

MODULE DESCRIPTION FORM



DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CL207 STRUCTURAL MECHANICS AND MATERIALS 2

Module Registrar: Shangtong Yang	Taught To (Course): Cohorts for whom class is compulsory / optional / elective		
Other Lecturers Involved: David Alcaraz-Garcia	Credit Weighting: 20	Semester: 1 and 2	
Assumed Prerequisites: CL132	Compulsory/ optional / elective class	Academic Level: 2	Suitable for Exchange: Y/N

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	2			4		80	80	206

Educational Aim

This module aims to introduce the students to advanced topics in structural mechanics and structural design principles

Learning Outcomes

On completion of the class the student is expected to be able to

Semester 1 – Shangtong Yang:

- LO1 Able to analyse problems of torsion for simple structures, e.g., beams with circular section.
- LO2 Able to analyse beams with moving live loads.
- LO3 Able to calculate deflection of simple beams.
- LO4 Able to calculate bending induced stresses.

Semester 2 – David Alcaraz-Garcia

- LO5 Understand the basic principles of limit state design.
- LO6 Carry out qualitative analysis of statically indeterminate beams & frames.
- LO7 Understand the principles of validating structural analysis models & verification of results from structural analysis software

(UK SPEC suggests no more than 4 learning outcomes per class. Statements must be broad and be syllabus free and link in with the intended learning outcomes on the course specifications.)

Syllabus

The module will include the following:

Shangtong Yang:

- Bending moment expression.
- Deflection of beams.
- Torsion of beams.
- Influence line for beams.
- Bending induced stress and sectional properties for beams.

David Alcaraz-Garcia:

- Load paths in simple frames and structures
- Introduction to Eurocodes
- Introduction to loadings in accordance with Eurocodes
- Characteristic and ultimate loads
- Load combinations and pattern loading
- Qualitative analysis of indeterminate beams and frames
- Modelling statically indeterminate structures using structural analysis software

Assessment of Learning Outcomes

Criteria

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

[Note: Criteria break the LO down into 'teachable' elements but do not become syllabus orientated i.e. no mention of CAD package names, components etc.]

- LO1 Able to analyse problems of torsion for simple structures, e.g., beams.
- C1 Understand the basic concepts of torsion, e.g., torque, shear stress etc.
 - C2 Able to calculate the shear stresses for given torques applied on different structures.
- LO2 Able to analyse beams with moving live loads.
- C1 Understand the basic principles of live loads and influence lines.
 - C2 Able to construct influence lines of shear force and bending moment for beams.
 - C3 Able to apply the influence lines to a number of loading cases for evaluation of structural safety.
- LO3 Able to calculate deflection of simple beams.
- C1 Understand bending resistance property of cross-section of beams.
 - C2 Determine the bending moment expression with respect to location.
 - C3 Use double-integration method to calculate the deflection of beams.
- LO4 Able to calculate bending induced stresses.
- C1 Understand the sectional properties for beams, e.g., first moment of area and second moment of area.
 - C2 Understand the engineer's bending formula and physical meanings.
 - C3 Able to analyse the bending induced stress development at the cross-section.
- LO5 Understand the basic principles of limit state design.
- C1 Ability to define the load paths in statically determinate framed structures.
 - C2 Ability to calculate the characteristic and ultimate values for permanent and variable actions in accordance with Eurocodes 0 and 1.
 - C3 Appreciation of load combinations and pattern loading in accordance with Eurocodes 0 and 1.
- LO6 Carry out qualitative analysis of statically indeterminate beams & frames.
- C1 Sketch the deflection, reaction and bending moment and shear diagrams for a range of continuous beam and indeterminate frame configurations.
 - C2 Understand the structural significance of the points of contraflexure and hinges.
 - C3 Understand the difference between determinate and indeterminate structures.
- LO7 Understand the principles of validating structural analysis models & verification of results from structural analysis software
- C1 Knowledge of modelling assumptions.
 - C2 Appreciation of how sensitivity analysis is used to validate an analysis model.
 - C3 Knowledge of methods of verifying results.
 - C4 Ability at verifying results for simple structural

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/staff/policies/academic/>)

Please state briefly how these are incorporated in this module.

1. Marking criteria are outlined clearly in the assignment hand-out and multiple opportunities for questions are available, either in class or through electronic correspondence. Each marking sheet is taken directly from this handout.
2. Group assignments, project and lab work encourages interaction between peer groups and with the instructor.
3. Tutorial questions are provided to support student self-assessment and reflection.
4. Departmental policy is to carry out mid-term class assessments and provide feedback to students.

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

	Examinations			Courseworks		Projects		
	Number	Month(s)	Duration	Weighting	Number	Weighting	Number	Weighting
	2		4 hours	60%	3	40%		
L/Outcomes	LO1 – LO7			LO1 – LO7				

Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

Coursework / Submissions deadlines (*academic weeks*):

- S21: Class test – Semester 1, Week 6 – 10%
 S22: Lab report – Semester 1, Week 9 – 10%
 S23: Robot Structure Analysis Coursework – Semester 2, Week 9 – 5%
 S24: Modelling – Semester 2, Week 11 – 15%
 S25: Online-quizzes – both semesters in different weeks – 10%

Resit Assessment Procedures:

--hr examination in August diet / Resubmission of coursework(s) prior to commencement of the August exam diet.
(delete as appropriate)
 Resit mode will be communicated to you directly after May exam if it applies to you, i.e., exam in August or coursework during the summer.

PLEASE NOTE:

Students must gain a summative mark of 40% /-50% *(delete as appropriate)* to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of exam/coursework/viva *(delete as appropriate)*. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

***Purchase recommended	**Highly recommended reading	*For reference
** Structural and Stress Analysis', 2 nd ed. by T.H.G.Megson, pub. Elsevier, 2005. ISBN 0 7506 6221 2		
** Introduction to Structural Mechanics', by P.S. Smith, pub. Palgrave, 2001. ISBN 0-333-96255-9		
** Structural Analysis' SI edition, by R.C. Hibbeler, pub. Pearson, 2005. ISBN 013-124-572-4		
* Understanding Structural Analysis' by David Brohn, ISBN 0-246-12238 – 2		
* Structural Analysis', 3 rd ed. By A Kassimali, pub. Thomson, 2005. ISBN 0-534-39168-0		
* Modern Structural Analysis - Modelling Process and Guidance' by Iain A MacLeod. ICE Publishing. ISBN 9780727732798-072773279X.		
*BS EN 1990, Eurocode 0: Basis of Structural Design.		
*BS EN 1991, Eurocode 1: Actions on Structures – Part 1-1.		

Additional Student Feedback

(Please specify details of when additional feedback will be provided)

Date	Time	Room No

Session: mid-term oral feedback.

Approved:

Course Director Signature: Shangtong Yang

Date of Last Modifications: 31/8/22

(Updated May 2018)

MODULE TIMETABLE

Module Code:

CL207

Module
Title:

Structural Mechanics and Materials 2

Brief Description of Assessment:

One class test in S1, one lab report in S1, one assignment in S2, a number of online quizzes in both S1 and S2, and a final exam in May.

Assessment Timing:-

Indicate on the table below the start/submission dates for each assignment/project and the timing of each exam/assessment using the dropdowns provided. Dropdowns can be left blank. Add extra notes below the dropdowns.

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

Semester	W&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
Semester One	Choose an item. Choose an item.	Online Test Choose an item.	Choose an item. Choose an item.	Online Test Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Class Test Choose an item.	Choose an item. Choose an item.	Online Test Choose an item.	Online Test Lab Report Submission	Online Test Choose an item.	Choose an item. Choose an item.	Choose an item.
	Choose an item. Choose an item.	Choose an item. Choose an item.	Online Test Choose an item.	Choose an item. Choose an item.	Online Test Choose an item.	Choose an item. Choose an item.	Online Test Choose an item.	Course work Set Choose an item.	Course work Set Choose an item.	Course work Submit Choose an item.	Choose an item. Choose an item.	Course work Submit Choose an item.	Exam