

MODULE DESCRIPTOR

Module Title

Manufacture and Material 1

Reference	EN1102	Version	3
Created	April 2023	SCQF Level	SCQF 7
Approved	July 2018	SCQF Points	30
Amended	August 2023	ECTS Points	15

Aims of Module

To provide the student with the fundamental principles of structures and properties of engineering materials as well as metal alloys.

Learning Outcomes for Module

On completion of this module, students are expected to be able to:

- 1 Understand the internal structure of atoms and molecules as well as bonding and imperfections - and how quality is affected.
- 2 Understand the important properties of solid materials including mechanical, physical, electrical and thermal.
- 3 Understand the fundamentals of heat treatment, surface hardening and metal-casting.
- 4 Develop awareness of global supply chain issues and environmental impact of materials use.
- 5 Investigate the mechanical properties of materials using a tensile test.

Indicative Module Content

The structure of metals: types of atomic bonds, crystal structure of metals, deformation and strength of single crystals, grain and grain boundaries, recovery and grain growth, cold, warm and hot working. Imperfections in solids: point defect, miscellaneous imperfections, microscopic examination. Material properties: mechanical (tensile strength, toughness, hardness and ductility), physical (density, melting point and specific heat), thermal conductivity and expansion, electrical properties and corrosion resistance. Introduction to engineering materials: metals and their alloys, ceramics, polymers and composites. Metal alloys: phase diagram, main types of ferrous and non-ferrous materials, heat treatment of ferrous and non-ferrous alloys, surface hardening techniques for steels used by industry with reference to engineering applications. Fundamental of metal casting (solidification of metals, fluidity of molten metal and defects), metal casting processes and equipment, design considerations in casting, economics of casting. Introduction to global supply chain and environmental impacts of materials.

Module Delivery

The module is delivered in Blended Learning mode using structured online learning materials/activities and directed study, facilitated by regular online tutor support. Workplace Mentor support and work-based learning activities will allow students to contextualise this learning to their own workplace. Face-to-face engagement occurs through annual induction sessions, employer work-site visits, and modular on-campus workshops.

Indicative Student Workload

	Full Time	Part Time
Contact Hours	30	N/A
Non-Contact Hours	30	N/A
Placement/Work-Based Learning Experience [Notional] Hours	240	N/A
TOTAL	300	N/A
<i>Actual Placement hours for professional, statutory or regulatory body</i>	240	

ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

Component 1

Type:	Coursework	Weighting:	80%	Outcomes Assessed:	1, 2, 3, 4
Description:	Logbook of solved tutorials and online assessments.				

Component 2

Type:	Coursework	Weighting:	20%	Outcomes Assessed:	5
Description:	Report.				

MODULE PERFORMANCE DESCRIPTOR

Explanatory Text

The module has 2 components and to gain an overall pass a minimum D grade must be achieved in each component. The component weighting is as follows: C1 (y-axis) is worth 80% and C2 (x-axis) is worth 20%.

		Coursework:						
		A	B	C	D	E	F	NS
Coursework:	A	A	A	A	B	E	E	
	B	B	B	B	B	E	E	
	C	B	C	C	C	E	E	
	D	C	C	D	D	E	E	
	E	E	E	E	E	E	E	
	F	E	E	E	F	F	F	
	NS	Non-submission of work by published deadline or non-attendance for examination						

Module Requirements

Prerequisites for Module	None.
Corequisites for module	None.
Precluded Modules	None.

INDICATIVE BIBLIOGRAPHY

- 1 CALLISTER W.D., RETHWISCH, D. G., 2014. Materials Science and Engineering. 9th Edition SI Version, New York: Wiley
- 2 KALPAKJIAN, S. and SCMID, S., 2014. Manufacturing engineering & technology. 7th ed. Harlow: Pearson.
- 3 GROOVER, M.P., 2016. Principles of modern manufacturing. Global Edition SI Version, New York: Wiley.
- 4 KING, A., 2021. Critical materials. Amsterdam, Netherlands ; Cambridge, MA : Elsevier
- 5 PRASAD, M. N. V., SHIH, K. editors 2016. Environmental materials and waste : resource recovery and pollution prevention. London : Academic Press, an imprint of Elsevier.