NAVL3620
Ship Hydrodynamics


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1. STAFF CONTACT DETAILS

Contact details and consultation times for course convener

Mr Phil Helmore
Room EE464H
Tel (02) 9385 5215
Fax (02) 9663 1222
Email p.helmore@unsw.edu.au

Consultation concerning this course is available on Monday–Thursday 0930–1700 whenever I am not otherwise engaged (see the timetable on the noticeboard outside my office door). Direct consultation or phone is preferred; email should only be used as a last resort as it uses your time and mine less efficiently.

Contact details and consultation times for additional lecturers and casual academic staff

A/Prof. Noor-E-Alam Ahmed
Room EE464K
Tel (02) 9385 4099
Fax (02) 9663 1222
Email n.ahmed@unsw.edu.au

Dr Rozetta Payne
Tel 0438 602 459
Email rozetta_payne@hotmail.com

2. COURSE DETAILS

Units of credit

This is a 6 unit-of-credit (UoC) course, and involves 6 hours per week (h/w) of face-to-face contact.

The UNSW website states “The normal workload expectations of a student are approximately 25 hours per semester for each UoC, including class contact hours, other learning activities, preparation and time spent on all assessable work.”

For a standard 24 UoC in the semester, this means 600 hours, spread over an effective 15 weeks of the semester (thirteen weeks plus stuvac plus one effective exam week), or 40 hours per week, for an average student aiming for a credit grade. Various factors, such as your own ability, your target grade, etc., will influence the time needed in your case. Some students spend much more than 40 h/w, but you should aim for not less than 40 h/w on coursework for 24 UoC.
This means that you should aim to spend not less than about 10 h/w on this course, i.e. an additional 4 h/w of your own time. This should be spent in making sure that you understand the lecture material, completing the set assignments, further reading about the course material, and revising and learning for the examination.

NAVL3620 is taught in parallel with AERO3630 Aerodynamics for the fluid flow component, but separately for the hydrodynamics component.

**Summary of the course**

This course focusses on the hydrodynamics of ships, both with reference to the flow of fluid around the ship due to its movement (usually forward), and the response of the ship to fluid flow by way of wave action.

**Aims of the course**

This course enables you to explore the flow of fluid around streamlined shapes, both qualitatively and quantitatively, using experimental techniques in the wind tunnel. Qualitatively, flow visualisation is used for flow around bluff and streamlined bodies with the aim of showing you the benefits of streamlining. Quantitatively, the aim is to determine the forces generated on a body moving through a fluid. Measurements of pressure distributions around bluff and streamlined bodies are made to obtain the lift forces produced on them, together with measurements of the wake field of a streamlined body to obtain the drag force on it.

The course also provides you with the terminology of fluid dynamics and methods for determining the physical forces exerted by fluids (especially those considered as incompressible and in viscid) on their boundaries. The aim is for you to be able to calculate the hydrodynamic forces on streamlined bodies, such as ships, propeller blades and the like. You will also be introduced to the basic techniques associated with towing-tank tests for resistance and seakeeping predictions.

This course builds on the principles of conservation of mass, momentum and energy which you learned in MMAN1300. It also builds on the principles of fluid mechanics, dimensional analysis and Bernoulli’s principle which you learned in MMAN2600. It uses the ship terminology which you learned in NAVL3610, and lays the groundwork for the hydrodynamics component of NAVL4140.

**Student learning outcomes**

At the conclusion of this course, it is expected that you will be able to:
- Describe the flow around bluff and streamlined bodies, and to discuss the benefits of streamlining.
- Measure the pressure distribution around a body in a wind-tunnel test and to determine the lift force produced on it.
- Measure the wake field of a streamlined body and to determine the drag force on it.
- Apply fluid flow principles, including conservation of mass, momentum and energy, Bernoulli’s principle, the stream and potential functions, and sources and sinks, to assess the forces applied by the flow to streamlined bodies.
Set up the parameters for a series of resistance or seakeeping tests in a towing tank, and to extrapolate the results of the tests to full size.

**Graduate attributes**

UNSW’s graduate attributes are shown at [https://my.unsw.edu.au/student/atoz/GraduateAttributes.html](https://my.unsw.edu.au/student/atoz/GraduateAttributes.html)

UNSW aspires to develop graduates who are rigorous scholars, capable of leadership and professional practice in a global community. The university has, thus, articulated the following Graduate Attributes as desired learning outcomes for ALL UNSW students.

UNSW graduates will be

1. Scholars who are:
   (a) understanding of their discipline in its interdisciplinary context
   (b) capable of independent and collaborative enquiry
   (c) rigorous in their analysis, critique, and reflection
   (d) able to apply their knowledge and skills to solving problems
   (e) ethical practitioners
   (f) capable of effective communication
   (g) information literate
   (h) digitally literate

2. Leaders who are:
   (a) enterprising, innovative and creative
   (b) capable of initiating as well as embracing change
   (c) collaborative team workers

3. Professionals who are:
   (a) capable of independent, self-directed practice
   (b) capable of lifelong learning
   (c) capable of operating within an agreed Code of Practice

4. Global Citizens who are:
   (a) capable of applying their discipline in local, national and international contexts
   (b) culturally aware and capable of respecting diversity and acting in socially just/responsible ways
   (c) capable of environmental responsibility

✓ = Developed in this course

In this course, you will be encouraged to develop Graduate Attributes 1(b), 1(d), 1(f), 1(g), 3(a), and 4(a) by undertaking the selected activities and knowledge content. These attributes will be assessed within the prescribed assessment tasks, as shown in the assessment table on Page 7.

You will be supported in developing the above attributes through:
   (i) the design of academic programs;
(ii) course planning and documentation;
(iii) learning and teaching strategies; and
(iv) assessment strategies.

3. RATIONALE FOR INCLUSION OF CONTENT AND TEACHING APPROACH

This course is intended to give you the skills to analyse the flow of fluid around shapes commonly in the design of marine vehicles, such as the vessel’s hull, hydrofoils, propeller blades, etc. The content includes the methods used most-commonly in industry for this analysis, and the use of wind tunnels. The course is taught by an expert from industry, and by an experienced researcher.

Effective learning is supported when you are actively engaged in the learning process and by a climate of enquiry, and these are both an integral part of the lectures and tutorials.

You become more engaged in the learning process if you can see the relevance of your studies to professional, disciplinary and/or personal contexts, and the relevance is shown in the lectures and assignments by way of practical examples.

Dialogue is encouraged between you, others in the class and the lecturers and demonstrators. Diversity of experiences is acknowledged, as some students in each class have prior marine experience. Your experiences are drawn on to illustrate various aspects, and this helps to increase motivation and engagement.

It is expected that assignments will be marked and handed back in the week following submission. You will have feedback and discussion while fresh in your mind to improve the learning experience.

4. TEACHING STRATEGIES

Lectures in the course are designed to cover the terminology and core concepts and theories in the flow of fluids around ships and streamlined bodies. They do not simply reiterate the texts, but build on the lecture topics using examples to show how the theory is applied in practice and the details of when, where and how it should be applied.

The laboratory classes in flow experimentation are conducted in groups, with each group making their own qualitative and quantitative measurements.

Tutorials in hydrodynamics are designed to provide you with feedback and discussion on the assignments, and to investigate problem areas in greater depth to ensure that you understand the application and can avoid making the same mistake again.
5. **ASSESSMENT**

**General**

You will be assessed by way of a logbook, a report and a class test in flow experimentation, and assignments and an end-of-semester examination in hydrodynamics, all of which involve calculations and descriptive material.

Part A of the course (Flow Experimentation, 3 h/w for Weeks 4–10) counts 30% towards the overall grade in the course, and Part B (Hydrodynamics, 6 h/w for Weeks 1–3 and Weeks 11–13, and 3 h/w for Weeks 4–10) counts 70% towards the overall grade, as follows:

<table>
<thead>
<tr>
<th></th>
<th>Part A</th>
<th>Part B</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>FE Logbook</td>
<td>5</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>FE Report</td>
<td>15</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>FE Class test</td>
<td>15</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>HD Assignments</td>
<td>20</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>HD Exam</td>
<td>30</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>35</td>
<td>50</td>
<td>80</td>
</tr>
</tbody>
</table>

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

**Flow Experimentation Logbook**

For the Flow Experimentation you must keep a logbook. The log book will be a bound A4 exercise book containing the date of experiment, observations, notes, calculations, figures and your comments while conducting the experiment. No loose sheets are acceptable. All handouts related to a particular experiment should be appropriately stapled or pasted into the log book. The log book is to be submitted to Rozetta Payne in Week 12 with the Flow Experimentation report.

**Flow Experimentation Report**

Following the class test, you will be required to write a report on one of the four experiments which have been conducted in the wind tunnel, using the details from your logbook and lecture notes. The specific experiment will be at random, and will be decided by the lecturer, but will be the same experiment for the whole class. Your report is to be submitted to Rozetta Payne in Week 12 with the Flow Experimentation logbook.

**Flow Experimentation Class Test**

The class test in Flow Experimentation will be held in the Flow Experimentation lecture during Week 8. The test will be of one hour duration and will be based on the Flow Experimentation material covered up to the end of Week 7. The test will be of the multiple-choice type.
Visit to AMC in Launceston

There will be a visit to the Australian Maritime College in Launceston, Tasmania, on the Thursday and Friday of Week 10. The visit is to acquaint you with the facilities available including the towing tank for resistance and seakeeping tests, the cavitation tunnel, the model basin, the flume tank, the shiphandling simulator, etc., and the calculations required to extrapolate the resistance and seakeeping results to full size.

Hydrodynamics Assignments

There will be four hydrodynamics assignments, as shown on the following page.

Hydrodynamics Examination

There will be one two-hour examination at the end of the semester, and this will be based on the hydrodynamics component for the whole semester.

You will need to provide your own calculator, of a make and model approved by UNSW, for the examination. The list of approved calculators is shown at https://student.unsw.edu.au/exam-approved-calculators-and-computers

It is your responsibility to ensure that your calculator is of an approved make and model, and to obtain an “Approved” sticker for it from the School Office or the Engineering Student Centre prior to the examination. Calculators not bearing an “Approved” sticker will not be allowed into the examination room.

Assignments

Presentation

All submissions should have a standard School cover sheet available on the School website at www.engineering.unsw.edu.au/mechanical-engineering/forms-and-guidelines. All submissions are expected to be neat, and clearly set out. All calculations should be shown as, in the event of incorrect answers, marks are awarded for method and understanding.

The preferred set-out of any numerical calculation is similar to the following:

\[ \Delta = \rho V \]

\[ = 1.025 \times 200 \]

\[ = 205 \text{ t} \]
## Part A  Flow Experimentation

<table>
<thead>
<tr>
<th>No.</th>
<th>Experiment</th>
<th>Mark</th>
<th>Learning outcomes assessed</th>
<th>Graduate attributes assessed</th>
<th>Due Thu</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experiment 1</td>
<td></td>
<td>Visualise flow around bodies</td>
<td>1(a) 1(d) 1(f) 1(g) 1(h)</td>
<td>Week 4</td>
</tr>
<tr>
<td></td>
<td>Experiment 2</td>
<td></td>
<td>Measure pressure and determine forces</td>
<td>1(a) 1(d) 1(f) 1(g) 1(h)</td>
<td>Week 5</td>
</tr>
<tr>
<td></td>
<td>Experiment 3</td>
<td></td>
<td>Measure pressure and determine forces</td>
<td>1(a) 1(d) 1(f) 1(g) 1(h)</td>
<td>Week 6</td>
</tr>
<tr>
<td></td>
<td>Experiment 4</td>
<td></td>
<td>Measure pressure and determine forces</td>
<td>1(a) 1(d) 1(f) 1(g) 1(h)</td>
<td>Week 7</td>
</tr>
<tr>
<td></td>
<td>Logbook</td>
<td>5</td>
<td></td>
<td></td>
<td>Week 12</td>
</tr>
<tr>
<td></td>
<td>Report on one experiment</td>
<td>15</td>
<td></td>
<td></td>
<td>Week 12</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

## Part B  Hydrodynamics

<table>
<thead>
<tr>
<th>No.</th>
<th>Assignment</th>
<th>Mark</th>
<th>Learning outcomes assessed</th>
<th>Graduate attributes assessed</th>
<th>Due Mon</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conservation of mass and</td>
<td>10</td>
<td>Apply fluid flow principles</td>
<td>1(a) 1(d)</td>
<td>Week 5</td>
</tr>
<tr>
<td></td>
<td>Bernoulli’s principle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Conservation of momentum</td>
<td>10</td>
<td>Apply fluid flow principles</td>
<td>1(a) 1(d)</td>
<td>Week 7</td>
</tr>
<tr>
<td>3</td>
<td>Potential flow and stream function</td>
<td>10</td>
<td>Apply fluid flow principles</td>
<td>1(a) 1(g)</td>
<td>Week 9</td>
</tr>
<tr>
<td>4</td>
<td>Towing tank calcs and report</td>
<td>10</td>
<td>Analyse towing tank results</td>
<td>1(a) 1(d) 1(f)</td>
<td>Week 12</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Scaled</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Submission

Assignments are due on the scheduled day of the class in the week nominated above. Assignments should, preferably, be submitted direct to the lecturer (rather than via the assignment boxes in the foyer of the School office).

Late submission of assignments attracts a penalty of ten percent per day, unless prior dispensation has been given; i.e. see the lecturer before the due date to avoid penalty. It is always worth submitting as, in the event of difficulty making a final grade (either to pass or higher), any penalties for late submission may be removed.

For more information on submission of assignments, see Administrative Matters for All Courses available on the School website.

Criteria

The submissions in Part A are the logbook and laboratory report, and the following criteria will be used:

(a) Logbook

The logbook must contain all the information relevant to each experiment (date, time, venue, handouts), calculations, discussion and conclusions. The information is to be written down on site; calculations, discussion and conclusions can be written later if necessary. You name and student number must be shown clearly, with the family name underlined.

(b) Report

The report is to be in the usual format (introduction, method, results, discussion, conclusion and references), with a School cover sheet.

The following criteria will be used:

- Comparison of results with different meshes, different turbulence models, and the effects of convergence.
- Plots (graphs) of velocity vectors, streamlines, pressure distribution and lift and drag coefficients.
- Validation of results by comparison with experimental data

The assignments in Part B all involve numerical calculations, for which the following criteria will be used:

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

The final assignment in Part B also involves a report on the results, and the following criteria will be used:

- Clarity of communication—this includes development of a clear and orderly structure and the highlighting of core arguments.
- Sentences in clear and plain English—this includes correct grammar, spelling and punctuation.
- Correct referencing in accordance with the prescribed citation and style guide.
Special Consideration and Supplementary Assessment

For details of applying for special consideration and conditions for the award of supplementary assessment, see *Administrative Matters for All Courses*, available from the School website.

6. **ACADEMIC HONESTY AND PLAGIARISM**

Plagiarism is using the words or ideas of others and presenting them as your own. Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a booklet which provides essential information for avoiding plagiarism: [https://my.unsw.edu.au/student/academiclife/Plagiarism.pdf](https://my.unsw.edu.au/student/academiclife/Plagiarism.pdf)

There is a range of resources to support students to avoid plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one. Information is available on the dedicated website Plagiarism and Academic Integrity website: [http://www.lc.unsw.edu.au/plagiarism/index.html](http://www.lc.unsw.edu.au/plagiarism/index.html)

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student’s work 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 a honours thesis) even suspension from the university. The Student Misconduct Procedures are available here: [http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf](http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)

Further information on School policy and procedures in the event of plagiarism is presented in a School handout, *Administrative Matters for All Courses*, available on the School website.

7. **COURSE SCHEDULE**

Lectures in Part A of the course are given by A/Prof. Noor-e-Alam Ahmed
Lectures in Part B of the course are given by Dr Rozetta Payne.
<table>
<thead>
<tr>
<th>Week</th>
<th>Time</th>
<th>Location</th>
<th>Day</th>
<th>Lecturer</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1000–1300</td>
<td>RedCWestM010</td>
<td>Monday</td>
<td>RP</td>
<td>Conservation of energy and momentum</td>
</tr>
<tr>
<td></td>
<td>1000–1300</td>
<td>TyreeG16</td>
<td>Wednesday</td>
<td>NA</td>
<td>Introduction and dimensional analysis</td>
</tr>
<tr>
<td>2</td>
<td>1000–1300</td>
<td>RedCWestM010</td>
<td>Monday</td>
<td>RP</td>
<td>Bernoulli’s principle, fluid flow in pipes</td>
</tr>
<tr>
<td></td>
<td>1000–1100</td>
<td>CLB1</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Applications of Dimensional analysis for wind tunnel testing</td>
</tr>
<tr>
<td></td>
<td>1100–1300</td>
<td>TyreeG16</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Applications of Dimensional analysis for wind tunnel testing</td>
</tr>
<tr>
<td>3</td>
<td>1000–1300</td>
<td>RedCWestM010</td>
<td>Monday</td>
<td>RP</td>
<td>Stream function definition and properties</td>
</tr>
<tr>
<td></td>
<td>1000–1100</td>
<td>CLB1</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Testing facilities and Instrumentations</td>
</tr>
<tr>
<td></td>
<td>1100–1300</td>
<td>TyreeG16</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Methods of qualitative and quantitative Investigations</td>
</tr>
<tr>
<td>4</td>
<td>1000–1300</td>
<td>RedCWestM010</td>
<td>Monday</td>
<td>RP</td>
<td>Application of stream function to basic flows, construction of flow fields</td>
</tr>
<tr>
<td></td>
<td>1000–1100</td>
<td>CLB1</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Matters related to Experiment 1</td>
</tr>
<tr>
<td></td>
<td>1100–1300</td>
<td>TyreeLG07</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Experiment 1: Flow Visualization</td>
</tr>
<tr>
<td>5</td>
<td>1000–1300</td>
<td>RedCWestM010</td>
<td>Monday</td>
<td>RP</td>
<td>Potential function definition and properties</td>
</tr>
<tr>
<td></td>
<td>1000–1100</td>
<td>CLB1</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Matters related to Experiment 2</td>
</tr>
<tr>
<td></td>
<td>1100–1300</td>
<td>TyreeLG07</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Experiment 2: Demonstration of the Significance of Potential flow concept</td>
</tr>
<tr>
<td>6</td>
<td>1000–1300</td>
<td>RedCWestM010</td>
<td>Monday</td>
<td>RP</td>
<td>Application of potential function to flows, comparison with stream function</td>
</tr>
<tr>
<td></td>
<td>1000–1100</td>
<td>CLB1</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Matters related to Experiment 3</td>
</tr>
<tr>
<td></td>
<td>1100–1300</td>
<td>TyreeLG07</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Experiment 3: Determination of Lift coefficient of an airfoil</td>
</tr>
<tr>
<td>7</td>
<td>1000–1300</td>
<td>RedCWestM010</td>
<td>Monday</td>
<td>RP</td>
<td>Generation of bodies with line distribution of sources</td>
</tr>
<tr>
<td></td>
<td>1000–1100</td>
<td>CLB1</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Matters related to Experiment 4</td>
</tr>
<tr>
<td></td>
<td>1100–1300</td>
<td>TyreeLG07</td>
<td>Wednesday</td>
<td>NA</td>
<td>Physical Experimentation: Experiment 4: Determination of Drag coefficient of an airfoil</td>
</tr>
<tr>
<td>8</td>
<td>1000–1300</td>
<td>RedCWestM010</td>
<td>Monday</td>
<td>RP</td>
<td>Generation of bodies with surface distribution of sources</td>
</tr>
<tr>
<td></td>
<td>1000–1100</td>
<td>CLB1</td>
<td>Wednesday</td>
<td>NA</td>
<td>Wrap-up/Revision of flow experimentation</td>
</tr>
<tr>
<td></td>
<td>1100–1300</td>
<td>TyreeG16</td>
<td>Wednesday</td>
<td>NA</td>
<td>Fluid Experimentation Class Test</td>
</tr>
</tbody>
</table>
The schedule shown may be subject to change at short notice to suit exigencies.

8. RESOURCES FOR STUDENTS

Textbooks

Part A

Relevant materials/notes will be available on the Moodle website.

Part B


Both of these are available in the UNSW Library.

Lewis is available for purchase from the Society of Naval Architects and Marine Engineers, Jersey City, USA. However, the price to non-members exceeds the member price plus the cost of student membership, so it is advisable to join the Society and order the book at the same time. Please see the course convenor for an application form if you wish to do this.

Suggested additional readings

Flow Experimentation


This is available in the UNSW Library.
Hydrodynamics


This is available in the UNSW Library.

**Additional materials provided in Moodle**

This course has a website on Moodle which includes:
- relevant material/notes for flow experimentation;
- copies of hydrodynamics assignments (as they are issued, in case you missed the hand-out in class);
- previous examination papers in hydrodynamics from 2008 onwards;
- answers to the numerical questions in hydrodynamics examinations from 2008 onwards; and
- a discussion forum.

The discussion forum is intended for you to use with other enrolled students. The course convenor will occasionally look at the forum, monitor the language used and take note of any frequently-asked questions, but will not respond to questions on the forum. If you want help from the convenor then direct contact is preferred.

**Recommended Internet sites**

There are many websites giving lectures, papers and data on hydrodynamics. Try searching for “hydrodynamics”, for example, with your favourite search engine (or, better, a meta-search engine such as Dogpile at www.dogpile.com).

**Other Resources**

If you wish to explore any of the lecture topics in more depth, then other resources are available and assistance may be obtained from the UNSW Library.

One starting point for assistance is: [www.library.unsw.edu.au/servicesfor/students.html](http://www.library.unsw.edu.au/servicesfor/students.html).

**9. COURSE EVALUATION AND DEVELOPMENT**

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 tutorial class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course, a recent improvement is the incorporation of the flow experimentation component to improve your visualisations of flow and experimental technique. A new lecturer took over the hydrodynamics component as of 2009, and your feedback is welcomed.
10. **ADMINISTRATIVE MATTERS**

You are expected to have read and be familiar with *Administrative Matters for All Courses*, available on the School website. This document contains important information on student responsibilities and support, including special consideration, assessment, health and safety, and student equity and diversity.

*P.J. Helmore*

24 July 2014