MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME529 AERODYNAMICS IN C

Module Registrar: Dr E Henderson **e.henderson@strath.ac.uk**	**Taught To (Course): Cohorts for whom class is optional**		
Other Lecturers Involved: Dr M Stickland **matt.stickland@strath.ac.uk**	**Credit Weighting: 10 (ECTS 5)**	**Semester: 2**	
Assumed Prerequisites: 16351 ME201 16259	**Optional class**	**Academic Level: 5**	**Suitable for Exchange: N**

Required pre-requisites

Note: It is the responsibility of ALL students to ensure that they satisfy the prerequisite knowledge for this module BEFORE adding as part of curriculum selection. If unsure, please contact the Module Registrar or discuss with your Programme/Year Adviser of Studies.

Fundamental knowledge:
- Prior knowledge of principles and concepts of fluid Mechanics.
- Knowledge of partial derivatives, partial differential equations and differential relations of fluid flow (i.e., continuity equation, momentum equation etc).
- Linear algebra, vectors, matrices.

Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
	10						30	60	100

Educational Aim

This module aims to introduce students to the principles of programming in a high level programming language. The language used will be C#. The code will be written in the Microsoft Visual Studio (community edition) IDE. Students will write programs to simulate the flow field around aerofoils and wings using inviscid aerodynamics. These programs will use windows forms apps to allow input from the user and present the data. ***It should be noted that the Apple IOS version of VS does not include the Windows Forms app and therefore students who use Apple computers should consult the registrar as they will need to use either the university desktop or some other method to write the code.***

Learning Outcomes

On completion of the module the student is expected to be able to:

LO1 Understand the derivation of the Navier Stokes (N-S) equations by vector mathematics

LO2 Simplify the N-S equations to solve simple flow problems such as the measurement of drag by wake traverse

LO3 Understand how to solve fluid mechanics problems using inviscid aerodynamics such as panel methods and lifting line theory

LO4 Write programs in a high level programming language, C#, to simulate flows using inviscid aerodynamics

Syllabus

The module will teach the following:

- Vector mathematics
- Derivation and simplification of the Navier Stokes equations
- Inviscid aerodynamics in the form of lifting line theory and panel methods
- Programming in a high level language such as C#

Assessment of Learning Outcomes

Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1 and LO2
- C1 Understand the fundamentals of vector maths
- C2 Understand how the Navier Stokes equations are derived.

LO3 and LO4
- C1 The student should understand the principles of inviscid aerodynamics
- C2 The student should be able to simulate a simple flow field using inviscid aerodynamics
- C3 The student should be sufficiently capable in C# programming to write a simple code to simulate a flow field using inviscid aerodynamics

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment and Feedback
(within Assessment and Feedback Policy at: https://www.strath.ac.uk/professionalservices/staff/policies/academic/)

Assessment will be by the submission of reports and case files containing the results of the two course work submissions. There will also be on line quizzes to ensure that the students achieve the learning outcomes. All quizzes are of one hour duration and may be taken at any time until midnight Friday of the last week of term.

Regular feedback and discussion will be available in on line forums. Feedback on the report and coursework submissions will enable students to reflect on their understanding of the subject material

Summative feedback: The summative feedback will be provided by the course works and quizzes. Formative feedback: Online forums will provide opportunities for students to discuss their work and course material with members of staff. The courseworks will be returned to students with written feedback.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams

Examination				**Coursework**		**Practical**		**Project**	
Number	Month(s)	Duration	***Weighting***	Number	***Weighting***	Number	***Weighting***	Number	***Weighting***
10	Quizzes	1 hour	20%	2	80% (40% each)				
* LO 1-4				* LO 3-4		*		*	

* ***L/Os:*** *Indicate which Learning Outcomes (L01, L02, etc) are to be assessed by exam/coursework/practical/project as required.*

Coursework / Submissions deadlines (*academic weeks*): wk8 and wk11

Resit Assessment Procedures:
Once a student is aware that they require a resit they should contact the registrar of the course as soon as possible. The registrar will provide a resit assignment. Completion of the assignment will require the submission of report, executable and code prior to commencement of the August exam diet.

PLEASE NOTE:
Students must gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be re-assessed prior to the August diet. This re-assessment will consist entirely of coursework/report. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

*****Purchase recommended **Highly recommended reading *For reference**

*** C# 2010 for Dummies, Bill Sempf, Wiley ISBN: 978-0-470-56348-9

** Beginning Visual C# 2010, Wilson, Wiley,978-0-470-50226-6

** Fundamentals of Aerodynamics, John Anderson, McGraw Hill ISBN 007118146-6

Additional Student Feedback
(Please specify details of when additional feedback will be provided)

Date	Time	Room No

Session: 2023/24

Approved:

Course Director Signature: Dr Andrew McLaren (on behalf of Dr Henderson)
Date of Last Modifications: January 2024

(Updated August 2023)

MODULE TIMETABLE

Module Code:	**ME529**	**Module Title:**	**Aerodynamics in C**

Brief Description of Assessment:

10 quizzes (no set timing)
2 courseworks

Assessment Timing:-

Indicate on the table below the start/submission dates for each assignment/project and the timing of each exam/assessment using the dropdowns provided. Dropdowns can be left blank. Add extra notes below the dropdowns.

Please note: Timings can and will change, this should only be used as a guide.

Semester One	W&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item.

Semester Two	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Submit	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Submit	Choose an item.