MECH202

Thermodynamics and Fluids

S2 Day 2014

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff
Lecturer
Sammy Diasinos
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Contact via email
E6B 108
Tuesday and Wednesday between 9am and 10am

Credit points
3

Prerequisites
(ENGG170(P) or ELEC170(P) or ENGG150(P)) and ((PHYS140(P) and PHYS143(P)) or (PHYS106 and PHYS107)) and (MATH132 or MATH135(P))

Corequisites

Co-badged status

Unit description
This unit will examine the basic concepts of thermodynamics. It will analyse the First Law of Thermodynamics; and examine the roles of fluids and their properties in an engineering context. In particular concepts of pressure and head; hydrostatics; buoyancy; and closed systems will be examined.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

The student will be able to identify the characteristics associated with different types of fluids and if a fluid system is either static or dynamic.
The student will be able to apply a selection of static theories to ideal and real-world problems.
The student will be able to choose and apply either Bernoulli's equation or one of the fundamental laws of fluid flows, as appropriate, to solve ideal and real-world fluid dynamics problems.

The student will obtain an appreciation for experimental and numerical techniques that exist to investigate fluid flows that are too complex to analyse using hand calculations while forming an understanding of the responsible practice for using these techniques.

General Assessment Information

It is a requirement that the final examination be completed with a score of no less than 50% for a pass to be awarded for this course.

Tutorial and Laboratory session attendance is compulsory.

Assessment Tasks

Name	Weighting	Due
Class tests (2)	15%	Week 5 and Week 10
Laboratories (3)	22%	Week 6, Week 8 and Week 9
Assignment	13%	Week 12
Examination	50%	Examination period

Class tests (2)

Due: **Week 5 and Week 10**
Weighting: **15%**

Class Test assessing material delivered up to the point when each test is given.

On successful completion you will be able to:

- The student will be able to identify the characteristics associated with different types of fluids and if a fluid system is either static or dynamic.
- The student will be able to apply a selection of static theories to ideal and real-world problems.
- The student will be able to choose and apply either Bernoulli's equation or one of the fundamental laws of fluid flows, as appropriate, to solve ideal and real-world fluid dynamics problems.

Laboratories (3)

Due: **Week 6, Week 8 and Week 9**
Weighting: **22%**

Three individual laboratory reports written for three unique experiments demonstrating; Buoyancy and Stability, Bernoulli's Theorem and losses due to friction in piping systems.

On successful completion you will be able to:

- The student will be able to identify the characteristics associated with different types of fluids and if a fluid system is either static or dynamic.
- The student will be able to apply a selection of static theories to ideal and real-world problems.
- The student will be able to choose and apply either Bernoulli's equation or one of the fundamental laws of fluid flows, as appropriate, to solve ideal and real-world fluid dynamics problems.

Assignment

Due: **Week 12**
Weighting: **13%**

An assignment that encompasses the results obtained from the final laboratory (wind tunnel testing) and requires the student to produce a simulation (Computational Fluid Dynamics Model) in order to make a suitable comparison. Once results have been obtained, students are required to identify the possible causes for variations between the experiment and simulation.

On successful completion you will be able to:

- The student will obtain an appreciation for experimental and numerical techniques that exist to investigate fluid flows that are too complex to analyse using hand calculations while forming an understanding of the responsible practice for using these techniques.

Examination

Due: **Examination period**
Weighting: **50%**

Final Examination assessing all material delivered throughout the course.

On successful completion you will be able to:

- The student will be able to identify the characteristics associated with different types of fluids and if a fluid system is either static or dynamic.
- The student will be able to apply a selection of static theories to ideal and real-world problems.
- The student will be able to choose and apply either Bernoulli's equation or one of the fundamental laws of fluid flows, as appropriate, to solve ideal and real-world fluid dynamics problems.
- The student will obtain an appreciation for experimental and numerical techniques that

exist to investigate fluid flows that are too complex to analyse using hand calculations while forming an understanding of the responsible practice for using these techniques.

Delivery and Resources

The main text required for this course is: Potter and Wiggert, Mechanics of Fluids, 3rd Ed

Unit Schedule

Week	Lecture Topic	Lecturer	Laboratory/ Tutorial	Assesments
1	Introduction to Fluid Mechanics, Fluid Properties	Dr Diasinos	No Tutorial	
2	Fluids Statics, Pressures in Fluids, Accelerating Fluids	Dr Diasinos	Tutorial	
3	Forces of Fluids Acting on Surfaces	Dr Diasinos	Tutorial	
4	Buoyancy and Stability	Dr Diasinos	Tutorial	
5	Description and Classification of Fluids In Motion	Dr Diasinos	Laboratory 1 and Tutorial	In Class Test 1
6	Bernoulli's Equation and The Fundamental Laws of Fluid Motion	Dr Diasinos	Tutorial	Laboratory Report 1 Due
7	Internal Flows	Dr Diasinos	Laboratory 2 and Tutorial	
8	Dimensional Analysis and Similitude	Dr Diasinos	Laboratory 3 and Tutorial	Laboratory Report 2 Due
9	Experimental Techniques to Investigate Fluid Mechanics	Dr Diasinos	Laboratory 4 and Tutorial	Laboratory Report 3 Due
10	Numerical Techniques to Investigate Fluid Mechanics	Dr Diasinos	CFD Tutorial	In Class Test 2
11	External Flows	Dr Diasinos	CFD Tutorial	
12	Compressible Flows	Dr Diasinos	CFD Tutorial	Assignment Due
13	Revision	Dr Diasinos	Tutorial	

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy http://mq.edu.au/policy/docs/grading/policy.html

Grade Appeal Policy http://mq.edu.au/policy/docs/gradeappeal/policy.html

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the Learning and Teaching Category of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- Workshops
- StudyWise
- Academic Integrity Module for Students
- Ask a Learning Adviser

Student Services and Support

Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit http://informatics.mq.edu.au/help/.

When using the University's IT, you must adhere to the Acceptable Use Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcomes

- The student will be able to identify the characteristics associated with different types of fluids and if a fluid system is either static or dynamic.
- The student will be able to apply a selection of static theories to ideal and real-world problems.
- The student will be able to choose and apply either Bernoulli’s equation or one of the fundamental laws of fluid flows, as appropriate, to solve ideal and real-world fluid dynamics problems.
- The student will obtain an appreciation for experimental and numerical techniques that exist to investigate fluid flows that are too complex to analyse using hand calculations while forming an understanding of the responsible practice for using these techniques.

Assessment tasks

- Laboratories (3)
- Assignment

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships

with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcome

- The student will obtain an appreciation for experimental and numerical techniques that exist to investigate fluid flows that are too complex to analyse using hand calculations while forming an understanding of the responsible practice for using these techniques.

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

Learning outcomes

- The student will be able to identify the characteristics associated with different types of fluids and if a fluid system is either static or dynamic.
- The student will be able to apply a selection of static theories to ideal and real-world problems.
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Assessment tasks

- Class tests (2)
- Laboratories (3)
- Assignment
- Examination

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate

and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

Learning outcomes

- The student will be able to identify the characteristics associated with different types of fluids and if a fluid system is either static or dynamic.
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Assessment tasks

- Class tests (2)
- Laboratories (3)
- Assignment
- Examination

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

Learning outcomes

- The student will be able to identify the characteristics associated with different types of fluids and if a fluid system is either static or dynamic.
- The student will be able to apply a selection of static theories to ideal and real-world problems.
- The student will be able to choose and apply either Bernoulli's equation or one of the fundamental laws of fluid flows, as appropriate, to solve ideal and real-world fluid

dynamics problems.
- The student will obtain an appreciation for experimental and numerical techniques that exist to investigate fluid flows that are too complex to analyse using hand calculations while forming an understanding of the responsible practice for using these techniques.

Assessment tasks

- Class tests (2)
- Laboratories (3)
- Assignment
- Examination

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes

- The student will be able to apply a selection of static theories to ideal and real-world problems.
- The student will be able to choose and apply either Bernoulli's equation or one of the fundamental laws of fluid flows, as appropriate, to solve ideal and real-world fluid dynamics problems.
- The student will obtain an appreciation for experimental and numerical techniques that exist to investigate fluid flows that are too complex to analyse using hand calculations while forming an understanding of the responsible practice for using these techniques.

Assessment tasks

- Assignment
- Examination

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcome

- The student will obtain an appreciation for experimental and numerical techniques that exist to investigate fluid flows that are too complex to analyse using hand calculations while forming an understanding of the responsible practice for using these techniques.

Assessment tasks

- Laboratories (3)
- Assignment
- Examination

Changes since First Published

Date	Description
07/03/2014	The Prerequisites was updated.
24/12/2013	The Prerequisites was updated.