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MODULE DESCRIPTOR

Module Title

Energy Conversion and Storage

Reference	EN3570	Version	4
Created	November 2017	SCQF Level	SCQF 9
Approved	March 2004	SCQF Points	15
Amended	March 2018	ECTS Points	7.5

Aims of Module

To provide the student with the ability to apply fundamental technical concepts and principles in the appraisal and selection of energy conversion and storage devices.

Learning Outcomes for Module

On completion of this module, students are expected to be able to:

1	Analyse the performance of IC engines and combustion in IC engines.
2	Identify and analyse typical alternative energy storage devices.
3	Analyse the performance of wind and hydro power generation systems.
4	Analyse experimental results taken from the IC engine test bed.
5	Compare the performance of different energy storage technologies.

Indicative Module Content

Heat pumps, geo-thermal/ground source. Rankine cycle, Refrigeration & air conditioning, Combustion, Aspects of Steam Plant Design, Nuclear, IC Engines. Turbo-Machinery: Well's Turbine, Hydraulic Turbines,Pelton, Francis,Kaplan. Dimensional analysis, performance laws, perfomance characteristics, specific speed, energy losses, hydraulic efficiency. Energy storage requirements, principles, technologies and applications. Thermal energy storage, wet and dry systems; mechanical energy storage, flywheels, compressed air energy storage, pumped hydro schemes; electrical energy storage, battery systems, psb, vrb, ZnBr, NaS, Li-ion, lead-acid, metal-air, super capacitors, SMES; hydrogen energy systems, fuel cells, Regenesys system.

Module Delivery

This is a lecture based course supported by tutorial sessions, laboratory work and student centred learning.

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Indicative Student Workload	Full Time	Part Time
Contact Hours	N/A	44
Non-Contact Hours	N/A	106
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	N/A	150
Actual Placement hours for professional, statutory or regulatory body		

ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

Component 1

Type:	Coursework	Weighting:	50%	Outcomes Assessed:	4, 5
Description:	Component 1 is a combination of coursework and a written laboratory report.				

Component 2

Type:	Examination	Weighting:	50%	Outcomes Assessed:	1, 2, 3
Description:	Component 2 is a closed book examination.				

MODULE PERFORMANCE DESCRIPTOR

Explanatory Text

To pass the module, you must achieve a 40% weighted average mark from the exam and coursework. In addition you need to achieve at least 35% in both the individual exam and coursework components.

Module Grade	Minimum Requirements to achieve Module Grade:
A	>=70%
B	60-69%
C	50-59%
D	40-49%
E	35-39%
F	< 35%
NS	Non-submission of work by published deadline or non-attendance for examination

Module Requirements

Prerequisites for Module	Statics and Dynamics (EN1700) or its equivalent.
Corequisites for module	None.
Precluded Modules	None.

INDICATIVE BIBLIOGRAPHY

1. DIXON, S.L., 2013. Fluid Mechanics and Thermodynamics of Turbomachinery. 7th edition Boston, MA: Butterworth-Heinemann.
2. MASSEY, B., 2006. Mechanics of Fluids. 8th ed. London: Stanley Thornes.
3. EASTOP, T.D. AND CROFT, D.R., 1990. Energy Efficiency for Engineers and Technologists. Harlow: Pearson Higher Education/Longman