Description: Fluid Mechanics

Subject | Cat-Nbr | Class | Term | Mode | Units | Campus
---|---|---|---|---|---|---
MEC | 3102 | 10572 | 1, 2002 | EXT | 1.00 | TWMBA

Academic Group: FOENS
Academic Org: FOES02
HECS Band: 2
ASCED Code: 030799

STAFFING
Examiner: Ruth Mossad
Moderator: John Eastwell

PRE-REQUISITES
Pre-requisite: MAT 2100 and MEC 2101

RATIONALE
Mechanical engineers are expected to have the knowledge and the understanding of the basic principles and concepts of fluid mechanics both in static and dynamic conditions. This is to enable them to analyse and design systems in which fluid is the working medium.

SYNOPSIS
This course presents the fundamental concepts of fluid behaviour both under static and dynamic conditions. This course is designed to enable the student to analyse and design any practical problem in which fluid is the working medium. The contents of this course includes statics and dynamics of fluid flow, dimensional analysis, internal viscous flow, e.g. laminar and turbulent flows in pipes and ducts. Also, viscous flow around bodies, boundary layer and compressible flow. The theoretical knowledge is reinforced by practical work, videos and a project.

OBJECTIVES
On completion of this course, the student should be able to: Analyse and design many of the real life flow type problems. And be able to choose a suitable simple model for the analysis to make the solution possible with the tools they have learned. Some examples of these problems are:

- Estimation of forces on submerged bodies in static fluid situation and their stability.
• Transporting different types of fluids in different types of applications and avoiding unwanted phenomena such as cavitation and water hammer.
• Estimation of forces on moving, or stationary bodies caused by flowing fluids, such as drag forces on chimneys, high rise buildings, different types of constructions, aircraft’s and ships.
• Behaviour of high speed flows ie compressible flow in ducts, nozzles and diffusers.

**TOPICS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Weighting (%)</th>
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</thead>
<tbody>
<tr>
<td>1. INTRODUCTION AND FUNDAMENTAL CONCEPTS Definition of a fluid, dimensions, units and methods of analysis, fluid as a continuum, some basic definitions, description and classification of fluid motions.</td>
<td>5.00</td>
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<tr>
<td>2. FLUID STATICS Pressure variations in static fluid, hydrostatic forces on submerged bodies.</td>
<td>15.00</td>
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<tr>
<td>3. CONTROL VOLUME FORMULATION Basic equations for fluid flow, such as continuity, momentum and energy equations for control volume approach, and the angular momentum principle.</td>
<td>15.00</td>
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<td>4. DIFFERENTIAL FORM FORMULATION Differential form of the basic equations, Euler’s and Bernoulli’s equations.</td>
<td>15.00</td>
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<tr>
<td>5. SIMILITUDE AND DIMENSIONAL ANALYSIS Buckingham’s theorem, important dimensionless groups, dynamic similarity practical use of the dimensionless groups.</td>
<td>8.00</td>
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<tr>
<td>6. INTERNAL INCOMPRESSIBLE VISCOUS FLOW Laminar and turbulent flows, pipe flow, head loss in pipes, minor head loss in pipe systems, hydraulic and energy grade lines, multiple path pipe systems.</td>
<td>18.00</td>
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<tr>
<td>7. EXTERNAL INCOMPRESSIBLE VISCOUS FLOW Boundary layer, laminar and turbulent flow on flat plate Fluid flow about immersed bodies, drag and lift forces.</td>
<td>12.00</td>
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<tr>
<td>8. COMPRESSIBLE FLOW Study compressible flow in changing area channels with or without friction.</td>
<td>12.00</td>
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**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.

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.


STUDENT WORKLOAD REQUIREMENTS

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>HOURS</th>
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</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>10</td>
</tr>
<tr>
<td>Directed Study</td>
<td>74</td>
</tr>
<tr>
<td>Examinations</td>
<td>3</td>
</tr>
<tr>
<td>Private Study</td>
<td>68</td>
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</table>

ASSESSMENT DETAILS

<table>
<thead>
<tr>
<th>Description</th>
<th>Marks Out of</th>
<th>Wtg(%)</th>
<th>Required</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROBLEM SOLVING ASSIGNMENT 1</td>
<td>100.00</td>
<td>10.00</td>
<td>Y</td>
<td>04 Mar 2002 (see note 1)</td>
</tr>
<tr>
<td>PROBLEM SOLVING ASSIGNMENT 2</td>
<td>100.00</td>
<td>10.00</td>
<td>Y</td>
<td>04 Mar 2002 (see note 2)</td>
</tr>
<tr>
<td>ASSIGNMENT 3 - PROJECT</td>
<td>100.00</td>
<td>10.00</td>
<td>Y</td>
<td>04 Mar 2002 (see note 3)</td>
</tr>
<tr>
<td>3 HOUR RESTRICTED EXAMINATION</td>
<td>700.00</td>
<td>70.00</td>
<td>Y</td>
<td>END S1 (see note 4)</td>
</tr>
</tbody>
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NOTES:

1. Further details about the due dates are detailed in the assessment section of the Course Specifications.
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3. Further details about the due dates are detailed in the assessment section of the Course Specifications.
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OTHER REQUIREMENTS

1. In order to successfully complete the course, students must normally obtain, 50% of the marks in the final examination and a reasonable effort (at least 40%) should be shown in all other assessments for the course.

2. The due date for an assignment is the date by which a student must submit the assignment to the USQ. The onus is on the student to provide proof of the submit date, if requested by the Examiner.

3. Students must retain a copy of each item submitted for assessment. This must be produced within five days if required by the Examiner.

4. 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.

5. 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.

6. 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.

7. The Faculty of Engineering and Surveying will NOT accept submission of handwritten 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.

8. The final examination 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. No other materials are permitted in the examination. Tables, charts and graphs needed for the solution of the examination will be provided.

9. A minimum standard of communication skills must be demonstrated in order for a passing grade to be achieved.

10. The Faculty of Engineering and Surveying does not offer supplementary examinations.

11. 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.

12. 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).