

Module Specification

Module Summary Information

1	Module Title	Thermofluids
2	Module Credits	20
3	Module Level	7
4	Module Code	ENG7149

5	Module Overview
<p>This module provides you with the opportunity to learn about the Fundamentals of Thermofluids: the conservation laws and their application, viscosity and the constitutive equations, boundary layers, turbulence and thermofluid properties. Computational Fluid Dynamics. Overview of discretisation methods: FD, FE, FV etc. The finite volume method of discretisation. Newtonian and non-Newtonian flows, boundary layers, turbulence, compressible flows, flows with heat transfer. Validation of CFD.</p>	

6	Indicative Content
<ul style="list-style-type: none"> • Fundamentals of Thermodynamics I - 1st & 2nd Law, Enthalpy, Entropy, Continuity • Fundamentals of Thermodynamics II - Heat Transfer, Thermodynamic Properties & Processes • Introduction to Combustion I & II - Properties of Fuels, Combustion Chemistry, Steady & Unsteady Combustion, Modelling. • Introduction to Computational Fluid Dynamics (Fluent) – Introduction to ANSYS Fluent by Fluid flow, and Heat transfer applications. • Thermodynamic Process Modelling I & II - Gas Power Cycles, Emptying & Filling Cycles, Case Studies • Fundamentals of Fluid Mechanics I - Fluid Properties & Processes, Boundary Layers, Turbulence Models. • Fundamentals of Fluid Mechanics II - Flow Coefficients, Sub & Super Sonic Flow, Introduction to Turbo machinery • Fundamentals of Fluid Mechanics III – Performance analysis of axial turbines & compressors; Molliers Diagram, Velocity diagrams, Stage Efficiencies, Stage Reactions • Fluid Dynamic Modelling - Governing Equations, Turbulence Models, Compressible and Incompressible flows, Boundary Conditions. • Single and Multi-Phase Flow, Mesh Generation, CFD Codes, Case Studies. 	

7		Module Learning Outcomes
On successful completion of the module, students will be able to:		
	1	Apply the basic laws of thermodynamics to the synthesis of solutions to complex engineering problems involving energy conservation and heat transfer.
	2	Evaluate the mechanisms of combustion and thermodynamic process modelling.
	3	Apply the fundamentals of fluid mechanics to solve typical engineering problems involving fluid transfer.
	4	Critically appraise the underpinning science of computational fluid dynamics.

8		Module Assessment		
Learning Outcome				
		Coursework	Exam	In-Person
1 – 4			X	

9		Breakdown Learning and Teaching Activities	
Learning Activities		Hours	
Scheduled Learning (SL) includes lectures, practical classes and workshops, peer group learning, Graduate+, as specified in timetable		36	
Directed Learning (DL) includes placements, work-based learning, external visits, on-line activity, Graduate+, peer learning, as directed on VLE		0	
Private Study (PS) includes preparation for exams		164	
Total Study Hours:		200	