MMAN2600

FLUID MECHANICS

Contents

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1. Staff contact details

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ranging from car/airplane aerodynamics, heat exchangers, combustion systems, micro-fluidics, and flows in artificial hearts.

In this course the topics covered include: fluid properties, fluid statics and buoyancy, Bernoulli's equation and its use/limitations, linear momentum, dimensional analysis, laminar and turbulent flow, flow in pipes and pipe networks including pressure drop calculations, boundary layer in external flow, drag or immersed bodies, turbines, fans and pumps and analysis of turbo-machines.

The knowledge of fluid mechanics gained in this course is a spring board for many other courses studied in the mechanical engineering degree programmes, including, advanced thermofluids (heat transfer and advanced thermodynamics), computational fluid dynamics (CFD), automobile engine technology, and aerodynamics and propulsion, as well as other disciplines particularly renewable energy.

Aims of the course

This course will familiarise you with the terminology associated with fluid mechanics and the use of fluid properties in solving problems. At first, you will develop an intuitive understanding of fluid mechanics by emphasis of the physics and physical arguments. Then you will be given insight into the basic principles of fluid mechanics and you will learn how to measure fluid systems and be given the tools to design fluid systems. Also, you will be given an understanding of the workings of hydraulic systems e.g. turbines.

This course uses the mathematical and physical concepts which you learned in MATH1131 or MATH1141 and PHYS1121 or PHYS1131. It lays the groundwork for the procedure which you will use in undertaking more complex fluid dynamics problems in courses such as AERO3630 or MECH9620 as well as thermal engineering problems in courses such as MECH3610 and MECH9761.

Student learning outcomes

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

After successfully completing this course, you should be able to:

Learning Outcome		EA Stage 1 Competencies
1.	Be familiar with the terminology associated with fluid mechanics	PE1.1
2.	Be able to use fluid properties correctly to solve problems	PE2.1, 2.2
3.	Understand the principals of flow rates and velocity measurement	PE1.1
4.	Be able to determine pressure drops for pipe systems and choose appropriate pumps and turbines depending on the application	PE2.3, 2.4

3. Teaching strategies

Lectures in the course are designed to cover the terminology and core concepts and theories in fluid mechanics. They do not simply reiterate the texts, but build on the lecture topics using practical examples to show how the theory is applied in real engineering problems and the details of when, where and how it should be applied.

Demonstrations are designed to provide you with feedback and discussion on the example problems, and to investigate problem areas in greater depth to ensure that you understand the application and can avoid making the same mistake again.

LABORATORY TIMETABLE

Undergraduate Teaching Laboratory (UTL), J18 Willis Annexe

Laboratory Time Slots

M10A	Mon	1000	1200	UTL
M12A	Mon	1200	1400	UTL
T09A	Tue	0900	1100	UTL
T15A	Tue	1500	1700	UTL
H10A	Thu	1000	1200	UTL
F12A	Fri	1200	1400	UTL
F14A	Fri	1400	1600	UTL

Due to the large number of students, each of these timeslots will further be broken into 2 groups. You will be notified of which group, Archimedes or Bernoulli, you are in before the lab commences in week 3. For example, if you are enrolled to M10A and are selected for group Bernoulli, you will attend the lab on Mon 10:00-12:00 in week 4, 6, 8, 11 and 13. If you are enrolled to H10A and are selected for group Archimedes, your lab will be on Thurs 10:00-12:00 in week 3, 5, 7, 9 and12.

Laboratory Topic

Lab 1 Flow measurement
CFD CFD laboratory, conducted in the computer labs
Lab 2 Hydrostatics
Lab 3 Pipe friction
Lab 4 Pelton wheel

5 Assessment

General

You will be assessed by way of two mid-session tests, laboratory works, online work and final examination.

Assessment	Weight	Learning outcomes assessed	Due	Marks returned
5 x Laboratories	25% of final mark	1, 2, 3, 4	During each allocated lab class	In class
2 x Mid-session tests	25% of final mark	1, 2, 3, 4	During week 5 and 9 lecture	During week 7 and 11 lecture
1 x Final exam	50% of final mark	1, 2, 3, 4	TBC, during UNSW exam period	With release of results
Total	**100%**			

In order to pass the course, you must achieve an overall mark of at least 50%.

Lab Assignments

There will be 5
including 1 computer-lab based CFD experiment.

You are required to obtain a bound laboratory book (alternate lined and graph pages) to record results of each experiment and analysis carried out whilst in the laboratory.

The laboratory demonstrators will mark your preliminary work at the start of the laboratory period and mark your data collection and analysis at the end of the laboratory period. Ensure that your work is marked before you leave the laboratory and that your mark is entered in the class record and your laboratory book and initialled by the demonstrator. You will not be admitted to the laboratory unless you are appropriately dressed for safe working, have a laboratory book, a calculator and present the assigned preliminary work.

The laboratory demonstrators will give instructions on how to operate the equipment, and will explain what is required of you. If in doubt, ask. It is important that you fully understand the experiment at the time it is being carried out, when instruction is available. In some experiments you are only required to take readings at intervals, use the intermediate time to ask questions and find out what other members of your group are doing. Little is learned merely by sitting and waiting to make a measurement - much is learned by inquiry and discussion.

Attendance at all laboratory experiments to which you are assigned is compulsory and a register is taken. If you are unable to attend, due to illness, it is important that you inform the Head Demonstrator as soon as possible so that you may be reassigned to that experiment at a later date. You might be asked to present a medical certificate later.

Criteria

Specific criteria will be given for each particular laboratory experiment, or test.
In general, for any work that involves numerical calculations, the following criteria will be used:

Accuracy of numerical answers.
Use of diagrams, where appropriate, to support or illustrate the calculations.
Use of graphs, were appropriate, to support or illustrate the calculations.
Use of tables, where appropriate, to support or shorten the calculations.
Neatness.

Mid-session Tests

There will be two mid-session tests (held in weeks 5 and 9), during the 2-hr lecture time. For each test, there will be questions from week 1~4 lectures (Test 1) and week 5~8 lectures (Test 2). Due to the large number of students, the tests will be conducted in concurrently in two separate lecture rooms (Central Lecture Block 7 for Archimedes or Central Lecture Block 8 for Bernoulli).

Final Examination

There will be one 3-hour examination at the end of the session for everything learned from this course.

You must be available for all tests and examinations. Final examinations for each course are held during the University examination periods, which are June for Semester 1 and November for Semester 2.

Provisional Examination timetables are generally published on myUNSW in May for Semester 1 and September for Semester 2

For further information on exams, please see the Exams section on the intranet.

You will need to provide your own calculator, of a make and model approved by UNSW, for the examinations. The list of approved calculators is shown at

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Textbook

Cengel and Cimbala, Fluid Mechanics Fundamentals and Applications, 2nd Ed in SI unit. The textbook is available from the UNSW Bookshop and the UNSW Library (http://info.library.unsw.edu.au/web/services/services.html).

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Feedback on the course is gathered periodically using various means, including the Course and Teaching Evaluation and Improvement (CATEI) process, informal discussion in the final

seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course, recent improvements resulting from student feedback include a new method of running demonstrations and the incorporation of blended teaching modules into the course.

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UNSW has an ongoing commitment to fostering a culture of learning informed by academic

or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here: www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Further information on School policy and procedures in the event of plagiarism is available on the intranet.

9. Administrative matters

All students are expected to read and be familiar with School guidelines and polices, available on the intranet. In particular, students should be familiar with the following: