NAVL4120 and NAVL4130

Ship Design Project A and B

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Course Outline

NAVL4120 and NAVL4130 Ship Design Project A and B

1. COURSE STAFF

Contact details and consultation times for course convener

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

Consultation concerning this course is available on Monday and Tuesday 0930–1700 whenever I am not otherwise engaged. 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 tutorial/laboratory teaching staff

Nil.

2. COURSE DETAILS

Units of credit

NAVL4120 and NAVL4130 are each 6 unit-of-credit (UoC) courses, and involve 3 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 each of these courses, i.e. an additional 7 h/w of your own time. This should be spent in making sure that you understand the lecture material, further reading and research

about the course material and vessels similar to your design, and completing the set assignments.

There is no parallel teaching in these courses.

Summary of the courses

NAVL4120 and NAVL4130 are two separate courses; however, they are, in effect, one complete design project which runs over two semesters. These courses focus on the design of a vessel to meet the requirements of a design brief.

Aims of the courses

These courses expose you to the reality of accepting a design brief (set of requirements) from a client, researching the requirements and coming up with the design of a vessel which will meet those requirements, and preparing the documentation (drawings, calculations and specification) to describe that vessel so that it may be built.

These courses also provide you with a solid grounding in data collection, deciding on principal particulars, generating a suitable hullform, laying out the general arrangement of the vessel, making an estimate of the mass and location of its centre of gravity, assessing the stability of the vessel against an appropriate set of criteria, and analysing the resistance of the vessel to come up with a powering specification and propeller to suit.

In these courses you will use information and skills from *all* other NAVL courses:

NAVL3120 Ship Design and Propulsion	Design aspects and propeller
NAVL3410 Ship Structures 1	Structural arrangement
NAVL3610 Ship Hydrostatics and Practice	Hydrostatics and stability
NAVL3620 Ship Hydrodynamics	Resistance prediction
NAVL3710 Ship Practice and Marine Engineering	Engine-room layout and powering
NAVL4140 Design of Yachts and High Speed Craft	Yacht or HSC design
NAVL4410 Ship Structures 2	Structural details

This project is where the skills gained in each of these areas are integrated to produce a design which meets the requirements of the design brief.

Student learning outcomes

At the conclusion of these courses, it is expected that you will be able to:

- Collect data on previous vessels from the literature, and analyse it to decide on a set of principal particulars to meet the requirements for your particular vessel.
- Generate a hullform suitable for the operation in Maxsurf and translate to a lines plan in AutoCAD.
- Generate a layout of the vessel to meet the design brief and regulatory requirements and translate to a general arrangement drawing in AutoCAD.

- Make an estimate of the mass of the vessel and the location of its centre of gravity, and assess the stability of the vessel.
- Calculate the resistance of the vessel, specify the powering requirement, and design an appropriate propeller.
- Calculate the scantlings of the principal structural members of the vessel and generate a basic structural drawing in AutoCAD.

Graduate attributes

UNSW's graduate attributes are shown at
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 6.

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 included to give you an understanding of how ships are designed by exposing you to the complete design cycle, from the first estimate of dimensions, thorough the preliminary layout and calculations, and then iterating through to the final layout and analysis, confirming that the proposed vessel meets the requirements of the design brief.

The content, in addition to being directed at the design requirements, reflects the experience of the lecturer in drawing offices, in shipyards, and at sea on various vessels.

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, and this is encouraged during the literature searches.

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 relevance to your particular design.

Dialogue is encouraged between you, others in the class and the lecturers. 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

You will be provided with several design briefs from which to select the type of vessel for your design project. This is not what happens in industry, as you are unlikely to have any choice about the type of vessel you design next; it is done here so that you may design the type of vessel in which you have the greatest interest. You will be provided with descriptive sheets for each assignment.

Lectures in the course are designed to cover the next phase of the design assignment schedule, what to look for and how to go about it, and to alert you to pitfalls and traps which you may encounter. This introduces you to how the design process unfolds, and you then know what to expect in industry.

Much of the design project involves self-directed work, both in researching designs of previous similar vessels in the literature, and in working on your own design, as you will be expected to do as a naval architect.

Tutorials are arranged on both a one-to-one basis with the lecturer, and group sessions with the lecturer, to assist in the analysis at each stage of the design process. Designs are discussed as they evolve, and students who have selected the same type of vessel can benefit from the experiences of and information found by others.

5. ASSESSMENT

General

In both NAVL4120 and NAVL4130, you are assessed by way of assignments involving data collection, calculations and descriptive material to test your grasp of the principles involved in the ship design process. The intention is that these assignments involving collecting data, calculations, decisions and reports should reflect the actions which you will be expected to undertake as a graduate naval architect preparing the design documentation for a prospective client.

There is no examination in either of the courses, and assessment is entirely on the basis of assignments. An aggregate mark of 50 is required to pass each course.

Assignments

The set assignments during the semester are shown on the following page. Assignments will be handed out in hard copy in class, and will be available on the Moodle website in case you miss the hand-out in class.

Presentation

A standard specification is available from the School office to aid presentation of your assignments (in all courses). All submissions should have a standard School cover sheet. 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:

$\Delta = \rho\nabla$	(Equation in symbols)
$= 1.025 \times 200$	(Numbers substituted)
$= 205$ t	(Answer with units)

NAVL4120 Semester 1

No.	Assignment	Mark	Learning outcomes assessed	Graduate attributes assessed						Due Mon
1	Report on data published on vessels relevant to the chosen design brief and preliminary calculations to establish the basic dimensions	20	Data collection and analysis	1(a)		1(f)		1(f)	3(a)	Week 4
2	Preliminary lines plan	20	Hullform and lines plan	1(a)	1(c)	1(f)	2(a)	3(a)		Week 7
3	Preliminary general arrangement drawing	30	General arrangement drawing	1(a)	1(c)	1(f)	2(a)	3(a)	4(a)	Week 10
4	Preliminary mass estimate and stability data	30	Mass estimate and stability assessment	1(a)	1(c)	1(f)	2(a)	3(a)	4(a)	Week 13
	Total	100								

NAVL4130 Semester 2

No.	Assignment	Mark	Learning outcomes assessed	Graduate attributes assessed						Due TBA
1	Resistance prediction	15	Resistance, powering and propeller design	1(a)	1(c)	1(f)		3(a)		Week 3
2	Powering, engine selection and propeller design	20	Resistance, powering and propeller design	1(a)	1(c)	1(f)	3(a)			Week 5
3	Structural calculations and drawing	25	Structural calculations and drawing	1(a)	1(c)	1(f)	2(a)	3(a)	4(a)	Week 8
4	Final lines plan and general arrangement drawing	20	Hullform, lines plan and general arrangement	1(a)	1(c)	1(f)	2(a)	3(a)	4(a)	Week 10
5	Final mass estimate and stability book	20	Mass estimate and stability assessment	1(a)	1(c)	1(f)	2(a)	3(a)	4(a)	Week 12
	Total	100								

Submission

Assignments are due on the scheduled day of the class in the week nominated on the previous page. Assignments should be submitted direct to me in class or at my office by 1700 on the date due, rather than via the assignment boxes.

Late submission of assignments attracts a penalty of ten percent of the total marks awarded for each calendar day the assignment is late. For example, if you received a mark of 40 out of 50 for an assignment that you handed in 2 days late you would receive a penalty of 8 marks and your mark would be reduced to 32. If the same assignment were handed in 4 days late the mark would be reduced to 24. 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 https://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

Criteria

In general, the assignments comprise collected data, calculations, and/or a drawing, together with a report. The following criteria will be used to grade assignments:

For data collection:
- Comprehensiveness of information.
- Clarity of presentation.
- Neatness.

For drawings:
- Comprehensiveness of information.
- Compliance with drawing standards.
- Clarity of presentation.
- Labelling.
- Neatness.

For numerical calculations:
- Accuracy of numerical answers.
- All working shown (see *Presentation* above).
- Use of diagrams, where appropriate, to support or illustrate the calculations.
- Use of graphs, were appropriate, to support or illustrate the calculations.
- Use of tables, where appropriate, to support or shorten the calculations.
- Neatness.

For reports:
- Identification of key facts and the integration of those facts in a logical development.

- 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 on the School website (see Section 10).

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

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

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

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

All lectures in this course are given by Mr Phil Helmore.

NAVL4120 Monday 1300–1600 OMB144A

Week	Topic
1	Introduction, design briefs and data collection
2	Data collection
3	Design lanes and basic dimensions
4	The lines plan and tutorial on Maxsurf in CAD Lab
5	Tutorial on importing hullforms into AutoCAD in CAD Lab
6	Student's own time in CAD Lab
7	The general arrangement drawing
8	General arrangement details
9	Student's own time in CAD Lab
10	Mass estimates and stability criteria
11	Stability assessment using Hydromax
12	Submission of preliminary mass estimate and stability assessment
13	Review of design projects

NAVL4130 Monday 1400–1700 ASB105

Week	Topic
1	Resistance prediction methods
2	Resistance prediction using Hullspeed in CAD Lab
3	Powering and engine selection
4	Propeller design
5	Structural rules and Lloyd's SSC software
6	Structural arrangement and details
7	Student's own time in CAD Lab
8	Refining the lines plan
9	Refining the general arrangement drawing
10	Refining the mass estimate
11	Stability book details
12	Submission of final mass estimate and stability book
13	Review of design projects

The schedule shown for either course may be subject to change at short notice to suit exigencies.

8. RESOURCES FOR STUDENTS

Textbooks

There is no required textbook for these courses. Textbooks and lecture notes from all other NAVL courses are relevant and can be used for your design project.

Suggested additional readings

Lamb, T. (Ed.) (2003 and 2004), *Ship Design and Construction*, v.1 and 2, Society of Naval Architects and Marine Engineers, Jersey City.

Larsson, L. and Eliasson, R.E. (2007), *Principles of Yacht Design*, 3rd Ed., Adlard Coles Nautical, London.

Claughton, R.E., Wellicome, J.F. and Shenoi, A. (Eds), *Sailing Yacht Design: Theory* (v.1) *and Practice* (v.2), Longman, London.

Skene, N.L. and Kinney, F.S. (1981), *Skene's Elements of Yacht Design*, 8th Ed., Dodd Mead & Co., New York.

These are all available in the UNSW Library and are useful as additional reading material.

Lamb (2003 and 2004) are text books for other naval architecture courses at UNSW and are also available for purchase from the Society of Naval Architects and Marine Engineers, Jersey City, USA. However, the price to non-members (of any one book) exceeds the member price plus the cost of student membership, so it is advisable to join the Society and order the books at the same time. Please see the course convenor for an application form if you wish to do this.

Additional materials provided in Moodle

This course has a website on Moodle which includes:

- copies of notes (as they are issued, in case you missed the hand-out in class);
- copies of assignments (as they are issued); and
- a discussion forum.

The discussion forum is intended for you to use with other students enrolled in this course. 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

Internet sites relevant to particular topics will be advised in class.

The NSW Roads and Maritime Services' website

www.maritime.nsw.gov.au/cv/vessel_compliance.html

has a number of spreadsheet applications which are useful for calculating the requirements for

- shafting diameters
- shafting systems (bearing spacing, couplings, etc.)
- rudder and steering gear
- bilge systems

- fuel tanks
- etc.

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/index.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, recent improvements include the provision of printed notes on Moodle, the introduction of AutoCAD software in the computer laboratory for drawing work (as this is the software which is used by the ship design and building industry in Australia), and a change to drawing the lines plan before the general arrangement drawing (instead of in the reverse order).

In addition, it was recognised, from previous feedback, that the workload in this course was high for a 3 UoC course. This has been addressed in the new program structure which has been introduced in the Faculty of Engineering. In 2009 the UoC for NAVL4120 Ship Design Project A and NAVL4130 Ship Design Project B were increased to 6 UoC each, which is more commensurate with the calibre of work generally submitted.

The Special Service Craft rules from Lloyd's Register is now the structural standard for the National Standard for Commercial Vessels. In 2011 the SSC software was introduced for you to calculate the scantlings of structure in your design project.

In 2012 the first two assignments (collection of data and estimation of preliminary dimensions) were combined into one assignment.

In 2013 the marks for Assignments 1 and 4 were re-arranged from 25/25 to 20/30 to better align with the effort required.

10. ADMINISTRATIVE MATTERS

You are expected to have read and be familiar with *Administrative Matters for All Courses*, available on the School website:

https://www.engineering.unsw.edu.au/mechanical-engineering/sites/mech/files/u41/S1-2015_Admin-Matters.pdf

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
20 February 2015