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MODULE DESCRIPTOR

Module Title

Advanced Thermofluids

Reference	EN5501	Version	6
Created	June 2022	SCQF Level	SCQF 11
Approved	March 2004	SCQF Points	15
Amended	August 2022	ECTS Points	7.5

Aims of Module

To establish competence in the theory and practice of Fluid Mechanics and Computational Fluid Dynamics, particularly applied to the energy industries.

Learning Outcomes for Module

On completion of this module, students are expected to be able to:

1	Explain advanced concepts related to complex flow systems, boundary layers, turbulence and thermofluids properties.
2	Employ knowledge and understanding of fluid dynamics using various techniques.
3	Reflect on the application of state of the art CFD software for solving fluid flow and heat transfer problem.
4	Employ CFD software for solving complex fluid flow and heat transfer problems and provide critical analyses of results.

Indicative Module Content

Fundamentals of Fluid Mechanics: the conservation laws and their application, viscosity/rheometry and the constitutive equations, boundary layers, turbulence and thermofluid properties. Comptational 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. Applications taken from (but not limited to): lubrication, aerodynamics, atmospherics (wind energy), oceanic flows (wave energy), open and closed channel flow (tidal energy), oil & gas industry (tubulars and process plant) , acquifers (oil & gas, water, geothermal), industrial hydraulics and pneumatics.

Module Delivery

The module will be delivered by means of lectures and tutorials supporting CFD laboratories and practical work. Academic and industrial seminars will be held when possible.

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Indicative Student Workload	Full Time	Part Time
Contact Hours	48	N/A
Non-Contact Hours	102	N/A
Placement/Work-Based Learning Experience [Notional] Hours	N/A	N/A
TOTAL	150	N/A
Actual Placement hours for professional, statutory or regulatory body		

ASSESSMENT PLAN

If a major/minor model is used and box is ticked, % weightings below are indicative only.

Component 1

Type:	Coursework	Weighting:	30%	Outcomes Assessed:	3
Description:	A reflective statement based on CFD simulations.				

Component 2

Type:	Coursework	Weighting:	70%	Outcomes Assessed:	1, 2, 4
Description:	A report after solving a practical thermofluid problem using a CFD code.				

MODULE PERFORMANCE DESCRIPTOR

Explanatory Text

The module has 2 components and to gain an overall pass a minimum D grade must be achieved in each component. The component weighting is as follows: C1 (x-axis) is worth 30% and C2 (y-axis) is worth 70%.

		Coursework:						
		A	**B**	**C**	**D**	**E**	**F**	**NS**
Coursework:	**A**	A	A	B	B	E	E	
	B	B	B	B	C	E	E	
	C	B	C	C	C	E	E	
	D	C	C	D	D	E	E	
	E	E	E	E	E	E	F	
	F	F	F	F	F	F	F	
	NS	Non-submission of work by published deadline or non-attendance for examination						

Module Requirements

Prerequisites for Module	Plant Performance (EN4700) or equivalent
Corequisites for module	None.
Precluded Modules	None.

INDICATIVE BIBLIOGRAPHY

1	VERSTEEG, H. and MALALASEKERA, W., 2007, An introduction to computational fluid dynamics-The finite volume method, 2nd ed. Harlow:Pearson
2	FERZIGER, JOEL H and MILOVAN PERIC., 2002. Computational methods for fluid dynamics. 3rd ed. Berlin: Springer.
3	CFD online documentation.