



# Course outline

Semester 2 2016

UNSW

## **NAVL3620**

# **Ship Hydrodynamics**

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## Contact hours

	<b>Day</b>	<b>Time</b>	<b>Location</b>
<b>Lecture/tutorial</b>	Monday	11am – 1pm	tba
<b>Lecture/tutorial</b>	Thursday	2pm – 5pm	Business School 130

## 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

## Student learning outcomes

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

After successfully completing this course, you should be able to:

Learning Outcome		EA Stage 1 Competencies
1.	Describe the flow around bluff and streamlined bodies, and to discuss the benefits of streamlining.	PE1.3, PE1.5, PE2.1, PE2.2, PE2.3
2.	Calculate the pressure distribution around a body in a wind-tunnel test and to determine the lift force produced on it.	PE2.1-2.3
3.	Calculate the wake field of a streamlined body and to determine the drag force on it.	PE1.1, PE1.2, PE2.2
4.	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.	PE1.1, PE1.2, PE2.2
5.	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.	PE2.1-2.4
6.	Analyse the manoeuvring characteristics of the vessel's hullform, compare that to achievable standards, and specify the steering gear required.	PE2.1-2.3
7.	Calculate the resistance and powering requirements of a range of high-speed craft (including monohulls, catamarans and hydrofoils), and judge whether the craft is performing efficiently in relation to others.	PE2.1-2.3

## 3. 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 with specialised treatment of high speed craft and ship manoeuvrability. 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.

Tutorial aspects are also covered as part of blended learning in the periods identified as lectures, as required and 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.



17/10/16	12	Manoeuvrability standards and high-performance rudders. High-performance craft (hydrofoils, ACVs SES, etc.).
24/10/16	13	Revision and exam details tutorial.

### \*\*\* Visit to AMC/University of Tasmania in Launceston

There will be a visit to the Australian Maritime College in Launceston, Tasmania, on the Thursday and Friday of Week 7, departing Sydney on Wednesday 7 September and returning Friday evening 9 September. 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.

## 5. Assessment

### Assessment overview

Black text – ship hydrodynamics. Blue text – ship manoeuvrability. Red text – high speed craft hydrodynamics.

No.	Assignment	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Marks returned:
1	(a) Conservation of mass and Bernoulli's principle. (b) The equations of motion (c) Dimensional analysis	10%	1-7	Lecture material from weeks 1 - 4.	Week 5: 25/8/16	2 weeks after submission
2	(a) Conservation of momentum. (b) Rudder design. (c) Transport efficiency	10%	1-7	Lecture material up to week 6.	Week 7: 8/9/16	2 weeks after submission
3	(a) Potential flow and stream function. (b) Angle of heel in a turn. (c) Resistance of planing craft.	10%	1-7	Lecture material up to week 8.	Week 9: 22/9/16	2 weeks after submission

4	(a) Towing tank calcs and report. (b) Acceleration and deceleration (c) Hydrofoil lift, drag and cavitation.	10%	1-7	Lecture material up to week 10.	Week 11: 1310/16	2 weeks after submission
Exam		60%	All	All	Examination period: 4-19/11/16	After release of results

## Assignments

### *Presentation*

All submissions should have a standard School cover sheet which is available from this course's Moodle page.

**All submissions are to be neatly typed and clearly set out.** Presenting them clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

### *Submission*

By email to Dr Payne or other agreed arrangement with Dr Payne.

Late submissions will be penalised 5% of the available marks per calendar day (including weekends). An extension may only be granted in exceptional circumstances. Where an assessment task is worth less than 20% of the total course mark and you have a compelling reason for being unable to submit your work on time, you must seek approval for an extension from the course convenor **before the due date**. Special consideration for assessment tasks of 20% or greater must be processed through [student.unsw.edu.au/special-consideration](http://student.unsw.edu.au/special-consideration).

It is always worth submitting late assessment tasks when possible. Completion of the work, even late, may be taken into account in cases of special consideration.

## Examinations

You must be available for all tests and examinations. The final School 3-hour examination for this Course will be held during the University examination period 4-19 November 2016.

Provisional examination timetables are generally published on myUNSW in September for Semester 2.

For further information on exams, please see the [Exams](#) section on the intranet and contact the Course convenor



## Calculators

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

## Special consideration and supplementary assessment

For details of applying for special consideration and conditions for the award of supplementary assessment, see the School [intranet](#), and the information on UNSW’s [Special Consideration page](#).

## 6. Expected resources for students

Lewis, E.V. (Ed.) (1988), *Principles of Naval Architecture*, v.3, Motions in Waves and Controllability, Society of Naval Architects and Marine Engineers, Jersey City.

Newman, J.N. (1980), *Marine Hydrodynamics*, MIT Press, Cambridge, Massachusetts.

Taggart, R. (Ed.) (1980), *Ship Design and Construction*, Chapter XII, Society of Naval Architects and Marine Engineers, Jersey City.

Doctors, L.J. (1985), *Hydrodynamics of High-speed Small Craft*, University of Michigan, Department of Naval Architecture and Marine Engineering, Report 292, Ann Arbor.

Doctors, L.J. (2015), *Hydrodynamics of High-Performance Marine Vessels: Volumes 1 & 2* [www.amazon.com](http://www.amazon.com)

These are also available in the UNSW Library.

### Suggested additional readings

Bertram, V. (1999), *Practical Ship Hydrodynamics*, Butterworth-Heinemann, UK.

This is available in the UNSW Library.

Journal *Fast Ferry International*.

Papers from Fast Sea Transportation (FAST) conferences.

Papers from Fast Ferry International (FFI) conferences.

## **Additional materials provided in Moodle**

This course has a website on Moodle which includes:

- copies of hydrodynamics assignments
- previous examination papers in hydrodynamics from 2010 onwards;
- answers to the numerical questions in hydrodynamics examinations from 2010 onwards;
- and
- a discussion forum.

The discussion forum is intended for you to use with other enrolled students. The course lecturer will occasionally look at the forum and take note of any frequently-asked questions, but will not respond to questions on the forum.

## **Recommended internet sites**

Principal particulars and design details of many different types of vessels are available on the Internet. You might like to try the following:

- Austal Ships [www.austal.com](http://www.austal.com)
- Incat Crowther Design [www.incatcrowther.com.au](http://www.incatcrowther.com.au)
- One2three Naval Architects [www.one2three.com.au](http://www.one2three.com.au)

## **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)

# **7. 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 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, recent improvements resulting from student feedback include the alignment of component parts within the course that complement each other. To that end, the ship's entire powering and propulsion train from the engines to the propeller are treated as a whole in order to meet the powering requirements that are assessed in order to overcome the vessel's resistance.

## 8. Academic honesty and plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off 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 website with a wealth of resources to support students to understand and avoid plagiarism: [student.unsw.edu.au/plagiarism](http://student.unsw.edu.au/plagiarism) The Learning Centre assists students with understanding

## 9. Administrative matters

All students are expected to read and be familiar with School guidelines and policies, available on the intranet. In particular, students should be familiar with the following:

[Attendance, Participation and Claee6 63 Tmiquette 1](#)  
[.fam csl560 19 20 10. .779972 44.7 19.689ers](#)

## Appendix A: Engineers Australia (EA) Stage 1 Competencies for Professional Engineers

	<b>Program Intended Learning Outcomes</b>
<b>PE1: Knowledge and Skill Base</b>	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge