MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME212 MATERIALS ENGINEERING AND DESIGN

Module Registrar: Dr A McLaren **andrew.mclaren@strath.ac.uk**	**Taught To (Course): Cohorts for whom module is compulsory**		
Other Lecturers Involved:	**Credit Weighting: 10 (ECTS 5)**	**Semester: 1 and 2**	
Assumed Prerequisites: None	**Compulsory module**	**Academic Level: 2**	**Suitable for Exchange: Y**

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

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
	10				40		10	40	100

Educational Aim

The module aims to provide a grounding in concepts of materials science and engineering with reference to mechanical design and material selection.

Learning Outcomes

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

LO1 Understand crystal structure, deformation mechanisms and strengthening mechanisms in metals

LO2 Understand the use of phase diagrams to predict the equilibrium structure of metals and alloys

LO3 Develop a basic knowledge of heat treatment of metals

LO4 Understand the properties on non-metallic materials

LO5 Appreciate the importance of environmental factors and sustainability

Syllabus

The module will be delivered though blended online learning. This will consist of short pre-recorded videos and directed reading and study, supported by fortnightly face-to-face tutorials and online quizzes. The module will teach the following, divided in two semesters.

Semester 1

- Measurement of mechanical properties of materials
- Atomic bonding and crystal structure of solids
- Crystal defects and effects on properties
- Strengthening mechanisms and heat treatment
- Sustainability and natural materials

Semester 2

- Phase diagrams and microstructure of metals and alloys
- Engineering metals and alloys
- Heat Treatment and non-equilibrium transformations
- Non-metallic materials including ceramics, polymers and composites

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 knowledge in strengthening and deformation processes with respect to metals and alloys
C2 demonstrate understanding of atomic structure, packing density and slip planes in crystals
C3 demonstrate understanding of the influence of crystal structure in terms of physical and mechanical properties

LO2
C1 demonstrate knowledge using different types of phase diagram
C2 understand the difference between phases and weight composition
C3 demonstrate knowledge in recognizing steels and cast-iron microstructure

LO3
C1 demonstrate knowledge of heat treatment methods and applications
C2 demonstrate understanding of the role of phase diagrams in determining heat treatment procedure
C3 demonstrate knowledge in hardening and tempering, annealing, stress relieving and normalizing

LO4
C1 demonstrate knowledge of a range of non-metallic materials
C2 describe the relationship between processing, structure and properties in ceramics, polymers, and composites

LO5 Appreciate the importance of environmental factors and sustainability
C1 demonstrate understanding of sustainability in material supply and use
C2 demonstrate understanding of the use of natural and biomaterials

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/)

Formal, summative feedback will be provided 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).

Informal feedback will be provided at regular on-campus tutorial sessions primarily through verbal discussion with individuals or groups on tutorial exercises attempted in advance by students (note:- to receive this feedback students should participate in these tutorials but attendance is not mandatory).

Fortnightly online quizzes will provide formative feedback on each student's learning and may be reviewed in tutorial sessions.

A first exam at the end of Semester 1 will be used to assess the students' understanding of the concepts inherent in Semester 1.

A second exam at the end of Semester 2 will be used to assess the students' understanding of the concepts inherent in Semester 2.

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 1	Dec Apr/May	1hr 1hr	50% 50%						
* Dec sem1 exam: LO1 – LO3, LO5 * Apr/May sem2 exam: LO3, LO4				*		*		*	

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

Coursework / Submissions deadlines (*academic weeks*):
There will be an online quiz each fortnight. These will take place in weeks 2, 4, 6, 8 and 10 of each semester. These will not contribute to the marks for the module, but will provide individual feedback and help prepare each student for the end of semester exam.

Resit Assessment Procedures:
2 hr written 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**

** "Materials Science and Engineering: an Introduction" by Wm D Callister, John Wiley & Sons, 2003, ISBN 0-471-22471-S
** Additional online textbooks will be referenced through Myplace.

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

Date	Time	Room No
		Check timetable webpages for details

Session: 2023/24

Approved:

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

Date of Last Modifications: 25/08/2023

(Updated August 2023)

MODULE TIMETABLE

Module Code:	**ME212**	**Module Title:**	**MATERIALS ENGINEERING AND DESIGN**

Brief Description of Assessment:

Semester 1 Exam (1 hour)
Semester 2 Exam (1 hour)

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.	Exam

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.	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