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 T Scanlon, Dr I J Taylor, Dr M Oliveira

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

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

<table>
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<tr>
<th>Lecture</th>
<th>Tutorial</th>
<th>Laboratory</th>
<th>Groupwork</th>
<th>External</th>
<th>Online</th>
<th>Project</th>
<th>Assignments</th>
<th>Private Study</th>
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Educational Aim

Complex and interesting fluid flow and heat transfer problems 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. 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): refrigeration and power systems, high speed flows important for modern air- and spacecraft design, nanotech desalination and water purification, 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:

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

Up to four topics selected from the following will be explored:

- Multiphase flows
- Phase change heat transfer (boiling, condensation, melting, solidification)
- Micro and nano flows
- Very-high-speed aerodynamics
- Wind effects on structures
- Turbulence
- Microdroplet technology
- Computational fluid dynamics
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 how 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.

12 Principles of Assessment and Feedback
(on Learning & Teaching web pages: www.strath.ac.uk/learnteach/teaching/staff/assessfeedback/12principles/)

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 courseworks which encourage ‘time and effort’ on challenging learning tasks. It will help students to focus on developing research skills and self-learning abilities. The courseworks and 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

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<th>L/Outcomes</th>
<th>Examinations</th>
<th>Courseworks</th>
<th>Projects</th>
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<tr>
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<td>Number</td>
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<td>LO1-4</td>
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Indicate which learning outcomes (LO1, LO2 etc) are to be assessed by exam/coursework/project as required.

Coursework / Submissions deadlines: To be announced by the individual lecturer on a particular topic.

Resit Assessment Procedures: Resubmission of coursework prior to the commencement of the August Examination diet.

PLEASE NOTE:
Students need to gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of coursework.

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)

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Session: 2014/15

Approved:

Course Director Signature: [Signature]

Date of Last Modifications: 28 August 2014
**MODULE TIMETABLE**

**Module Code:** ME514

**Module Title:** ADVANCED TOPICS IN FLUID SYSTEMS ENGINEERING

**Brief Description of Assessment:**

We will assess student whether she/he 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(s).

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