Co-requisites: | None | | |
| Exclusions: | None | | |
| Courses to which this module is restricted: | BEng/ MEng Civil Engineering | | |

LEARNING, TEACHING AND ASSESSMENT INFORMATION

| 6a. Module Description |
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| <p>Deepen your understanding of both structural mechanics and structural analysis techniques. In this module you will cover static equilibrium, the resistance of structures to external loads, behaviour of structures under the influence of external loads, internal stresses, internal stress distributions and superposition. You will be introduced to structural deformations and deflections, determinate and indeterminate structures and influence lines.</p> <p>Hand calculation analysis for beams, frames, continuous beams and trusses will be covered and you will also be introduced to the use of software for structural analysis with an emphasis on the use of hand calculations to support and validate the results obtained using structural analysis packages.</p> <p>You will be expected to show that you can generate structural analysis calculations that are clear and suitable for checking by an independent engineer.</p> |

| 6b. Outline Content |
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Structural mechanics to understand the behaviour of structural elements and simple frames:

- Equations of static equilibrium.
- The principle of superposition.
- Simple bending equation.
- Calculation and sketching of bending and shear stress distributions over the depth of beam sections.
- Combined stress, principal stress and Mohr's circle in a structural member under external actions.

Structural analysis to understand the behaviour of structural elements and simple frames:

- Elastic analysis of line elements and the behaviour of beams under external actions.
- Calculations for and sketching of axial force, shear force and bending moment diagrams for beams and columns.
- Calculation and sketching of slope and deflection of beams.
- Deformations of beams and frames by direct integration and Macaulay's method.
- Analysis of indeterminate structures using suitable methods, such as method of forces and Moment Distribution Method (MDM).

Analysis of trusses with method of nodes and method of sections

Transferable skills to enhance the evaluation of the structural element behaviour:

- Production of clear, concise and well annotated analysis calculations.
- Correct use of specialised terminology commonly used within the industry.
- Effective time management.
- Effective acquisition and use of design information.
- Tackling and solving mathematical problems in relation to structural calculations and design.

6c. Key Texts/Literature

The reading list to support this module is available at: <https://readinglists.aru.ac.uk/>

6d. Specialist Learning Resources

Light structures lab

| 7. Learning Outcomes (threshold standards) | | |
|--|---|--|
| No. | Type | On successful completion of this module the student will be expected to be able to: |
| 1 | Knowledge and Understanding | Determine the principal stresses and direct, bending, combined and shear stress distribution in structural elements. |
| 2 | Knowledge and Understanding | Calculate the bending moment, shear force and axial force in structural elements. |
| 3 | Intellectual, practical, affective and transferrable skills | Manually analyse indeterminate beams and frames. |
| 4 | Intellectual, practical, affective and transferrable skills | Manually analyse statically determinate beams and frames. |

| 8a. Module Occurrence to which this MDF Refers | | | | |
|--|------------|---|----------|------------------|
| Year | Occurrence | Period | Location | Mode of Delivery |
| 2024/5 | ZZF | Template For Face To Face Learning Delivery | | Face to Face |

| 8b. Learning Activities for the above Module Occurrence | | | |
|---|-------|-------------------|--|
| Learning Activities | Hours | Learning Outcomes | Details of Duration, frequency and other comments |
| Lectures | 24 | 1-4 | 2 hours of lectures per week |
| Other teacher managed learning | 12 | 1-4 | 1 hour of laboratory / tutorial per week |
| Student managed learning | 114 | 1-4 | Autonomous study and individual learning activities. |
| TOTAL: | 150 | | |

| 9. Assessment for the above Module Occurrence | | | | | |
|--|---------------------------|--------------------------|----------------------|--------------------------------|----------------------------|
| Assessment No. | Assessment Method | Learning Outcomes | Weighting (%) | Fine Grade or Pass/Fail | Qualifying Mark (%) |
| 010 | Practical | 1,2,4 | 50 (%) | Fine Grade | 30 (%) |
| 1500 words equivalent presentation; this assessment is aligned with Engineering Council learning outcomes AHEP4: C2 (LO1 and LO2) and C3 (LO4). | | | | | |
| Assessment No. | Assessment Method | Learning Outcomes | Weighting (%) | Fine Grade or Pass/Fail | Qualifying Mark (%) |
| 011 | Examination Chelmsford | 2-4 | 50 (%) | Fine Grade | 30 (%) |
| 1.5 hour closed book examination; this assessment is aligned with Engineering Council learning outcomes C2 (LO2) and C3 (LO3 and LO4). | | | | | |

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:

- (a) achieve the qualifying mark for each element of fine graded assessment as specified above
- (b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]