MECH202

Fluid Mechanics

S2 Day 2015

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff Lecturer Sammy Diasinos sammy.diasinos@mq.edu.au Contact via email E6B 108 Tuesday and Wednesday between 9am and 10am
Credit points 3
Prerequisites (MATH132 or MATH135(P)) and ((PHYS106 and PHYS107) or (PHYS140(P) and PHYS143(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 proficient at mathematical analysis and the application of physics associated with fluid mechanics.

The student will understand the basics of static and dynamic fluid systems.

The student will be able to analyse simple static and dynamic fluid problems applied to real world problems.

The student will be able to apply appropriate technology to investigate more complex fluid flow problems.

The student will be able to prepare, contribute and participate in their lessons in a professional manner.

General Assessment Information

In order to pass this unit, it is necessary for students to demonstrate satisfactory achievement of all learning outcomes, perform satisfactorily in the invigilated assessments (class tests and final examination) and perform satisfactorily overall.

Students who fail to follow the instructions provided for assessment tasks risk not having the effected sections of the assessment marked.

In the event that an assessment task is submitted late, the following penalties will apply; 0 to 24 hours -25%, 24 hours to 48 hours -50%, greater than 48 hours will result in no mark being awarded.

Assessment Tasks

Name	Weighting	Due
Skills Test	3%	Week 2 Lecture
Fluid Static Class tests	8%	Week 5 Lecture
Fluid Static Laboratories	8%	Weeks 6
Fluid Dynamic Laboratories	8%	Week 9
Fluid Dynamics Class test	8%	Week 10 Lecture
Professionalism & Contribution	8%	Weeks 2 to 13
Assignment	7%	Week 13
Examination	50%	Examination period

Skills Test

Due: **Week 2 Lecture**
Weighting: **3%**

A test to be conducted in the first lecture to confirm the students assumed knowledge ascertained from the prerequisite courses.

On successful completion you will be able to:

- The student will be proficient at mathematical analysis and the application of physics associated with fluid mechanics.

- The student will be able to prepare, contribute and participate in their lessons in a professional manner.

Fluid Static Class tests

Due: **Week 5 Lecture**
Weighting: **8%**

In Class Test assessing material delivered relevant to the Fluid Statics module of the course.

On successful completion you will be able to:

- The student will understand the basics of static and dynamic fluid systems.
- The student will be able to analyse simple static and dynamic fluid problems applied to real world problems.

Fluid Static Laboratories

Due: **Weeks 6**
Weighting: **8%**

Combined laboratory reports written for two unique experiments demonstrating; hydrostatic forces as well as buoyancy and stability.

On successful completion you will be able to:

- The student will understand the basics of static and dynamic fluid systems.
- The student will be able to analyse simple static and dynamic fluid problems applied to real world problems.

Fluid Dynamic Laboratories

Due: **Week 9**
Weighting: **8%**

Combined laboratory report written for unique two experiments demonstrating; Bernoulli's theorem and losses due to friction in piping systems.

On successful completion you will be able to:

- The student will understand the basics of static and dynamic fluid systems.
- The student will be able to analyse simple static and dynamic fluid problems applied to real world problems.

Fluid Dynamics Class test

Due: **Week 10 Lecture**
Weighting: **8%**

In Class Test assessing material delivered relevant to the Fluid Dynamics module of the course.

On successful completion you will be able to:

- The student will understand the basics of static and dynamic fluid systems.
- The student will be able to analyse simple static and dynamic fluid problems applied to real world problems.

Professionalism & Contribution

Due: **Weeks 2 to 13**
Weighting: **8%**

An assessment of the professionalism and contribution made by individual students throughout all tutorial and laboratory sessions

On successful completion you will be able to:

- The student will be able to prepare, contribute and participate in their lessons in a professional manner.

Assignment

Due: **Week 13**
Weighting: **7%**

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 and assess which is the more trustworthy result for the given application.

On successful completion you will be able to:

- The student will be able to apply appropriate technology to investigate more complex fluid flow problems.

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 understand the basics of static and dynamic fluid systems.
- The student will be able to analyse simple static and dynamic fluid problems applied to

real world problems.

- The student will be able to apply appropriate technology to investigate more complex fluid flow problems.

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

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/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au.

Tutorial and Laboratory attendance is compulsory at the enrolled tutorial time. Students who wish to change the tutorial time after the session commences may only do so with the written permission of the unit convener. Active participation during tutorials and laboratories will contribute towards the "professionalism and contribution" assessment.

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

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 analyse simple static and dynamic fluid problems applied to real world problems.
- The student will be able to apply appropriate technology to investigate more complex fluid flow problems.

Assessment tasks

- Fluid Static Class tests
- Fluid Static Laboratories
- Fluid Dynamic Laboratories
- Fluid Dynamics Class test
- Professionalism & Contribution
- Assignment
- Examination

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 understand the basics of static and dynamic fluid systems.
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- The student will be able to prepare, contribute and participate in their lessons in a professional manner.

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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 outcomes

- The student will be proficient at mathematical analysis and the application of physics associated with fluid mechanics.
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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 proficient at mathematical analysis and the application of physics associated with fluid mechanics.
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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 understand the basics of static and dynamic fluid systems.
- The student will be able to analyse simple static and dynamic fluid problems applied to real world problems.
- The student will be able to apply appropriate technology to investigate more complex fluid flow problems.
- The student will be able to prepare, contribute and participate in their lessons in a professional manner.

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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 proficient at mathematical analysis and the application of physics associated with fluid mechanics.
- The student will understand the basics of static and dynamic fluid systems.
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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 be able to prepare, contribute and participate in their lessons in a professional manner.

Assessment tasks

- Fluid Static Laboratories
- Fluid Dynamic Laboratories
- Professionalism & Contribution
- Assignment

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Learning outcome

- The student will be able to prepare, contribute and participate in their lessons in a professional manner.