MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME514 ADVANCED TOPICS IN FLUID SYSTEMS ENGINEERING

Module Registrar: Prof Y Zhang yonghao.zhang@strath.ac.uk	**Taught To (Course): Cohorts for whom class is optional**		
Other Lecturers Involved: Dr I Kokkinakis, Dr K Ritos, Dr S Haeri	**Credit Weighting: 10 (ECTS 5)**	**Semester: 2**	
Assumed Prerequisites: ME101 ME203 ME301 ME405 Heat and Flow (1/2/3/4); 16363 Engineering Analysis3; 16429 Computer Aided Engineering Design	**Optional class**	**Academic Level: 5**	**Suitable for Exchange: Y**

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

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
20								80	100

Educational Aim

This module aims to introduce complex and interesting fluid flow and heat transfer problems, which are central to many advanced fluid engineering systems often at the cutting-edge of modern engineering. These include human biological flows, multiphase flows, micro and nano scale flows, and space shuttle re-entry. In all of these our physical understanding is limited, which limits our engineering design ability. This class will give students the opportunity to identify and explore a number of advanced topics in heat transfer and fluid flow. We will investigate the limitations of current engineering knowledge and the new approaches that engineers are seeking to develop. Where appropriate, computational fluid dynamics techniques will be used to explore some advanced modelling approaches and to carry out simulations of complex fluid systems. The range of flow systems the students will encounter may include (in addition to those mentioned above): oil/gas production process, power systems, high speed flows important for modern air- and spacecraft design, nano/micro technology, and flows encountered in urban environments and structures.

Learning Outcomes

To broaden the students' appreciation of the importance of fluid flow and heat transfer in modern and future technological applications, as well as to deepen the students' understanding of a number of specific topics.

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

LO1 identify and classify complex flow systems from physical arguments, and appreciate the limitations of current modelling techniques to complex flow systems.

LO2 review and assess the technical literature on specific flow topics.

LO3 understand the main formulation methods and the limitations of the equations derived from them.

LO4 be able to carry out certain engineering calculations using CFD techniques for complex fluid flows.

Syllabus

The module will teach the following four topics:

- Advanced computational fluid dynamics
- Computational methods including molecular dynamics and other particle methods
- Micro and nano flows
- High-performance computing

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: understand why current modelling techniques have limitations in describing some complex flow systems

LO2: able to identify and source relevant information, and synthesise a range of results and analysis

LO3: able to derive and use relevant formulae, and describe their underlying physical assumptions

LO4: able to work with and apply the formulae in engineering computations to obtain realistic results

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/staff/policies/academic/)

This module is designed to expose the students to state of the art engineering systems where fluid and heat transfer problems play central roles. The assessment will be through online quiz and exam which encourage 'time and effort' on challenging learning tasks. It will help students to focus on developing research skills and self-learning abilities. The interactive discussion with students will help the lecturers to improve the course. The major means of feedback will be through class discussion. Assessment and feedback in this course can also be incorporated in discussions in class. Informational feedback such as one-to-one discussion may be arranged if necessary.

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***
2	Feb(wk4) Apr/May	0.5 hr 1 hr	25% 75%						
* LO1-4				*		*		*	

* ***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*):

Resit Assessment Procedures:
1 hr examination in August 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 during the August diet. This re-assessment will consist entirely of exam. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

Class reading to be recommended by the individual lecturer on a particular topic.

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

Date	Time	Room No
		Check timetable webpages for details

Session: 2019/20

Approved:

Course Director Signature: Dr Stuart Grey

Date of Last Modifications: 06/09/2019

(Updated July 2019)

MODULE TIMETABLE

Module Code:	**ME514**	**Module Title:**	**Advanced Topics in Fluid Systems Engineering**

Brief Description of Assessment:

Online test (done in class) and exam.
We will assess whether a student:

- can understand why the current modelling techniques have limitations in describing complex flow systems
- is able to find relevant information and analyse it, to derive formulae and know the indication of necessary underlying assumptions, and to apply the formulae for engineering calculations.

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.	Online Test	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.	Exam