MECH H2602: Energy Systems 2

Module Title:	Energy Systems 2
Language of Instruction:	English

Credits:	10

NFQ Level:	6

Module Delivered In	2 programme(s)

Teaching & Learning Strategies:	Module will be delivered using lectures and tutorials using a mixture of presentations, example exercises, question and answer sessions, group discussions and online resources. Laboratory classes will be delivered to students working in groups to obtain experimental data with subsequent individual reporting/assessment

Module Aim:	To provide students with an broad knowledge of the processes associated with the generation and consumption of fluids and energy in engineering systems

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Describe the types and characteristics of flow within a pipe
LO2	Distinguish between types of pumps and fans in terms of their design and performance
LO3	Apply simplified fluid dynamic models to representative systems in order to determine the steady state performance of such systems
LO4	Apply simplified thermodynamic models to representative systems in order to determine the steady state performance of such systems
LO5	Quantify by calculation and experimental measurement the characteristics of fluid dynamic and thermodynamic processes

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
No requirements listed

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Module Content & Assessment

Indicative Content
• Fluid Dynamics o Types of flow, o Conservation of mass, o Conservation of energy, o Bernoulli equation, o Pressure drops/Head Losses, o Pump head calculations, o Fluid momentum.
• Pumps & fans o Positive displacement pumps, o Centrifugal pumps & fans.
• Thermodynamics o Ideal gas law, o Steady state energy equation, o Properties of fluids, o Determining properties of fluids from charts and tables.
• Steam Generation and Processes o Boilers, o Turbines, o Condensers.
• Heat Engines & Power Generation o Carnot cycle, o Rankine cycle, o Brayton cycle, o Gas turbines systems and aircraft propulsion.
• Heat Transfer o Newton's law of cooling, o Fourier's law of conduction, o Conductance of solid slab, o Conductance of boundary layer, o Heat losses from rooms and pipes.
• Fuels and combustion o Stoichiometric combustion, o Products of combustion and air-to-fuel ratio, o Gaseous and liquid/solid fuels, o Higher and lower calorific values, o Effect of moisture content.

Assessment Breakdown	%
Continuous Assessment	15.00%
Practical	15.00%
End of Module Formal Examination	70.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Examination	Class Test: Fluid Mechanics	1,2,3	5.00	Week 6
Examination	Class Test: Thermodynamics	4	5.00	Week 13
Examination	Class Test: Steam and Gas power cycles	4	5.00	Week 23

No Project

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Fluid Mechanics Labs: Darcy's Formula, Calibration of Flowmeters, Centrifugal Fan, Gear Pump & Centrifugal Pump Thermodynamics Labs: Performance of Steam Turbine, Efficiency of Steam Generator, Steam Throttling Process, Energy Balance on a Condenser, Coefficient of Linear Expansion, Specific Heat Capacity of Materials, Thermal Conductivity of Materials,Thermal Radiation & Bomb Calorimeter. Laboratory reports and written assessment	5	15.00	n/a

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	A final written examination will assess the extent to which the student has achieved the module learning outcomes	1,2,3,4,5	70.00	End-of-Semester

ITCarlow reserves the right to alter the nature and timings of assessment

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	Every Week	2.50
Laboratory	Every Week	1.00
Estimated Learner Hours	Every Week	3.00
Tutorial	Every Week	1.00
	Total Hours	7.50

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_EMMEC_B	Bachelor of Engineering (Honours) in Mechanical Engineering	3	Mandatory
CW_EEMEC_D	Bachelor of Engineering in Mechanical Engineering	3	Mandatory