



The University of Southern Queensland

## Course Specification

### Description: Introduction to Fluid Mechanics

Subject	Cat-Nbr	Class	Term	Mode	Units	Campus
MEC	2106	15161	2, 2002	EXT	1.00	TWMBA

<b>Academic Group:</b>	FOENS
<b>Academic Org:</b>	FOES02
<b>HECS Band:</b>	2
<b>ASCED Code:</b>	030799

### STAFFING

Examiner: Omar Khondker

Moderator: John Eastwell

### PRE-REQUISITES

Pre-requisite: MAT 1100 and CIV 1501

### 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, 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 to enable the student to analyse simple thermal systems.

### OBJECTIVES

On completion of this course, students should be able to:

- analyse and evaluate simple systems with fluid as the working medium;
- analyse simple thermal systems in order to estimate heat gain or heat loss due to the different modes of heat transfer.

## TOPICS

Description	Weighting (%)
1. INTRODUCTION AND FLUID PROPERTIES Definition of a fluid, fluid as a continuum, 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 and the water hammer phenomenon.	10.00
6. PUMPS Position 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:**

Books can be ordered by fax or telephone. For costs and further details use the 'Book Search' facility at <http://bookshop.usq.edu.au> by entering the author or title of the text.

Esposito, A. 1998, *Fluid Mechanics with Applications*, Prentice Hall, (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.

Daugherty, R. et al 1997, *Fluid Mechanics with Engineering Application*, 9th edition, McGraw-Hill, (S1 Metric Edition)

Giles, R. V. et al 1994, *Schaum's Outline of Theory and Problems of Fluid Mechanics and Hydraulics*, 3rd edition, McGraw-Hill,

Kreith, F. & Bohn, M. S. 1997, *Principles of Heat Transfer*, 5th edition, PWS Publishing,

Munson, B. R. et al 1998, *Fundamentals of Fluid Mechanics*, 3rd edition, Wiley & Sons,

Roberson 1997, *Engineering Fluid Mechanics*, 6th edition,

(International Student Edition)

Street 1995, *Elementary Fluid Mechanics*, 7th edition, Wiley and Sons,

(SI Version)

## STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessment	15
Directed Study	62
Examinations	3
Private Study	75

## ASSESSMENT DETAILS

Description	Marks Out of	Wtg(%)	Required	Due Date
ASSIGNMENT 1	150.00	15.00	Y	02 Sep 2002
ASSIGNMENT 2	150.00	15.00	Y	28 Oct 2002
3 HOUR RESTRICTED EXAMINATION	700.00	70.00	Y	END S2 (see note 3)

### NOTES:

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

## OTHER REQUIREMENTS

- 1 Students must normally achieve 50% of the marks for the final examination and 40% for all other assessments for the course.
- 2 Students are normally required to obtain at least 70% of the overall marks to obtain a B grade in the course, at least 80% of the overall marks to obtain an A grade in the course, and at least 90% of the overall marks to obtain a HD grade in the course.
- 3 Request for an assignment extension due to difficult circumstances should be lodged to the examiner prior to the due date. Assignments lodged after model answers are released (which would normally be 3 weeks from the due date) will not be marked.
- 4 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.

- 5 Students must retain a copy of each item submitted for assessment. This must be produced within five days if required by the Examiner.
- 6 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.
- 7 If students submit assignments after the due date without prior approval then a penalty of up to 20% of the total marks for the assignment will apply for each working day late.
- 8 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.
- 9 The Faculty of Engineering and Surveying will NOT accept submission of hand written or typed assignments by facsimile, e- mail or computer diskette. Students in remote locations who do not have regular access to postal services may be given special consideration.
- 10 A minimum standard of communication skills must be demonstrated in order for a passing grade to be achieved.
- 11 The examination for this course is restricted. Students may take into the final examination, a handwritten A4 sheet (two sides) containing any information that they believe will be relevant for the examination. Calculators are also permitted. 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.
- 12 Students must note the make and model of the calculator used on the front of the Answer Book or Examination Paper where applicable. This may be subject to checking by the supervisor.
- 13 The Faculty of Engineering and Surveying does not offer supplementary examinations.
- 14 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 the temporary grade: IM (Incomplete - Make up). An IM 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.
- 15 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; IDSM (Incomplete Deferred Examination and Make-up).
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