MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME960 APPLIED METALLURGY

Module Registrar: Dr A I Toumpis athanasios.toumpis@strath.ac.uk	**Taught To (Course): MSc Advanced Mechanical Engineering (Online)**	
Other Lecturers Involved:	**Credit Weighting: 10**	**Semester: 2 (Online Learning)**
Optional class for MSc AME (Online) only	**Academic Level: 5**	**Suitable for Exchange: N**

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.

Fundamental Materials Science knowledge:
Basic understanding of the structure of materials
Prior knowledge of basic analytical principles for the deformation behaviour of metals and alloys, along with the ability to employ fundamental stress, strain, modulus of elasticity and other equations.
Elementary knowledge of alloy equilibrium phase diagrams and of typical microstructures and phases in steel alloys

Basic engineering research skills:
Ability to research the engineering literature on a specified subject area and construct a short engineering report
Appreciation of the diverse resources available and of the methods to access them
Basic competency in studying and summarising engineering journal papers

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

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
	9				9			82	100

Educational Aim

This module aims to develop an understanding of the applied metallurgy of principal engineering alloys, to include structure & properties of metals and alloys, metal extraction, diffusion theory, heat treatments, welding engineering and typical degradation mechanisms.

Learning Outcomes

On completion of the module, the student is expected to:

LO1 Gain knowledge and understanding of applied metallurgy (structure, properties, application, etc.)
LO2 Develop skills in material selection and processes used for physical property manipulation
LO3 Be able to apply the knowledge gained across a range of industrial sectors

Syllabus

The module will teach the following:

- Introduction to the structure of metals, reviewing aspects such as crystal structure, mechanical properties, crystal defects and their effects on alloy properties
- Application of metallurgical principles in the extraction and processing of iron and aluminium
- Theory of diffusion and the phenomenon of mass transport for heat treatments
- Phase diagrams (equilibrium and non-equilibrium conditions), focusing on steel phase transformations
- Heat treatments, primarily for steel alloys; hardening, softening and conditioning

- Welding engineering
- Corrosion science, including theory and practice, corrosion protection, etc.

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 Gain knowledge and understanding of applied metallurgy

C1 Exhibit knowledge of fundamental materials science over a range of common engineering alloys

C2 Demonstrate understanding of heat treatments, corrosion science and welding engineering

LO2 Develop skills in material selection and processes used for physical property manipulation

C1 Demonstrate understanding and application of material selection principles

C2 Evidence competence in applying advanced strategies for material and process selection

LO3 Be able to apply knowledge across several industrial sectors

C1 Present understanding of diverse heat treatment processes within an industrial context

C2 Exhibit knowledge of the degradation phenomena influencing a variety of engineering materials

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/)

Deliver high quality feedback information that helps learners self-correct.
Students are invited and actively encouraged to contact staff using the Myplace forum or by email with any module-related questions upon which specific formative feedback will be provided, including advice on style and expectations.

Ensure that summative assessment has a positive impact on learning.
The open book nature of the exam encourages students to read and research widely in preparation of their written answers.

Give choice in the topic, method, criteria, weighting or timing of assessments.
The Myplace activities and the online exam offer a 3-week submission window, allowing students to schedule their coursework around employment-related commitments.

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 (DL)	85%	5 (DL)	15%		
				* LO1-LO3					

* ***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*):

Knowledge consolidating multiple choice quizzes during the semester (5 untimed quizzes x 3 marks each = 15% of total mark)

Online exam-style coursework released in wk11 (March) with a submission date prior to the April/May exam diet

Resit Assessment Procedures:
Submission of alternate ^^coursework prior to commencement of the July/August exam diet.

^^Students must contact the module Registrar for details as soon as results confirm that a resit is required.

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 prior to the July/August exam diet. This re-assessment will consist entirely of coursework. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

***** Purchase essential** ****Purchase recommended** ***Highly recommended reading**

*** Callister W.D. & Rethwisch D.G., Materials Science and Engineering: An Introduction, any edition, Wiley

* Any textbook on Applied Metallurgy; multiple options proposed in the module's reading list on Myplace

Additional Student Feedback

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

Date	Time	Room No
Email to arrange		

Session: 2024/25

Approved:

Programme Lead/Director Signature: Dr A McLaren
Date of Last Modifications: 19/08/2024

(MAE template updated July 2024)

MODULE TIMETABLE

Module Code:	**ME960**	**Module Title:**	**Applied Metallurgy**

Brief Description of Assessment:

Knowledge consolidating multiple choice quizzes (5 untimed quizzes)
Online exam-style coursework released in wk11 with a submission date before the April/May exam diet

Assessment Timing

Indicated on the table below are the start/submission dates for each assignment/project and the timing of each exam/assessment.

Please note: Timings could change during unforeseen periods of disruption; 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.

Semester Two	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Online Test	Online Test	Online Test	Choose an item. Choose an item.	Choose an item. Choose an item.	Online Test	Online Test	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Set (exam style)	Coursework Submit (Online exam style submission **before** exam diet)