Title:	Thermofluids 3 APPROVED
Long Title:	Thermofluids 3

Module Code:	INTR7009	**Duration:**	1 Semester

Credits:	5
NFQ Level:	Intermediate
Field of Study:	Interdisciplinary Engineering
Valid From:	Semester 1 - 2016/17 (September 2016)
Module Delivered in	3 programme(s)
Module Coordinator:	GER KELLY
Module Author:	GER KELLY
Module Description:	SFEE. Heat transfer and heat exchanger operations. Assessment of power systems, generation, fuels and energy conversion. Refrigeration and heat pumps. Flow Measurement. Hydraulic machinery turbines and pumps.

Learning Outcomes	
On successful completion of this module the learner will be able to:	
LO1	Calculate the heat transfer rates from heat exchangers and other engineering applications.
LO2	Examine by way of a written report the key factors affecting the selection of energy conversion mechanisms.
LO3	Evaluate the operation and performance indicators of equipment associated with heating, cooling, ventilation and air conditioning thermofluid processes.
LO4	Conduct lab experiments in thermofluids as part of a team in a safe and appropriate manner and produce individual professional reports detailing the results, analysis and conclusions which arise

Pre-requisite learning
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.*
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. You may not enrol on this module if you have not acquired the learning specified in this section.*
No requirements listed
Co-requisites
No Co Requisites listed

Module Content & Assessment

Indicative Content
Heat transfer Review of conduction, convection and radiation. Thermal Resistances. Radiative Properties.
Heat Exchangers Types, construction, operational conditions. Selection. LMTD and NTU & E Methods.
Combustion and Fuels Basic Equation. Reactants and Products.
Refrigeration and Heat Pumps pH diagram. Cycles. COP. Refrigerants.
Energy Studies Energy sources, uses and conversion. Energy Management. Future Options
Flow Measurement Weirs, orifice plates, venturis, others.
Hydrodynamic Machinery Introduction to pumps types, operation and performance. Turbine types.
Lab Programme Report Writing. Experimental Methods. (Thermal Imaging, Heat Exchanger, Refrigeration, Pump, Flow Measurement.)

Assessment Breakdown	%
Course Work	30.00%
End of Module Formal Examination	70.00%

Course Work

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	lab programme	3,4	10.0	Every Week
Presentation	energy options article/poster	2	10.0	Week 9
Short Answer Questions	mid semester test	1,3	10.0	Week 5

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	End-of-Semester Final Examination	1,3	70.0	End-of-Semester

Reassessment Requirement
Repeat examination *Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.*

The institute reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time				
Workload Type	*Workload Description*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
Lecture	Lecture	3.0	Every Week	3.00
Lab	Lab programme	2.0	Every Second Week	1.00
Independent & Directed Learning (Non-contact)	No Description	3.0	Every Week	3.00
			Total Hours	8.00
			Total Weekly Learner Workload	7.00
			Total Weekly Contact Hours	4.00

Workload: Part Time				
Workload Type	*Workload Description*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
Lecture	Formal Lecture	3.0	Every Week	3.00
Lab	Laboratory sessions	2.0	Every Second Week	1.00
Independent & Directed Learning (Non-contact)	Self Directed Learning	3.0	Every Week	3.00
			Total Hours	8.00
			Total Weekly Learner Workload	7.00
			Total Weekly Contact Hours	4.00

Module Resources

Recommended Book Resources

- **Yunus A. Cengel, Afshin J. Ghajar 2014, *Heat and mass transfer Fundamentals and Applications*, 5th Ed., McGraw-Hill New York [ISBN: 0077366646]**
- **Joel, *Engineering Thermodynamics*, 4th edition Ed., Longman Sc & Tech; [ISBN: ISBN-10: 0470210753]**
- **Eastop and McConkey 1996, *Thermodynamics for Engineers*, 5 Ed., Prentice Hall [ISBN: ISBN-10: 0582091934]**
- **Energy Systems 1996, *Boyle*, 1 edition Ed., Oxford University Press, USA; [ISBN: ISBN-10: 0198564511]**
- **Massey 1989, *Fluid Mechanics*, VNR [ISBN: 0278000479]**

This module does not have any article/paper resources

Other Resources

- **Website: *Student companion website*, McGraw Hill**
  http://highered.mheducation.com/sites/00 73398187/student_view0/index.html

Module Delivered in

Programme Code	Programme	Semester	Delivery
CR_ESENT_8	Bachelor of Engineering (Honours) in Sustainable Energy Engineering	5	Mandatory
CR_EMECH_7	Bachelor of Engineering in Mechanical Engineering	6	Mandatory
CR_EMECN_7	Parttime - Bachelor of Engineering in Mechanical Engineering	6	Group Elective 1