

<b>Module Title:</b>	Materials Science
<b>Language of Instruction:</b>	English
<b>Credits:</b>	5
<b>NFQ Level:</b>	6
<b>Module Delivered In</b>	No Programmes
<b>Teaching &amp; Learning Strategies:</b>	The module will be delivered using lectures, tutorials and practical tasks with reference to standard mechanical engineering materials and science.
<b>Module Aim:</b>	<ul style="list-style-type: none"> <li>To provide the student with a broad knowledge of Materials, Material Science and the methods of altering material properties.</li> </ul>
<b>Learning Outcomes</b>	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Describe and apply the basic fundamentals of Material Science for Mechanical Engineering
LO2	Explain the characteristics, properties and identification of ferrous, non-ferrous materials and composites
LO3	Describe the Mechanical Properties and deformation of materials.
LO4	Select and apply appropriate mathematical formulae to solve Material Science problems
LO5	Describe Material Science experiments relevant to mechanical engineering and interpret the results
<b>Pre-requisite learning</b>	
<b>Module Recommendations</b>	
<i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>	
No recommendations listed	
<b>Incompatible Modules</b>	
<i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>	
No incompatible modules listed	
<b>Co-requisite Modules</b>	
No Co-requisite modules listed	
<b>Requirements</b>	
<i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>	
No requirements listed	

## Module Content & Assessment

Indicative Content
<b>Atoms, Molecules and Crystals</b> o Electron, Proton, Neutron o Structure of the atom, states of matter o Chemical bonding of atoms, Carbon and its compounds, Intermolecular forces o Lattice structures, Dendritic solidification, Impurities in Cast metals, Influence of cooling rates on crystal size.
<b>Mechanical Properties and Testing</b> o Stress, Strain, Young's Modulus of Elasticity, Hooke's law o Tensile, Hardness, Impact Tests
<b>Non-Destructive Testing</b> o Detection of surface cracks and flaws o Penetrant methods o Magnetic dust methods o Acid pickling methods o X-ray methods o Ultrasonic testing
<b>Iron and Steel</b> o Steel production o Composition of steel o- Heat treatment of steel
<b>Alloy Steel's</b> o Constructional steels o Tool steel's and die steels o Stainless steels o Heat resisting steels o Magnet Alloys
<b>Cast Iron</b> o Composition of cast iron o Influence of cooling rate on the properties of cast iron o Ordinary cast iron's o Malleable cast iron's o Alloy cast iron's
<b>Non-ferrous Metals and Alloys</b> o Non-ferrous metals o Alloys of non-ferrous metals
<b>Plastics and Rubbers</b> o Thermoplastic Polymers o Thermosetting Polymers o Rubber
<b>Ceramics</b> o Engineering Ceramic's o Properties of Ceramic's
<b>Composite Materials</b> o Particle hardened composites o Dispersion-hardened materials o Fibre-reinforced composites o Composite bearing materials

Assessment Breakdown	%
Continuous Assessment	40.00%
End of Module Formal Examination	60.00%

Continuous Assessment				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Performance Evaluation	Students will be expected to complete a number of written assignments and assessments during the academic year, typically at the conclusion of one or more learning outcomes.	1,2,3,4,5	40.00	n/a

No Project

No Practical

End of Module Formal Examination				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Formal Exam	Summer Final Exam	1,2,3,4,5	60.00	End-of-Semester

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

**Module Workload**

<b>Workload: Full Time</b>		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Every Week	2.00
Laboratory	Every Week	0.50
Estimated Learner Hours	Every Week	3.00
Total Hours		5.50

