UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title:	Advanced Fluid Mechanics with Aerodynamics
Module Code:	MAE6013-B
Academic Year:	2019-20
Credit Rating:	20
School:	Department of Mechanical and Energy Systems Engineering
Subject Area:	Mechanical and Automotive Engineering
FHEQ Level:	FHEQ Level 6
Pre-requisites:	
Co-requisites:	

Contact Hours	
Type	**Hours**
Lectures	48
Tutorials	24
Laboratory	6
Directed Study	122

Availability	
Occurrence	**Location / Period**
BDA	University of Bradford / Academic Year (Sept - May)

Module Aims

To examine the principles of fluid flow relevant to a wide range of industries. To qualify and quantify the effects of these internal and external flows upon the flight of airplanes, the performance of ground vehicles and industrially engineering machinery.

Outline Syllabus

Fluid properties and flow properties - static and dynamic pressure,
Types of fluid flow - laminar, transitional and turbulent, viscous and inviscid
Mass continuity, energy equations, momentum (Euler and Navier-Stokes) equations and their applications

Shear bounded flows - the boundary layer, pipe flows
Free shear flows - jets, wakes, mixing layers
External and internal incompressible and compressible flows
Aerodynamic forces - lift, drag - pressure, skin friction, induced drag
Aerodynamic axis systems and moments
Attached and separated flow, pressure coefficients, angle of attack
Ground vehicle aerodynamics: ground effects; under body channels; diffusers; spoilers; other typical examples of aerodynamics from real life case studies
Propulsion systems - propellors, turbojets, turbofans, ram and scramjets
Machines for renewable energy - wind turbines, wave machines and tidal power

Learning Outcomes

1	Understand the application of theories of Newtonian fluid mechanics; both viscous and inviscid, and incompressible and compressible, to real world applications in the aeronautics, automotive and other industries.
2	Quantify fluid dynamical forces and understand their influence on performance within a wide range of industrial applications.
3	Interpret and justify laboratory experimental data by using available information and propose solutions to problems arising from that analysis.

Learning, Teaching and Assessment Strategy

Theoretical understanding and problem solving through lectures, staff-led tutorial/example classes, laboratory experiments and directed study, practical skills of data interpretation and justification gained from lab sessions, assessed by examination.

This module satisfies the below Learning Outcomes as specified by the Accreditation of Higher Education Programmes: Third Edition (AHEP3) as published by The Engineering Council in-line with the UK Standard for Professional Engineering Competence (UK-SPEC). These outcomes specify six key areas of learning: Science and Mathematics (SM), Engineering Analysis (EA), Design (D), Economic, Legal, Social, Ethical and Environmental Context (EL), Engineering Practice (P) and Additional General Skills (G).
SM1b, SM2b, SM3b, EA1b, EA2, EA3b, EA4b, D3b, P1, P2, P3, G1, SM1m, SM2m, SM5m, EA1m, EA3m,
Further details of these learning outcomes can be found at https://www.engc.org.uk/.

Mode of Assessment

Type	Method	Description	Length	Weighting
Summative	Examination - closed book	four compulsory exam questions and one question based on laboratory activities	2 hours	100%

Reading List

To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html.

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.