

Summary Information

Module Code	5510NCCG
Formal Module Title	Aerodynamics
Owning School	Engineering
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 5
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
Nelson and Colne College Group

Learning Methods

Learning Method Type	Hours
Lecture	48
Practical	12

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
APR-PAR	PAR	April	12 Weeks
JAN-PAR	PAR	January	12 Weeks

SEP-PAR	PAR	September	12 Weeks
SEP_NS-PAR	PAR	September (Non-standard start date)	12 Weeks

Aims and Outcomes

Aims	This module aims to develop and extend the treatment of fluid mechanics to two-dimensional low speed flow and one-dimensional compressible flow; introduce the concepts of boundary layer theory; sources of drag (particularly aircraft drag); develop thin aerofoil theory and apply to the aerodynamic analysis of aerofoil sections in low speed flow; develop lifting line theory and apply to the aerodynamic analysis of unswept wings in low speed flow; describe the apparatus used and techniques employed in wind tunnel testing, analyse the inviscid aerodynamic performance of an aerofoil section over a range of Mach numbers, from low subsonic to hypersonic conditions.
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After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Analyse the properties of air and the atmosphere.
MLO2	2	Calculate the effect of forces on the aerodynamic characteristics of aircrafts/vehicles.
MLO3	3	Carry out investigations of the forces on various profiles under subsonic incompressible flow conditions
MLO4	4	Apply the aerodynamic characteristics of wings with various profiles under various flow regimes (subsonic incompressible, subsonic compressible, transonic, supersonic).

Module Content

Outline Syllabus	Hydrodynamics: governing equations; definition of vorticity and circulation; velocity potential and stream function. Boundary Layer Theory: Basic concepts, thin layer assumptions, flat plate flows, skin friction; laminar and turbulent conditions, general introduction to pressure gradient effects. Drag Sources: Types and origins of drag, drag reduction. Aerofoil And Wing Theory For Low-Speed Flow: Aerofoil characteristics, lift, drag and pitching moment; NACA and other commonly used wing sections; Aerodynamic centre, centre of pressure, stall, high lift devices; Wings, aspect ratio, trailing and bound vortices, induced drag. Reynolds number effects; Wind Tunnel Testing: Subsonic wind tunnel design and operation, shock tubes; pressure, force and velocity measurement, flow visualisation.
Module Overview	
Additional Information	

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Report	Assignment	100	0	MLO1, MLO2, MLO4
Competency	NCC Group Pass/Fail			MLO3

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Christian Matthews	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings
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