Liverpool John Moores University

Title:	Thermodynamics, Fluid Mechanics and Heat Transfer
Status:	Definitive
Code:	**6140ENG** (119006)
Version Start Date:	01-08-2019
Owning School/Faculty:	Maritime and Mechanical Engineering
Teaching School/Faculty:	Maritime and Mechanical Engineering

Team	Leader
David Allanson	Y

Academic Level:	FHEQ6	**Credit Value:**	10	**Total Delivered Hours:**	51
Total Learning Hours:	100	**Private Study:**	49		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	21
Practical	6
Tutorial	21

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Examination	70	3
Essay	AS2	Fluid Mechanics and Heat Transfer Laboratory Work	15	
Essay	AS3	Thermodynamics assignment	15	

Aims

To provide an insight into the physical behaviour of fluid flow and heat transfer and the mathematical and computational tools available for analysis.
To study power generation to an advanced level.
To examine the whole power generation scene including alternative sources.

To solve problems which arise in power plant.
To examine the design of heat exchange plant and its application to various other thermodynamic equipment. To examine air conditioning plant.
To study internal combustion engines and their turbo-supercharging.

Learning Outcomes

After completing the module the student should be able to:

1	Analyse steady state and unsteady multimode heat transfer using charts, tables and numerical analysis.
2	Calculate laminar and turbulent boundary layer parameters
3	Calculate lift and drag of flows around bluff objects
4	Determine the heat and mass transfers in air conditioning plant and cooling towers
5	Compute the efficiency, performance and other parameters for compressor plant, power plant and CHP systems and heat exchangers of various configurations.
6	Analyse the various alternative energy sources, techniques for energy storage and thus appreciate their advantages and disadvantages.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Examination	1	2	3	4	5	6
Fluid Mechanics and Heat lab	1	2	3	4		
Thermodynamics assignment	4	5	6			

Outline Syllabus

Differential equation of heat conduction with exact solutions
Radiation, view factors and radiation exchange
Unsteady heat transfer, solution by charts and tables
Heat transfer from extended surfaces
Introduction to Navier-Stokes equations
Laminar and turbulent boundary layers
Flow around bluff objects. Drag and lift.
Psychrometry and its application to air conditioning and evaporate coolers and dehumidification.
Power plant: vapour power plant, feedheating, combined heat and power plant, cogeneration, district heating. Reciprocating internal combustion engines, criteria of performance, turbcharging, intercooling, use of compressor and turbine characteristics.
Gas turbine cycles and cycle modifications. Back-up and load chopping duties. Aero engines.
Energy studies, alternative sources and methods of storage.
Heat exchangers, shell and tube, NTU method of analysis.

Learning Activities

Combination of lectures, tutorials and laboratory work

Notes

This module provides the necessary analysis tools to enable the solution of realistic problems in the field of fluid mechanics and heat transfer. In heat transfer conduction, convection and radiation receive equal prominence whilst the fluid mechanics concentrates on practically important fluid flows.
The module gives a good knowledge of the behaviour of thermodynamic equipment and gives also a sound background for plant selection in industrial applications. The module then provides a good comprehension of power generation, including the problems of pollution, renewable energy sources and power demands.