

MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME523 POLYMER AND POLYMER COMPOSITES

Module Registrar: Dr Barbara A. Keating barbara.keating@strath.ac.uk	Taught To (Course): Cohorts for whom class is optional		
Other Lecturers Involved: Dr M Mohammed	Credit Weighting: 10	Semester: 2	
Assumed Prerequisites: ME212, ME403 16232/16327 Engineering Mechanics	Optional class	Academic Level: 5	Suitable for Exchange: N

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

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	Total
22	11							67	100

Educational Aim

This module aims to introduce modern fibre reinforced polymer composites by first breaking them down to basic material components (e.g. polymer matrix, fibre reinforcement, and polymer-fibre interface) and then subsequently assembling them for lightweight composites through mechanical modelling. This module is cross-disciplinary and has a focus on both composites engineering and materials science.

Learning Outcomes

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

- LO1 Identify and describe main material components responsible for building lightweight composite materials
- LO2 Understand and analyse material mechanical behaviour in composite materials and their components
- LO3 Select different materials and design lightweight composites
- LO4 Understand and select different approaches to manufacturing lightweight composites

Syllabus

The module will teach the following:

Polymers for lightweight composites

- Polymer definition and basic synthesis route
- Polymer structure in solid state
- Polymer manufacturing technology
- Polymer mechanical behaviour: viscoelasticity

Fibre Reinforcement for lightweight composites

- Fibre structures (carbon fibre, glass fibre)
- Fibre mechanical properties and strength analysis
- Fibre manufacturing technology

Fibre-Polymer Interface in lightweight composites

- Role of composites interface
- Adhesion mechanisms in composites interface
- Interface characterisation and modification

Materials mechanics in lightweight composites

- Micro-Mechanical modelling for continuous fibre reinforced composites
- Micro-Mechanical modelling for discontinuous fibre reinforced composites

Manufacturing techniques for lightweight composites

- Injection moulding
- Compression moulding
- Vacuum infusion
- Pultrusion
- Autoclave

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 Identify and describe main material components responsible for building lightweight composite materials

C1: Have the ability to describe a range of advanced lightweight materials

C2: Have the ability to describe structure-property relationship in composite constitutes

C3 Have the ability to select different materials for assembling lightweight composite materials

LO2 Understand and analyse material mechanical behaviour in composite materials and their components

C1: Have the skill to calculate key mechanical properties in different composite structures

C2: Have the ability to recognise different composite materials and their potential and limitation

LO3 Select different materials and design lightweight composites

C1: Have the ability to design composite materials for lightweight applications

C2: Have the skill to perform simple failure analysis

LO4 Understand and select different approaches to manufacturing lightweight composites

C1: Have the ability to describe and select different techniques for manufacturing lightweight composites

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/>)

Tutorials

Assistance and feedback will be provided at weekly tutorial sessions through verbal discussion with individuals or groups. Tutorial questions will be made available to students in advance and to receive the feedback students should participate in these tutorials but attendance is not mandatory.

Revision

Additional tutorial sessions will be provided during revision period to give students feedback on their revision progress.

Course exam

Formal, summative feedback can be provided on request by the return of examination marks to students after assessment (note: - exam scripts will not be returned to students and no individual or collective discussion of exam performance will be facilitated).

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

Examination				Coursework		Practical		Project	
Number	Month(s)	Duration	Weighting	Number	Weighting	Number	Weighting	Number	Weighting
1	Apr/May	2hrs	80%	1 quiz	20%				
* LO1,2,3,4				*		*		*	

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

Coursework / Submissions deadlines (academic weeks):

Online 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 (do NOT purchase)**

- ** "Principles of Polymer Engineering 2nd Edition" by N.G. McCrum, C.P. Buckley and C.B. Bucknall
- ** "Introduction to Polymers 2nd Edition" by Young and Lovell
- ** "Composite Materials: Engineering and Science" By F.L. Matthews & R.D. Rawlings
- ** "An introduction to Composite Materials" by D Hull
- ** "Advanced Polymer Composites: Principles and Applications" by Bor Z. Jang
- * "Handbook of Polymer-Fibre Composites" Editor F.R. Jones

Additional Student Feedback

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

Date	Time	Room No
		Check timetable webpages for details

Session: 2020/21

Approved:

Course Director Signature: Dr Stuart Grey
Date of Last Modifications: 31 August 2020

MODULE TIMETABLE

Module Code:

ME523

Module Title:

Polymer and Polymer Composites

Brief Description of Assessment:

Online test week 7
2 hour examination in the April/May diet

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 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.