MATL H1401: Materials and Process

Module Title:	Materials and Process
Language of Instruction:	English

Credits:	10

NFQ Level:	6

Module Delivered In	No Programmes

Teaching & Learning Strategies:	The learner is immersed in a range of collaborative, problem-solving activities, to investigate and evaluate where design can propose solutions for commercial and social benefit. The holistic, student-centred studio-based approach, facilitated by faculty, is intended to negotiate, facilitate and guide learner engagement and scaffold a deep-learning using the following strategies: • Lectures, • Studio based learning, • Peer-to-peer group/team learning, • E-Learning, • Presentation, • Facilitated peer-to-peer critique/review, • Self-directed independent learning,

Module Aim:	The aim of this module is to introduce learners to design materials, production processes and how material properties and behaviour are governed by their internal structure. The learner will also be introduced to the different classes and properties of materials and their uses alongside the basic production processes associated with these materials. The learner will exposed to material science in order to see the restrictions and possibilities that govern the use of particular materials for specific tasks. The aim of this module is also to introduce the learner to terminology, function, ratings and safety requirements of electrical components used in electrically powered products. The learner will also be expected to apply this theoretical knowledge in a design project

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	To recognise the different classes of materials and their broad range of uses in product design
LO2	To demonstrate a knowledge of production processes and recognise the design opportunities and limitations of each process
LO3	To demonstrate the ability to select appropriate materials and production methods for besed on specific criteria
LO4	To demonstrate a knowledge of properties that impact on material selection
LO5	To demonstrate a knowledge of the basic mechanical and structural engineering principles
LO6	To demonstrate a knowledge of the basic electrical/electronic systems and components
LO7	To demonstrate the ability to anaylse existing products from a material, production and component perspective.
LO8	To develop skills of applying the theoretical knowledge into the design process
LO9	To review personal application over the module and engage with a development plan

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
No requirements listed

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Module Content & Assessment

Indicative Content
Materials • Classes of Materials • Polymers • Metals • Elastomers • Ceramics and Glass • Hybrids • Woods.
Processes • Production Processes for Polymers • Production Processes for Metals • Production processes for Glass and Ceramics • Production Processes for Hybrids
Properties • General Properties (Density, Price, etc) • Mechanical Properties (Elastic Modulus, Yield Strength, Stiffness, Tensile strength, Ductility, Stiffness, Toughness) • Thermal Properties (Service Temperature,, Thermal Conductivity, Heat Capacity, Thermal Diffusivity) • Electrical Properties (Conductors, Insulators, Resistivity, dielectric constant) • Optical Properties (Opaque, Translucent, Transparent) • Eco Properties (Material Life Cycle, CO2 Footprint, Recycling) • Fast Fracture& Fatigue Failure • Corrosion and Oxidation • Creep • UV Degradation
Electronics • Understanding Electricity • Designing with Electronics (Simple Circuits, Ohms Law, Kirchoffs Law • Electrical Components and Output Devices (Fuses, Resistors, Capacitors, Motors, Batteries, Switches, Transformers, Relays, Speakers Solenoids, Thyristor) • Integrated Circuits (555 Timers) • Investigating how products work (Gears, Levers, Pulley) • Technology (Wi-Fi, Bluetooth, Nano-technology)
CESedu pack Use CESedu pack to find the materials data that the learner might need, and then plot and analyse it to understand materials properties and compare materials. The Materials Selection software will allow the learner to gain insight into materials properties and explore materials options during design and development.
Design Studio (Resource) A dedicated space designed to allow for studio-based learning. This space is specific to a particular learning group. While used to deliver studio-based education the space is available to accommodate learners outside scheduled/timetabled hours. It provides a safe learner-driven, peer-reviewed environment, supported on a one-to-one basis. It supports the synthesis of parallel concurrent modular knowledge, skills and competency with prior learning & personal aesthetic judgement, to resolve specific design research question/s.
Computers / plotters / Printing (Resource) Each learner requires access to studio computers with suitable software (CESedu pack: Materials Selection) used on the Design programme. There should be access to printing and plotting facilities in order to complete Projects.

Assessment Breakdown	%
Continuous Assessment	100.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Open-book Examination	Exam (open- book) to demonstrate knowledge of Materials and Production, properties and knowledge of sciences.	1,2,3,4,5	30.00	Week 15
Case Studies	A Project submission demonstrating the application of knowledge through the reverse engineering analysis on the existing product. This will be part of a group project with a number of deliverables. (Project Report, PowerPoint Presentation)	1,6,7,8	20.00	Week 22
Project	Use CESedu pack software to find the materials data that the learner will evaluate during Design Project (P6) then plot and analyse it to understand materials properties, compare materials / costs and explore materials options during the design and development of this project.	1,2,3,4,5,6,7,8	20.00	Week 24
Portfolio	A submission of a portfolio showing content and development over the year across the six key learning streams	9	20.00	Week 30
Oral Examination/Interview	Learners will present for interview and review performance across the six key learning streams including a future development plan	9	10.00	Week 30

No Project

No Practical

No End of Module Formal Examination

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

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	Every Week	3.00
Independent Learning	Every Week	1.00
	Total Hours	4.00