University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Applied Engineering Science			
Code: ENGG07002	**SCQF Level: 7 (Scottish Credit and Qualifications Framework)**	**Credit Points: 20**	**ECTS: 10 (European Credit Transfer Scheme)**
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Dr Asraf Uzzaman		

Summary of Module

Units and dimensions. Gas laws of Boyle, Charles and Gay-Lussac. Chemical reactions of combustion fuels, rocket fuels and explosives.

Temperature scales; thermometry; expansion and contraction; conduction and convection; gas laws; vaporisation and condensation; energy conservation; heat capacity, thermal gradients; 1st and 2nd laws of thermodynamics, insulation, thermal imaging.

Longitudinal and transverse waves; waves in a string; sound waves; wave velocity, frequency and wavelength; levels of sound; ultrasonics and NDT; light waves; electromagnetic spectrum; reflection and refraction; total internal reflection; lasers.

Electric charge, current, voltage, resistance; Ohm's law; DC circuits; AC circuits; magnetic effects of current; power; earthing; safety transistors; integrated circuits; difference between analogue and digital; binary number system.

Properties of fluids; dimensions and dimensional analysis; pressure, viscosity, density, surface tension, buoyancy, the Archimedes effect and hydrostatic forces, and flow regimes.

The importance of materials in engineering. Periodic table, properties of the elements, atomic & subatomic structure, bonding forces in molecules, molecular compounds. Introduction to crystal structures

Properties and application of metallic materials. Production, properties and application of iron and steel. Brittle fracture. Alloys of aluminium. Corrosion of metals, corrosion protection.

Properties and application of plastics and polymeric materials. Properties and application of composites e.g. as sport equipment, marine boats.

Development, properties and application of smart materials. Sustainability and environmental issues of material usage. Recyclability.

- During the course of this module students will develop their UWS Graduate Attributes (https://www.uws.ac.uk/current-students/your-graduate-attributes/). Universal: Academic attributes - critical thinking and analytical & inquiring mind; Work-Ready: Academic attributes - discipline of deadlines in document submission; Successful : autonomous, driven and resilient. Workshops and sessions over the two terms will give students background in Intellectual Property, Innovation, Employability and Enterprise

Module Delivery Method					
Face-To-Face	**Blended**	**Fully Online**	**HybridC**	**Hybrid 0**	**Work-Based Learning**
☒	☐	☐	☐	☐	☐
See Guidance Note for details.					

Campus(es) for Module Delivery						
The module will **normally** be offered on the following campuses / or by Distance/Online Learning: (Provided viable student numbers permit) (tick as appropriate)						
Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
☒	☐	☐	☐	☐	☐	Add name

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1	☐	Term 2	☒	Term 3	☐

Learning Outcomes: (maximum of 5 statements) **These should take cognisance of the SCQF level descriptors and be at the appropriate level for the module.** At the end of this module the student will be able to:	
L1	To summarise the basic knowledge of engineering materials and apply the properties of materials to their use in the engineering industry.
L2	To summarise and apply knowledge of the essential scientific principles underlying engineering.
L3	To source legitimate published data on material properties and fluids and cite such intellectual property in a standard, recognised manner.
L4	To summarise and apply knowledge of fluids (static) properties and their application in engineering
L5	To recognise the sustainability of both existing and innovative fuels and materials in terms of the environmental impact made by their use.

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	During completion of this module, there will be an opportunity to achieve core skills in:

Knowledge and Understanding (K and U)	SCQF Level **7** Knowledge and understanding of the scientific principles underpinning engineering physics and engineering materials Demonstrate a broad knowledge and understanding of engineering physics and engineering materials. Introduction to the use of relevant materials, equipment and processes	
Practice: Applied Knowledge and Understanding	SCQF Level **7** Develop knowledge, understanding and practical engineering skills acquired through work carried out in problem-based learning, laboratories and workshops Be able to carry out risk assessments before carrying out basic laboratory and workshop activities	
Generic Cognitive skills	SCQF Level **7** Be able to apply appropriate quantitative science and engineering tools to basic problems.	
Communication, ICT and Numeracy Skills	SCQF Level **7** Develop transferable skills in communication by presenting laboratory reports.	
Autonomy, Accountability and Working with others	SCQF Level **7** Exercise autonomy and initiative in carrying out the defined activities at a professional level.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code:	**Module Title:**
	Other:	
Co-requisites	**Module Code:**	**Module Title:**

*Indicates that module descriptor is not published.

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Normally totalling 200 hours): (Note: Learning hours

	include both contact hours and hours spent on other learning activities)
Lecture/Core Content Delivery	24
Tutorial/Synchronous Support Activity	12
Laboratory/Practical Demonstration/Workshop	3
Independent Study	161
	Hours Total 200

****Indicative Resources: (eg. Core text, journals, internet access)**

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

Fundamentals of Material Science and Engineering, 10th edition SI Version, Callister, W.D. and D.G.Rethswisch, J. Wiley (2020).

Fundamentals of Thermal-Fluid Sciences, 6th Edition, Cengel, Y. A, J M Cimbala and R H Turner, McGraw-Hill (2021).

Principles of Electric Circuits: Pearson New International Edition: Conventional Current Version, 9/E by Thomas
L Floyd (2013)

(**N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements

In line with the Student Attendance and Engagement Procedure: Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

Equality and Diversity

The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code.

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	Engineering and Physical Sciences
Assessment Results (Pass/Fail)	Yes ☐No ☒
School Assessment Board	Engineering
Moderator	Parag Vichare
External Examiner	P Lewis
Accreditation Details	This module is accredited by Joint Board of Moderators of the ICE, IStructE, IHE and CIHT as part of BEng (Hons) Civil Engineering' This module is part of the BEng/MEng (Hons) Mechanical Engineering and BEng/Meng (Hons) Aircraft Engineering programmes accredited by the IMechE and the BEng/MEng(Hons) Chemical Engineering programme accredited by the IChemE.
Changes/Version Number	2.17- (was 2.16) Module Delivery Changed to Face-To-Face from Hybrid C. Term of delivery changed to 2 from 1&2. Module delivery hours changed to reflect Curriculum Framework norms.
Assessment: (also refer to Assessment Outcomes Grids below)	
Assessment for the module includes both formative and summative assessment. Formative assessment is provided in the form of class exercise problems, during tutorial sessions, during laboratory sessions and as part of the preparation for written submissions. Summative assessment will be based on the following: (a) final written unseen closed book invigilated class test worth 60% of the final mark, (b) laboratory reports worth 40% of the final mark, these are geared towards degree-specific activities.	
Assessment 1 – Unseen Closed Book Class Test (60%)	
Assessment 2 – Laboratory Reports (40%)	
(N.B. (i) **Assessment Outcomes Grids** for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed. (ii) An **indicative schedule** listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)	

Assessment Outcome Grids (See Guidance Note)

Component 1							
Assessment Type	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Learning Outcome (4)**	**Learning Outcome (5)**	**Weighting (%) of**	**Timetabled**

(Footnote B.)						Assessment Element	Contact Hours
Class Test (Unseen Closed Book)	✓	✓		✓	✓	60%	2

Component 2							
Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Learning Outcome (4)**	**Learning Outcome (5)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Laboratory	✓	✓	✓	✓	✓	40	3
Combined Total for All Components						**100%**	**5 hours**