UNSW AUSTRALIA

Never Stand Still | Faculty of Engineering | School of Mechanical and Manufacturing Engineering

NAVL4140

Design of Yachts

Contents

1. Staff Contact Details

Contact details and consultation times for Course Convener

Name: Mr David Lyons FRINA
Office Location: Room 208D, Ainsworth Building J17
Email: david.lyons@unsw.edu.au
Tel: (02) 9385 6120 or 0418 208370 (send SMS or leave voicemail if unattended)

Consultation concerning this Course is available by email, by phone or in person. For an in- person appointment, please contact David by email first or see him in class.

2. Course details

Credit Points:

This is a 6 unit-of-credit (UoC) course, and involves up to 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. Thus, for a full-time enrolled student, the normal workload, averaged across the 16 weeks of teaching, study and examination periods, is about 37.5 hours per week."

This means that you should aim to spend about 9 h/w on this Course. The additional time should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

Contact Hours

	Day	Time	Location
Lectures	Monday	9am – 12noon	D16 Goldstein G07
		1pm – 4pm	D16 Goldstein G07

Summary of the course

Australia achieves very highly in sailing yacht design and construction. This Course focuses on how these vessels are designed, the materials used, and the analyses which are required, specifically the hydrodynamics and the rules and regulations which are applicable.

Aims of the course

The Course provides you with the terminology and tools unique to the design of monohull ballasted sailing yachts, the majority of which is now constructed in composites. You are also given the tools to analyse the sail and rig of the yacht, the fin and ballast requirements, the resistance and, hence, the performance of the yacht using a velocity-prediction program.

This Course uses the ship terminology which you learned in NAVL3610, and builds on the hydrodynamic principles which you learned in NAVL3620. For those choosing a sailing yacht for their design project in NAVL4120 and NAVL4130, this provides a good stepping stone for the final design iteration. The assignments also build on the report-writing skills which you commenced in ENGG1000.

Student learning outcomes

At the conclusion of this Course, it is expected that you will be able to:

- Decide the principal dimensions for the design of a new monohull sailing yacht to suit an owner's requirements, and be able to advise on the appropriate selection of materials for construction.
- Analyse the influence of sailing yacht rating rules and wind/sea conditions by way of a velocity-prediction program, and analyse the scantlings of the hull structure, the aerodynamics of the sails and rigging, and the hydrodynamics of the hull, keel and rudder.

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 (PE)**
1.	Apply classification society or ISO rules & standards	1.1, 1.5, 2.3, 3.4
2.	Calculate hydrodynamic resistance	1.3, 2.2, 3.4
3.	Derive initial design sizing for a monohull sailing yacht	1.1, 1.2, 1.3, 2.2, 3.4
4.	Understand sailing yacht VPPs and derive scantlings	1.1, 1.2, 2.1, 2.3, 3.4

3. Teaching strategies

This Course is included to give you the skills to generate designs of sailing yachts, which will fulfil the owner's requirements and those of the regulatory authorities, and to be able to analyse the principal factors which contribute to them.

The content reflects the practical, professional experience of the lecturer in drawing offices, in shipyards, and at sea on various vessels, and practical examples drawn from that experience are used throughout the lectures and tutorials.

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 examples drawn from industry.

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.

Lectures in the Course are designed to cover the terminology and core concepts and theories in the design of sailing yachts. They do not simply reiterate the texts, but build on the lecture topics using examples taken directly from industry to show how the theory is applied in practice and the details of when, where and how it should be applied.

The work in the yacht design assignments involves both self-directed work, in being creative in the design of your component, and teamwork, in integrating your component into the overall design.

4. Course schedule

The lectures and tutorials in this Course are given as follows:

Monday 0900-1200 and 1300-1600 D16 Goldstein G07

All lectures are given by Mr David Lyons.

Week	Topic
1-2	(a) Introduction, course outline, resistance (b) Yacht hydrodynamics (1): resistance upright and heeled, unappended and appended
3-4	(a) Yacht hydrodynamics (2): appendage design, seakeeping/added resistance, resistance “budget” (b) Yacht aerodynamics (1): sail plan design
5-6	(a) Yacht aerodynamics (2): rig design (b) Construction materials (1): composites
	Mid-semester break is between weeks 7 and 8 (14-23 April 2017)
7-8	(a) Construction materials (2): timber, aluminium, steel (b) Construction materials (3): costs, gyradius, design of fittings
9-10	(a) Stability: intact static and dynamic (b) Rules and regulations (1): Structural rules — ABS Yacht Guide, ISO standards

11-12 (a) Rules and regulations (2): Rating and handicap rules — ORCi, IRC, Volvo ocean rule
(b)Velocity prediction programs, tank testing, CFD codes
13 Revision and exam details tutorial.

5. Assessment

Assessment overview

You will be assessed by way of short assignments and examinations, both of which involve calculations and descriptive material.

Assessment	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Marks returned
Assignments (4; – 6 max)	4 topics, each 6 pages + drawing (as guide)	50% (4 x 12.5%)	1, 2, 3 and 4	Completed design or drawing and documentation/report	9am Monday Week 13 29/05/2017 Hand to Lecturer	Upon release of final results
Final exam	2 hours	50%	1, 2, 3 and 4	All course content	Exam period, date TBC	Upon release of final results
TOTAL		100%				

In order to pass the Course, you must achieve an overall mark of at least 50%.

Assignments

The set assignments during the semester are shown on the following page. Assignments and full briefs will be posted on the Course's Moodle site. You must pick any four (4) of the following topics:

No.	Assignment	Mark	Learning outcomes assessed	Due
1	Design of rudder and stock	25	1, 2, 4	Week 13
2	Design of ballast lead and fin keel	25	1, 2	Week 13
3	Lines plan of canoe body	25	2, 3, 4	Week 13
4	Drawing of deck arrangement	25	3	Week 13

5	Design of keel floors	25	1, 4	Week 13
6	Design of rudder bearings (&1)	25	1, 4	Week 13
7	Design of hull shell laminate (&3)	25	1, 4	Week 13
8	Design of mast section	25	3, 4	Week 13
9	Drawing of interior arrang't (&3,	25	3	Week 13
10	Drawing of sail plan and rig	25	3, 4	Week 13

You have all semester to complete and submit them but you must consult in class throughout the semester in order to complete them successfully. This condition will be individually monitored.

Assignments are each a part of a typical team project to design a 12 m yacht. You must undertake four of the assignments from the list of ten. You should coordinate your work in the assignments with your yacht in NAVL4120 if you are enrolled and have chosen the yacht in that Course.

It is expected that each assignment will take at least 8 hrs to complete, including background reading, calculations, drawing (sketch or CAD), and a written overview of about 200 words. These assignments give a practical application of the design methodology, and further practice in written communication skills.

Presentation

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

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

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

$A_{bow} = 0.0035AmfV$ (Equation in symbols)
$= 0.0035 \times 480 \times 0.95 \times 1.0 \times 18.00$ (Numbers substituted)
$= 28.7\ m^2$ (Answer with units)

Submission

Assignments are due for submission to the lecturer at the start of the class in Week 13.

Late submissions will be penalised 5% 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.

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

The following criteria will be used to grade

assignments: 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.

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, where appropriate, to support or illustrate the calculations.
- Use of tables, where appropriate, to support or shorten the calculations.
- Neatness.

Examinations

You must be available for all tests and examinations. Final examinations for each course are held during the University examination periods, which are June for Semester 1 and November for Semester 2.

There will be one three-hour examinations at the end of the semester, covering all Course materials in Section 4.

Provisional Examination timetables are generally published on myUNSW in May for Semester 1 and September for Semester 2

For further information on exams, please see the Exams section on the intranet.

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

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

Textbooks

Larsson, L. and Eliasson, R.E. (2007), *Principles of Yacht Design*, 5th Ed., Adlard Coles Nautical, London is highly recommended.

The 3rd Edition is available in the UNSW Library.

Suggested additional readings

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

Marchaj, C.A. (1985), *Sailing Theory and Practic*e, Dodd Mead and Co., New York.

Marchaj, C.A. (1988), *Aero-hydrodynamics of Sailing*, Adlard Coles, London.

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

All of these are available in the UNSW Library and are useful as additional reading material.

Papers from SNAME's annual Chesapeake Sailing Yacht Symposia (not available in the UNSW Library) are also useful reading material:
http://www.sname.org/chesapeakesailingyachtsymposiumcsys/home

Additional materials provided in Moodle

This Course has a website on Moodle which may include:
- Copies of assignments (as they are issued);
- A discussion forum.

The discussion forum is intended for you to use with other students enrolled in this Course. The Course Convenor may occasionally look at the forum and take note of any frequently-asked questions and may respond to questions on the forum. If you want help from the Course Convenor then direct contact is suggested.

Recommended Internet sites

There are many websites giving lectures, papers and data on yachts and yacht design. You might like to try the following:

http://www.sailyachtresearch.org/tech-resources/library-syrf
http://www.orc.org/index.asp?id=8
http://www.sailing.org/documents/index.php

Beneteau	www.beneteau.com
McConaghy	www.mcconaghyboats.com/
Gurit Composites	www.gurit.com/
Reichel-Pugh Yacht Design	www.reichel-pugh.com
Farr Yacht Design	www.farrdesign.com/

Or, for news of what's happening in the yacht-racing world:

Sail World	www.sail-world.com/

Other useful websites (for all parts) may be advised in class.

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: https://www.library.unsw.edu.au/

7. Course evaluation and development

Feedback on the Course is gathered periodically using various means, including the myExperience 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 further documentation of the assignments and the provision of notes and assignments on Moodle.

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 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.

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 an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here: www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Further information on School policy and procedures in the event of plagiarism is available on the intranet.

9. Administrative matters

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

- Attendance, Participation and Class Etiquette
- UNSW Email Address
- Computing Facilities
- Assessment Matters (including guidelines for assignments, exams and special consideration)
- Academic Honesty and Plagiarism
- Student Equity and Disabilities Unit
- Health and Safety
- Student Support Services

D. Lyons *FRINA*
Naval Architecture Stream Coordinator
2 February 2017

Appendix A: Engineers Australia (EA) Professional Engineer Competency Standards

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	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
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving
	PE2.2 Fluent application of engineering techniques, tools and resources
	PE2.3 Application of systematic engineering synthesis and design processes
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (professional and lay domains)
	PE3.3 Creative, innovative and pro-active demeanour
	PE3.4 Professional use and management of information
	PE3.5 Orderly management of self, and professional conduct
	PE3.6 Effective team membership and team leadership