MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME931 INDUSTRIAL METALLURGY

Module Registrar: Dr A I Toumpis athanasios.toumpis@strath.ac.uk	**Taught To (Course): MSc Advanced Mechanical Engineering**	
Other Lecturers Involved:	**Credit Weighting: 10**	**Semester: 2**
Compulsory (MSc AME with Materials) / Optional class for MSc AME 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 formal 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**
10	3		5				5	77	100

Educational Aim

This module aims to develop an understanding of applied industrial metallurgy, to include 'Deformation Behaviour and Properties of Metals and Alloys', 'Metal Extraction', 'Characterisation Methods', 'Heat Treatments', 'Welding Engineering' and '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, steel 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 theory and practice, scientific context, corrosion protection

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 the knowledge across a range of industry 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/)

Assessment to be carried out through coursework and standard 2-hour exam.

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 during the assignment presentations sessions and at regular 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.

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	Apr/May	2 hours	80%	2	20%				
*LO1, LO2, LO3									

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

Coursework breakdown:	Mini-lecture slide pack	10%
	Presentation (approx. 20 min)	10%

Coursework / Submission deadlines (*academic weeks*): Presentation weeks will be set at the start of the semester, mini-lecture slide pack is due one week prior to each group's presentation slot.

Resit Assessment Procedures:
2hr examination in July/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 July/August exam 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**

*** 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
		Check timetable webpages for details

Session: 2024/25

Approved:

Programme Lead/Director Signature: Dr A McLaren
Date of Last Modifications: 23/08/2024

(MAE template updated July 2024)

MODULE TIMETABLE

Module Code:	**ME931**	**Module Title:**	**Industrial Metallurgy**

Brief Description of Assessment:

- Assignment: research, analysis, reporting and presentation of a relevant subject area/topic in groups. The students will be informed of the specific presentation slots towards the semester start.
- Regular exam diet (covering all lectures & tutorials plus information provided in the presentations)

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.	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Set	Choose an item. Choose an item.	Choose an item. Choose an item.	Presentation	Presentation	Presentation	Presentation	Presentation	Choose an item. Choose an item.	Exam