



The University of Southern Queensland

## Course specification

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The current and official versions of the course specifications are available on the web at  
<<http://www.usq.edu.au/coursespecification/current>>.

Please consult the web for updates that may occur during the year.

### Description: Introduction to Fluid Mechanics and Heat Transfer

Subject	Cat-nbr	Class	Term	Mode	Units	Campus
MEC	2106	66692	2, 2007	EXT	1.00	Toowoomba

<b>Academic group:</b>	FOENS
<b>Academic org:</b>	FOES02
<b>Student contribution band:</b>	2
<b>ASCED code:</b>	030799

### STAFFING

Examiner: Ahmad Sharifian

Moderator: Ruth Mossad

### REQUISITES

Pre-requisite: MAT1100 and CIV1501

### RATIONALE

Fluid is a substance ubiquitous to engineering, either as a material to be used and exploited, or as part of the environment with which engineering systems have to contend. Any qualifying course within the mechanical engineering profession must have a core subject presenting the fundamental concepts of fluid behaviour and heat transfer, both under static and dynamic conditions.

### SYNOPSIS

Technologists have a particular need to understand the behaviour of fluids for, amongst other things, they have the professional task of employing them in the massive technological field of energy conversion. This course presents the fundamental concepts of fluid behaviour, both under static and dynamic conditions. This course is designed to give the student the ability to analyse many practical problems in which fluid is the working medium. The aims of the analysis are to estimate forces on objects due to the fluid which can be either static or flowing (this is an important step in the design of these objects), to detect causes of decline in performance, and to recommend solutions to prolong the life and improve efficiencies of fluid systems. Heat transfer in its three different modes; conduction, convection and radiation, are also introduced. This is to enable the student to analyse simple thermal systems.

### OBJECTIVES

The course objectives define the student learning outcomes for a course. The assessment item(s) that may be used to assess student achievement of an objective are shown in parenthesis. On completion of this course, students should be able to:

1. analyse and evaluate simple systems with fluid as the working medium; (Assignment 1; Assignment 2; Exam)
2. analyse simple thermal systems in order to estimate heat gain or heat loss due to the different modes of heat transfer. (Assignment 1; Assignment 2; Exam)

## TOPICS

	Description	Weighting (%)
1.	INTRODUCTION AND FLUID PROPERTIES Definition of a fluid, fluid properties, dimensions and units.	6.00
2.	FLUID AT REST Pressure variations with elevation, pressure measurements, hydrostatic forces on submerged bodies, stability of immersed and floating bodies.	15.00
3.	FLUID IN MOTION Continuity equation for one dimensional flow, causes of pressure variation in a flowing fluid, Bernoulli's equation and cavitation.	12.00
4.	ENERGY PRINCIPLE The energy equation, application for the energy equation in the one dimensional incompressible flow in a pipe, hydraulic and energy grade lines, laminar and turbulent flow in pipes and principals for pipe systems.	18.00
5.	MOMENTUM PRINCIPLE The momentum equation, some applications on the momentum equation.	10.00
6.	PUMPS Positive displacement pumps, dynamics pumps such as centrifugal pump, model testing, similarity laws and selection of pumps.	12.00
7.	GAS FLOW Fans, blowers and compressors flow of gases through ducts, pipes and nozzles.	12.00
8.	Basic modes of heat transfer.	15.00

## TEXT and MATERIALS required to be PURCHASED or ACCESSED

ALL textbooks and materials are available for purchase from USQ BOOKSHOP (unless otherwise stated). Orders may be placed via secure internet, free fax 1800642453, phone 07 46312742 (within Australia), or mail. Overseas students should fax +61 7 46311743, or phone +61 7 46312742. For costs, further details, and internet ordering, use the 'Textbook Search' facility at <http://bookshop.usq.edu.au> click 'Semester', then enter your 'Course Code' (no spaces).

Esposito, A 1998, *Fluid Mechanics with Applications*, Prentice Hall, Upper Saddle River, NJ. (International Edition)

## REFERENCE MATERIALS

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

Crowe, CT, Elger, D & Robertson, JA 2006, *Engineering Fluid Mechanics*, 8th edn, Wiley, NY.

(International Student Edition)

Daugherty, R & Finnemore, EJ 2002, *Fluid Mechanics with Engineering Application*, 10th edn, McGraw-Hill, New York.

(SI Metric Edition)

Giles, RV et al 1994, *Schaum's Outline of Theory and Problems of Fluid Mechanics and Hydraulics*, 3rd edn, McGraw-Hill, New York.

Kreith, F & Bohn, MS 2001, *Principles of Heat Transfer*, 6th edn, Brooks/Cole Publishing, Australia.

Munson, BR et al 2002, *Fundamentals of Fluid Mechanics*, 4th edn, Wiley & Sons, New York.

Street, RL, Watters, GZ & Vennard, JK 1996, *Elementary Fluid Mechanics*, 8th edn, Wiley, NY.

(SI Version)

## STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessment	15.00
Directed Study	63.00
Examinations	2.00
Private Study	75.00

## ASSESSMENT DETAILS

Description	Marks out of	Wtg(%)	Due date
ASSIGNMENT 1	150.00	15.00	07 Sep 2007
ASSIGNMENT 2	150.00	15.00	26 Oct 2007
2 HOUR RESTRICTED EXAMINATION	700.00	70.00	END S2 (see note 1)

### NOTES

1. Student Administration will advise students of the dates of their examinations during the semester.

## IMPORTANT ASSESSMENT INFORMATION

- 1 Attendance requirements:  
There are no attendance requirements for this course. However, it is the students' responsibility to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration.
- 2 Requirements for students to complete each assessment item satisfactorily:  
To satisfactorily complete an individual assessment item a student must achieve at least 50% of the marks or a grade of at least C-. (Depending upon the requirements in Statement 4 below, students may not have to satisfactorily complete each assessment item to receive a passing grade in this course.)
- 3 Penalties for late submission of required work:

- If students submit assignments after the due date without extenuating circumstances then a penalty of 5% of the assigned mark may apply for each working day late up to a maximum of ten working days at which time a mark of zero can be recorded for that assignment.
- 4 Requirements for student to be awarded a passing grade in the course:  
To be assured of receiving a passing grade in a course a student must obtain at least 50% of the total weighted marks for the course.
  - 5 Method used to combine assessment results to attain final grade:  
The final grades for students will be assigned on the basis of the weighted aggregate of the marks (or grades) obtained for each of the summative assessment items in the course.
  - 6 Examination information:  
In a Restricted Examination, candidates are allowed access to specific materials during the examination. The only materials that candidates may use in the restricted examination for this course are: writing materials (non-electronic and free from material which could give the student an unfair advantage in the examination); calculators which cannot hold textual information (students must indicate on their examination paper the make and model of any calculator(s) they use during the examination); a handwritten A4 sheet (two sides) containing any information that they believe will be relevant for the examination; Translation dictionary. Students whose first language is not English, may, with the Examiner's approval, take an appropriate non- electronic translation dictionary into the examination. Students who wish to use a translation dictionary **MUST** request and receive written approval from the Examiner at least one week before the examination date. Translation dictionaries will be subject to perusal and may be removed from the candidate's possession until appropriate disciplinary action is completed if found to contain material that could give the candidate an unfair advantage; no other materials are permitted in the examination. Charts, labels and graphs needed for the solution of the examination problems will be provided to you with the examination paper.
  - 7 Examination period when Deferred/Supplementary examinations will be held:  
Any Deferred or Supplementary examinations for this course will be held during the examination period at the end of the semester of the next offering of this course.
  - 8 University Regulations:  
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL <http://www.usq.edu.au/corporateservices/calendar/part5.htm> or in the current USQ Handbook.

## **ASSESSMENT NOTES**

- 1 The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner.
- 2 Students must retain a copy of each item submitted for assessment. This must be despatched to USQ within 24 hours if required by the Examiner.
- 3 In accordance with University's Assignment Extension Policy (Regulation 5.6.1), the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances.
- 4 The Faculty will normally only accept assessments that have been written, typed or printed on paper-based media.
- 5 The Faculty will **NOT** accept submission of assignments by facsimile.

- 6 Students who do not have regular access to postal services or who are otherwise disadvantaged by these regulations may be given special consideration. They should contact the examiner of the course to negotiate such special arrangements.
- 7 In the event that a due date for an assignment falls on a local public holiday in their area, such as a Show holiday, the due date for the assignment will be the next day. Students are to note on the assignment cover the date of the public holiday for the Examiner's convenience.
- 8 Students who have undertaken all of the required assessments in a course but who have failed to meet some of the specified objectives of a course within the normally prescribed time may be awarded one of the temporary grades: IM (Incomplete - Make up), IS (Incomplete - Supplementary Examination) or ISM (Incomplete -Supplementary Examination and Make up). A temporary grade will only be awarded when, in the opinion of the examiner, a student will be able to achieve the remaining objectives of the course after a period of non directed personal study.
- 9 Students who, for medical, family/personal, or employment-related reasons, are unable to complete an assignment or to sit for an examination at the scheduled time may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination; IDM (Incomplete Deferred Make-up); IDB (Incomplete - Both Deferred Examination and Deferred Make-up).