



MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

16565 ENGINEERING COMPOSITES

Module Registrar: Dr Ross Minty ross.f.minty@strath.ac.uk	Taught To (Course): Cohorts for whom class is compulsory / optional	
Other Lecturers Involved:	Credit Weighting: 10	Semester: 2
Compulsory/ optional class	Academic Level: 5	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.

Ability to work with a spreadsheet and/or MATLAB to aid calculations (MATLAB is the officially supported language/environment for this module, but the assignments and exams can be done in any programming language/software package, including EXCEL).

Mathematical methods:

Linear algebra, vectors & matrices.

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

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	Total
20	7				1			72	100

Educational Aim

This module aims to give a basic understanding of modern composite materials and an appreciation of predictive modelling and design implications when composites are applied to engineering structures. The main composite manufacturing processes, evaluation and testing will also be outlined.

Learning Outcomes

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

LO1 understand the relationships between the constituents, structure, properties and processing techniques of composites.

LO2 understand micromechanics, classical laminate theory and some of the complexities of laminated systems.

LO3 understand the fundamentals of manufacturing defects, machining and joining, failure mechanisms and damage limitation and repair.

LO4 appreciate sustainability considerations and the development and use of SMART composites.

Syllabus

The module will teach the following:

1. Classification and definition of composites.
2. Fibres and matrices: fibre architecture; thermoplastic and thermosetting matrices.
3. Composite manufacturing: wet lay-up & compression moulding; filament winding & pultrusion; moulding (e.g. resin transfer moulding); pre-preg; choice of manufacturing route.

4. Micromechanics of a ply for weight and stiffness calculations as well as for strength calculation
5. 3D constitutive equations and plane stress constitutive equations of a ply
6. Classical Laminate Theory, ABD matrices and coupling between strain terms
7. Composite failure mechanisms. Impact failure mechanisms & toughening of composites.
8. Manufacturing defects. Machining of composites and joint design. Damage limitation and repair.
9. Characterisation and NDT.
10. SMART composites.
11. Sustainability of composite materials and Life Cycle Assessment.

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 an understanding of composite constituents: fibres and matrices, and their properties.
- C2 The ability to critically evaluate manufacturing techniques and choose an appropriate manufacturing method.
- C3 Assessment of the mechanical performance of composites from the given properties of the constituents.

LO2:

- C1 Describe and calculate the response of composite laminae and laminates to external loading via laminate theory involving matrix construction and manipulation.

LO3:

- C1 Demonstrate an understanding of manufacturing defects, machining of composites and joining methods.
- C2 The ability to critically assess possible failure mechanisms and how failure can be prevented.

LO4:

- C1 Describe and explain developments in SMART composites and how sustainability considerations can be addressed.

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/>)

Summative assessments: a) Time constrained quiz (Online Myplace quiz), b) Exam during the April/May exam period

Formal feedback: a) Automatically generated feedback will be provided including the correct answer and a short explanation, and the student's mark will be given for the online quiz, released at a minimum of 72 hours after the quiz deadline. b) Written feedback for the exam will be provided.

Informal feedback: Verbal feedback will be provided to the students during the lectures and tutorial sessions. Additional verbal feedback during the on-campus sessions will be given to support the provided my Myplace quiz feedback.

Written feedback will be given via Myplace forum and email to personal inquiries to the lecturers.

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

Examination				Coursework		Practical	
Number	Month(s)	Duration	<i>Weighting</i>	Number	<i>Weighting</i>	Number	<i>Weighting</i>
1 Exam	Apr/May	2hrs	70%				
1 Time constrained quiz	S2: Week 7	1hr	30%				
* LO1-LO4				*		*	

***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*):

Quiz week 7

Resit Assessment Procedures:

2hr examination in August diet.

PLEASE NOTE:

Students must gain a summative mark of 50% 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

Please refer to the Reading List on Myplace.

** "An Introduction to Composite Materials" by D Hull & Clyne T.W., Cambridge University Press

Additional Student Feedback

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

Date	Time	Room No
		Check Myplace for details

Session: 2023/24

Approved:

Course Director Signature: S Connolly (on behalf of E Henderson)

Date of Last Modifications: 25/08/23

(Updated August 2023)

MODULE TIMETABLE

Module Code:

16565

Module Title:

Engineering Composites

Brief Description of Assessment:

Examination (70% of overall mark)

1 time-constrained quiz, duration of 1 hour (via Myplace; 30% of overall mark), week 7.

Assessment Timing

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.	Choose an item. Choose an item.

Semester Two	C&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.	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.