MODULE SPECIFICATION

Module Code:	ENG357

Module Title:	Mechanical Science

Level:	3	**Credit Value:**	20

Cost Centre(s):	GAAE	JACS3 **code**:	H100

Faculty:	Faculty of Art, Science and Technology	**Module Leader:**	N. Vidmer

Scheduled learning and teaching hours	40 hrs
Guided independent study	160 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered (not including exit awards)	Core	Option
BEng (Hons) Aeronautical and Mechanical Engineering (with Foundation Year)	✓	☐
BEng (Hons) Electrical and Electronic Engineering (with Foundation Year)	✓	☐
BEng (Hons) Automotive Engineering (with Foundation Year)	✓	☐
BEng (Hons) Renewable and Sustainable Engineering (with Foundation Year)	✓	☐
BEng (Hons) Automation Engineering	✓	☐

Pre-requisites
None

Office use only
Initial approval: 12/12/2018 Version no:1
With effect from: 01/09/2019
Date and details of revision: Version no:

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Module Aims
To attain the basic knowledge and key skills in mechanical engineering science in order to apply the principles of solid mechanics to solve problems in practical situations; To analyse the behaviour of solid bodies subjected to various type of loading

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

At the end of this module, students will be able to		Key Skills	
1	Use fundamental and derived quantities with their correct units in statements and equations, and demonstrate ability to convert in order to express quantities in different units;	KS1	KS4
		KS10	
2	Describe the basic characteristics of simple engineering materials and relate their properties to typical applications;	KS1	KS4
		KS10	
3	Undertake practical work and write laboratory reports following technical report writing conventions;	KS1	KS3
		KS5	KS6
4	Analyse mechanical systems, demonstrating awareness of environmental and sustainability issues.	KS1	KS3
		KS5	KS10

Transferable skills and other attributes

Problem solving;
Mathematical applications;
Design, analysis, and synthesis.

Derogations
N/A

Assessment:

Indicative Assessment Tasks:

Assessment One: is by mean of a Portfolio of coursework and laboratory exercises spread throughout this part of the module, covering outcomes 1, 2, 3 and 4. A typical laboratory exercise is the analysis of Hooke's Law. The student would then produce a written report of the findings covering outcomes 1, 2, 3, and 4.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1,2,3,4	Portfolio	100%	n/a	2,500

Learning and Teaching Strategies:

The module will be presented to students through a series of lectures and learning reinforced through module tutor guided and self-directed study and interactive problem-solving tutorial sessions utilising laboratory equipment where appropriate.

Formative assessment takes place throughout the module and feedback is given during these tutorials.

Syllabus outline:

Introduction: ISO units, Newton's laws.
Scalar quantities.
Vector quantities.
Engineering indices.
Properties of Engineering Materials: Basic properties of engineering materials. Elasticity, plasticity, work hardening and failure. Hardness and toughness.
Forces in 2-Dimensions: Forces and turning moments, free body diagrams, forces and angles. Centres of gravity.
Friction: Limiting condition, sliding on flat and inclined surfaces.
Simply Loaded Beams: Shear force and bending moments. Introduction to torsion in beams.
Dynamics: Linear and angular motion: displacement, velocity, and uniform acceleration.
Energy: Work done, potential energy and kinetic energy. Power.
Basic Thermodynamics: Heat energy, temperature, thermal expansion and temperature stresses.
Engineering and the Environment: Awareness of environmental science relating to engineering. Engineering and sustainability.

Indicative Bibliography:
Reading lists will be provided in advance of each lecture as per subject basis, along with relevant academic papers and articles.

Essential reading

Bird, J. and Ross, C. (2015), *Mechanical Engineering Principles.* 3rd ed. Abingdon, Oxon: Routledge.

Hibbeler, R.C. (2017), *Engineering Mechanics: Statics*. 14th ed. Hoboken: Pearson.

Other indicative reading

Bolton, W. (2006) *Mechanical Science*, 3rd Edn., Blackwell Publishing.
Benham, P.P. et al. (1996) *Mechanics of Engineering Materials*, 2nd Edn., Prentice Hall.
Case, J. et al. (1999) *Strength of Materials and Structures*, 4th Edn., Butterworth-Heinemann Ltd.
Ashby, M.F. (2010) *Materials Selection in Mechanical Design,* 4th Edn., Butterworth-Heinemann Ltd.