MECH202

Fluid Mechanics

S1 Day 2017

Dept of Engineering

Contents

General Information

Unit convenor and teaching staff Lecturer Sammy Diasinos sammy.diasinos@mq.edu.au Contact via email E6B 144 Tuesday and Wednesday between 9am and 10am
Credit points 3
Prerequisites (MATH133 or MATH136(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.

General Assessment Information

Student Responsibilities

Be familiar with University policy and College procedures and act in accordance with those policy and procedures.

It is the responsibility of the student to retain a copy of any work submitted. Students must produce these documents upon request. Copies should be retained until the end of the grade appeal period each term.

Student is to perform the required due diligent for their assessment grade and rectify as soon as possible upon finding any errors.

Notifications

Formal notification of assessment tasks, grading rubrics and due dates will be posted on iLearn. Although all reasonable measures to ensure the information is accurate, The University reserves the right to make changes without notice. Each student is responsible for checking iLearn for changes and updates.

Report and Assignment Tasks

Assignment Problems will be posted on iLearn at least two weeks before their submission date. Assignment/Lab report solutions will be posted within a week after the submission date. Submissions will not be accepted once the solution is posted.

Assignment submissions and plagiarism policies

All assignments and reports must be submitted electronically through iLearn (in pdf format) unless otherwise explicitly stated. Submissions will undergo plagiarism checkers using the turnitin software and any work deemed to have 30% or higher similarity score may incur academic penalty. For more details on the policies of academic penalties relating to academic honesty, please refer to the policies and procedures section below.

Submissions are expected to be typed set in a logical layout and sequence and graphs are expected to be drawn using suitable software. Markers WILL NOT grade poorly organized or illegible scans or drafts. The expected workload includes preparation of final copies and clear diagrams.

Late submissions

Late submissions or absences from tutorials and laboratories will not be accepted. In the event

that an assignment or report is submitted late, between 0 and 24 hours a deduction of 25% will be made, between 24 and 48 hours a deduction of 50% will be made, more than 48 hours will result in no marks being awarded. Extenuating circumstances will be considered upon lodgement of a formal notice of disruption of studies.

Grading and passing requirement for unit

For further details about grading, please refer below in the policies and procedures section. In order to pass this unit a student must obtain a mark of 50 or more for the unit (i.e. obtain a passing grade P/ CR/ D/ HD).

Final Examinations

Final examinations will typically take place at the end of the semester. For further information, please refer to the Examination Timetable website on www.mq.edu.au

Assessment Tasks

Name	Weighting	Hurdle	Due
Skills Test	4%	No	Week 2 Lecture
Fluid Static Class tests	10%	No	Week 5 Lecture
Fluid Static Laboratories	8%	No	Weeks 6
Fluid Dynamic Laboratories	8%	No	Week 9
Fluid Dynamics Class test	10%	No	Week 10 Lecture
Assignment	10%	No	Week 13
Examination	50%	No	Examination period

Skills Test

Due: **Week 2 Lecture**
Weighting: **4%**

A test that will allow students to assess if they have obtained the necessary knowledge from the prerequisite Maths and Physics units in order to complete this unit successfully.

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.

Fluid Static Class tests

Due: **Week 5 Lecture**
Weighting: **10%**

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 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.

Fluid Static Laboratories

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

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%**

Laboratory reports written for two unique 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: **10%**

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 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.

Assignment

Due: **Week 13**
Weighting: **10%**

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 unit.

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 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 questions and CFD Introduction	In Lecture Skills Test
3	Forces of Fluids Acting on Surfaces	Dr Diasinos	Laboratory 1 and Tutorial	
4	Buoyancy and Stability	Dr Diasinos	Tutorial questions and CFD	
5	Description and Classification of Fluids In Motion	Dr Diasinos	Laboratory 2 and Tutorial	Fluid Statics In Class Test
6	Bernoulli's Equation and The Fundamental Laws of Fluid Motion	Dr Diasinos	Tutorial questions and CFD	Fluid Statics Laboratory Reports 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	Fluid Dynamics Laboratory Reports Due
10	Numerical Techniques to Investigate Fluid Mechanics	Dr Diasinos	Tutorial questions and CFD	Fluid Dynamics In Class Test
11	External Flows	Dr Diasinos	Tutorial questions and CFD	
12	Compressible Flows	Dr Diasinos	Tutorial questions and CFD	
13	Revision	Dr Diasinos	Tutorial questions and CFD	CFD/Wind Tunnel 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_2016.html

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration

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://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources 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
- 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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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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- Examination

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.
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real world problems.
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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

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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:

Assessment tasks

- Fluid Static Laboratories
- Fluid Dynamic Laboratories
- Assignment