Module Specification

Module Summary Information

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

5	**Module Overview**

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.

6	**Indicative Content**

- 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