SYNOPSIS

In common with many other areas of engineering, the body of knowledge within the traditional fluid mechanics areas has expanded widely to a point where the different disciplines of engineering need different specialised knowledge. This is reflected in the acceptance of "hydraulics" or "hydraulic engineering" as a specialist field of study of prime interest to civil, mining, environmental and agricultural engineers. Since water can largely be regarded as incompressible, some of the traditional concepts of fluid mechanics need to be treated only briefly to permit a greater grounding in the types of problems encountered by hydraulic engineers. The course seeks to provide a grounding in fluid statics, steady uniform and non-uniform incompressible flow in pipelines and channels, pumped systems, flow measurement, hydraulic similitude and introductory thermodynamics.

OBJECTIVES

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

- describe the relevant properties of fluids;
- calculate pressures and forces on immersed bodies;
- undertake simple stability analyses for small gravity dams or weirs;
- determine the rolling stability of a prismatic floating body;
- solve simple problems involving steady uniform and non-uniform open channel flow and pipeline networks;
- determine the operating point of a pumped pipeline system using single and multiple pumps;
- design rigid boundary channels;
- apply the concepts of specific energy and specific force in open channel flow;
- classify gradually varied flow profiles and calculate profile shape using the direct step method;
- estimate the head-discharge relationship for common flow measuring devices;
- undertake a dimensional analysis of a physical system incorporating many variables;
- design a scale model of a hydraulic system using Reynolds or Froude scaling;
- identify the thermodynamic laws and principles that apply to a given simple thermodynamic system; apply appropriate equations to analyse quantitatively a given simple thermodynamic system; identify the fundamental heat transfer modes present in a given appropriate situation; apply simple heat transfer by conduction formulae to simple multiple layer planes and pipes to quantify the heat transfer.

### TOPICS

<table>
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<tr>
<th>Description</th>
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<tr>
<td>1. Fluid statics</td>
<td>20.00</td>
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<td>2. Steady flow of incompressible fluids in pipelines</td>
<td>25.00</td>
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<td>3. Pumped pipeline systems</td>
<td>10.00</td>
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<tr>
<td>4. Steady open channel flow</td>
<td>20.00</td>
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<tr>
<td>5. Dimensional analysis and hydraulic similitude</td>
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<td>6. Flow measurement</td>
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<tr>
<td>7. Basic thermodynamics and heat transfer</td>
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### 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).

*ENV2103 Hydraulics I External Study Package*, USQ Publication,
Any hand-held, battery-operated non-communicable calculator.

(Text is also used in the course ENV3104 Hydraulics II.)

Nalluri, C & Featherstone, RE 2001, *Civil Engineering Hydraulics*, 4th edn, Blackwell Science,
(Text is also used in the course ENV3104 Hydraulics II.)
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>
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<th>ACTIVITY</th>
<th>HOURS</th>
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<tr>
<td>Assessment</td>
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<td>Directed Study</td>
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<td>Examinations</td>
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<td>Lectures</td>
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<td>Private Study</td>
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ASSESSMENT DETAILS

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<td>02 Mar 2004</td>
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<tr>
<td>ASSIGNMENT</td>
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<td>20.00</td>
<td>04 Jun 2004</td>
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<td>3 HOUR RESTRICTED EXAM</td>
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<td>(see note 2)</td>
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NOTES:

1. The Examiner will advise students of the date of the mid-semester test during the semester.
2. Student Administration will advise students of the dates of their examinations during the semester.

IMPORTANT ASSESSMENT INFORMATION

1. Attendance requirements:
   It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) scheduled for them, and 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 complete each of the assessment items satisfactorily, students must obtain at least 50% of the marks available (or at least a grade of C-) for each assessment item.

3 Penalties for late submission of required work:
If students submit assignments after the due date without prior approval then a penalty of 10% of the total marks gained by the student for the assignment will apply for each working day late.

4 Requirements for student to be awarded a passing grade in the course:
To be assured of a passing grade, students must demonstrate, via the summative assessment items, that they have achieved the required minimum standards in relation to the objectives of the course by: (i) satisfactorily completing the examination and assignments; and (ii) obtaining at least 50% of the total weighted marks available for all summative assessment items.

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); any type of hand-held, battery-operated, non-communicable calculator.

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 produced within five days 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).