

<b>Module Title:</b>	Metrology and Materials	<b>Level:</b>	5	<b>Credit Value:</b>	20
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<b>Module code:</b>	ENG52D	<b>Is this a new module?</b>	Yes	<b>Code of module being replaced:</b>	N/A
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<b>Cost Centre:</b>	GAME	<b>JACS3 code:</b>	J511
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<b>Trimester(s) in which to be offered:</b>	1, 2 & 3	<b>With effect from:</b>	September 16
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<b>School:</b>	Applied Science, Computing & Engineering	<b>Module Leader:</b>	Nataliia Luhyna
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Scheduled learning and teaching hours	60 hrs
Guided independent study	140 hrs
Placement	0 hrs
<b>Module duration (total hours)</b>	200 hrs

<b>Programme(s) in which to be offered</b>	Core	Option
FdEng Industrial Engineering	<input type="checkbox"/>	<input checked="" type="checkbox"/>

<b>Pre-requisites</b>
None

<b>Derogations</b>
A derogation from regulations has been approved for this module which means that whilst the pass mark is 40%, each element of assessment requires a minimum mark of 30% for the module to be passed overall.

Office use only

Initial approval June 16

APSC approval of modification *Enter date of approval*

Have any derogations received SQC approval?

Version 1

Yes  No

**Module Aims**

To develop the methodology, practice and reporting of laboratory experiments with particular reference to engineering metrology; To develop theoretical foundation and carry out practical tests to evaluate the properties of sample materials to enable selection of appropriate materials for a given device, component or structure.

**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	Analyse the measurement mechanism and methods for industrial applications which meet stringent design requirements for mechanical manufacturing and assembly.	KS3	
2	Analyse measurement errors, and define and apply the criteria for evaluating the validity of measurements.	KS5	KS10
3	Apply mechanical and electrical science principles to characterisation of the performance parameters of a range of materials.	KS5	
		KS10	
4	Apply experiment and reporting methodology to practical investigations relevant to engineering materials analysis and selection.	KS1	

**Assessment:**

Assessment One: A set of practical experiments, led by lecturers from the science and materials specialisms, with log reports; this is an evaluation of observed skills applied by students, in conjunction with the log reports. For example: ultrasonic level measurement, tensile load/extension test.

Assessment Two: is by means of an in-class test covering outcomes 2 and 3. It is time-constrained.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1, 4	Portfolio	50%		2000
2	2, 3	In-class test	50%	2hrs	

**Learning and Teaching Strategies:**

The module will be presented to students through lectures, tutorials and practically-based exercises. Approximately one-third of the time will be devoted to practical investigations. Demonstrations will also be arranged to show the operation and set up of certain processes.

**Syllabus outline:**

Errors in Measurement: scale error, reading error, measuring error, elastic deformation error, calamitous error, compound errors, error distributions, effects of averaging results on errors.

Linear and Angular Measurement: Principle of alignment, sensitivity, accuracy, variance, gauge calibration, gauge comparators, measurement of taper gauges, clinometer, optical instruments for angular measurement.

Limit and Limit Gauges: Gauge tolerances, taper limit gauges, gauging for large diameters.

Machine Tool Test: Alignment, level of installation, spindle test, straightness and flatness, squareness.

Gear Measurement: Involute function and curve, gear pitch measurement.

Materials structures: Atomic structure, bonding, crystalline and amorphous structures.

Properties of a range of materials: Metal, plastic, composite materials.

Applications: Range of applications, types of components.

Materials production and manipulation – range of processes applied to materials.

Material/device selection: manufacturers' data, British Standards.

Practical evaluation of characteristics and properties; test methods; equipment used; measurements and error quantification.

Test evaluation

**Bibliography:**

**Essential reading**

W. Bolton, R.A. Higgins, (2014), Materials for Engineers and Technicians, 6<sup>th</sup> edition, Routledge.

**Other indicative reading**

R.S. Figliola, D.E. Beesley, (2015), Theory and Design for Mechanical Measurement, 6<sup>th</sup> Edition edition, John Wiley & Sons.

J.F.W. Galyer, C.R. Shotbolt, (1990), Metrology for Engineering, 5<sup>th</sup> edition, Cassel Publishers Limited.