Module Title **Energy Conversion and Storage** **Keywords** Energy conversion, steam plant, turbo-machinery, fuel cells, energy storage	Reference EN3570 SCQF Level SCQF 9 SCQF Points 15 ECTS Points 7.5 Created December 2003 Approved March 2004 Amended August 2011 Version No. 2

This Version is No Longer Current

The latest version of this module is available here

Prerequisites for Module

Statics and Dynamics (EN1700) or its equivalent.

Corequisite Modules

None.

Precluded Modules

None.

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.

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.

Indicative Student Workload

Contact Hours	Full Time	Part Time
Assessment	2	2
Laboratories	6	6
Lectures	24	24
Tutorials	12	12

Learning Outcomes for Module

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

1. Quantify the essential features of energy conversion devices.
2. Identify and analyse typical operational problems which can occur in energy conversion and storage devices.
3. Critically evaluate energy conversion and storage reqirements and select suitable methods of meeting requirements.

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.

Directed Study	56	56
Private Study	50	50

Mode of Delivery

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

Assessment Plan

	Learning Outcomes Assessed
Component 1	1,2,3
Component 2	1,2,3
Coursework	1,2,3
Examination	1,2,3

Component 2 is a closed book examination. (50% Weighting)

Component 1 is a combination of coursework and a written laboratory report. (50% Weighting)

Component 1 is a combination of coursework and a written laboratory report. (50% Weighting)

Component 2 is a closed book examination. (50% Weighting)

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