UNSW AUSTRALIA

Course Outline

Semester 1 2016

Never Stand Still | Engineering | Mechanical and Manufacturing Engineering

NAVL3410

SHIP STRUCTURES 1

Contents

1. Staff contact details

Contact details and consultation times for course convenor

Dr Mac Chowdhury
Office location: Ainsworth 208B
Tel: (02) 9385 4119
Email: m.chodhury@unsw.edu.au

Consultation concerning this course is available by appointment, or directly by phone contact or email.

Contact details and consultation times for additional lecturers/demonstrators/lab staff

Nil.

2. Course details

Credit points

NAVL3410 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. 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, and further reading.

There is no parallel teaching in this course.

Contact hours

	Day	**Time**	**Location**
Lectures/Tutorials	Monday	12 noon–3 pm	BUS205
	Tuesday	2 pm–5 pm	BUS232

Summary of the course

This course focusses on three main areas of ship structures:

- The process of structural design and construction of ships is summarised during the first two weeks.
- The major portion of the course deals with the calculations of loading and response of the ship hull girder and major components. These calculations are based on first-principles analysis. The method of rule-based ship structural design is also introduced.
- The last three weeks are devoted to fatigue and fracture of ship structural joints using both S-N curve and fracture-mechanics approaches. The analysis of hull girder vibrations is also introduced.

Aims of the course

The main aim of this course is to develop a clear understanding of the methods of analysis of ship structures and structural components based on first principles. “First principles” in this context means the use of established theories of structural mechanics.

However, in practice, most ship structural designs are based on the rules of a classification society rather than explicit application of first principles. This course will also correlate these two methods with the help of practical design problems.

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.	Sketch the principal elements of a ship’s structure, including hull, decks and bulkheads, showing their plating, primary and secondary stiffening, and bracketing.	1.1, 1.3, 2.1, 2.2, 3.2
2.	Calculate the various loads on ships and offshore structures and predict the primary responses, i.e. stresses and deformations, for an initial structure.	1.1, 1.3, 1.5, 2.1, 2.2, 3.2
3	Modify the initial design to optimise the response using rule-book criteria.	1.1, 1.3, 2.1, 2.3, 3.2
4.	Predict the fracture and fatigue behaviour of ship and offshore structural joints using both S-N curve and fracture mechanics approaches.	1.1, 1.4, 2.1, 3.2
5.	Assess the various excitation sources of the hull girder and local vibrations, and predict the natural frequencies of the ship hull girder.	1.1, 1.3, 2.1, 2.3, 3.3

3. Teaching strategies

The material for this course will be presented through a combination of lectures and tutorials.

Lectures are designed to cover the methodology of ship structural analysis. These are mostly the theories of structural mechanics applied to ship structures. Lectures will be further developed by practical application in tutorial classes.

Tutorials are designed to provide you with feedback and discussion on the assignments, and to investigate problem areas in greater depth. You will be performing your own calculations under the supervision of the tutor. In this course the lecturer is also the tutor, and the tutorials will be conducted during the class time as and when required.

The assignments are based on calculations and tasks taken from design-office experience

4. Course schedule

All classes in this course are given by Dr Mac Chowdhury.

Week	Date	Topic	Location
1	29/2/16	Ship construction: materials, welding and cutting methods	BUS205
	1/3/16	Ship construction: materials, welding and cutting methods	BUS232
2	7/3/16	Shipyard practice	BUS205
	8/3/16	Classification society rules for ship structures	BUS232
3	14/3/16	Introduction to rationally-based design and optimisation	BUS205
	15/3/16	Rationally-based design and optimisation	BUS232
4	21/3/16	Still-ware loadings in ships and offshore structures	BUS205
	22/3/16	Still-ware loadings in ships and offshore structures	BUS232
Mid-semester break			
5	4/4/16	Statistical predictions of wave-induced loads	BUS205
	5/4/16	Statistical predictions of wave-induced loads	BUS232
6	11/4/16	Statistical predictions of wave-induced loads	BUS205
	12/4/16	Statistical predictions of wave-induced loads	BUS232
7	18/4/16	Hull girder longitudinal bending; a linear deterministic approach	BUS205
	19/4/16	Hull girder longitudinal bending; a linear deterministic approach	BUS232
8	25/4/16	Public holiday	
	26/4/16	Application of extended beam theory to the analysis of open-deck vessels	BUS232

9	2/5/16	Application of extended beam theory to the analysis of open-deck vessels	BUS205
	3/5/16	Application of extended beam theory to the analysis of open-deck vessels	BUS232
10	9/5/16	Fundamentals of fatigue and fracture	BUS205
	10/5/16	Fatigue of welded construction	BUS232
11	16/5/16	S-N curve approach to assess fatigue life of steel and aluminum structures	BUS205
	17/5/16	Introduction to fracture mechanics	BUS232
12	23/5/16	Crack growth and fatigue-life prediction	BUS205
	24/5/16	Hull girder vibrations	BUS232
13	30/5/16	Revision and exam details tutorial	BUS205
	31/5/16	Reserved	BUS232

The schedule shown for this course may be subject to change at short notice to suit exigencies; you will be advised by email of any changes.

5. Assessment

Assessment overview

In this course you will be assessed by way of assignments and a final examination, both involving calculations and descriptive material to test your grasp of the principles involved, but with more emphasis on the calculations. These are typical of the calculations, decisions and reports that you will be expected to make as a graduate naval architect.

The final assessment is based 40% on the assignments and 60% on the final examination. In order to pass this course, you must achieve an overall mark of at least 50%.

Assignments will be handed out in hard copy in class, and will also be posted on the Moodle site in case you miss the class. The assignments are a mix of individual and group submissions.

Assessment	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Marks returned
1	4%	1	Ship construction details	Tue 15/3/16, hard copy	One week after submission
2	6%	2, 3	Rational design calculations 1	Tue 5/4/16, hard copy	One week after submission
3	12%	2, 3	Rational design calculations 2	Tue 26/4/16, hard copy	One week after submission
4	6%	2, 3	Rational design calculations 3	Tue 10/5/16, hard copy	One week after submission
5	6%	4	Bi-linear S-N curves for aluminium catamaran	Tue 17/5/16, Hard copy	One week after submission
6	6%	4,5	Fracture mechanics and vibrations	Tue 24/5/16, Hard copy	One week after submission
Total	40%				

Assessment criteria

The following criteria will be used to grade assignments:

For numerical calculations:

- Accuracy of numerical answers.
- All working shown.
- 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.

Assignments

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 neat, 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.

Submission

Assignments are due on the scheduled day of the class as shown on the previous page. Assignments should be submitted direct to me in class, or in my office, or at the School Office by 1700 on the due date, and *not* via the assignment boxes.

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.

Examinations

There is a final three-hour examination in this course.

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.

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

Hughes, O. F. (1988), *Ship Structural Design : A rationally-based Computer-aided Optimization Approach*, Society of Naval Architects and Marine Engineers, Jersey City, USA.

Eyres, D. J. (2003), *Ship Construction*, 5th Edition, Elsevier Butterworth Heinemann, Oxford, UK.

These are the two main sources of reference for course contents, but purchase is not necessary as relevant portions will be handed out as hard copies.

Other printed notes will be handed out as required.

Additional materials provided in Moodle

This course has a website on Moodle which includes:

- copies of assignments (as they are issued, in case you miss the hand-out in class);
- copies of notes (as they are issued);
- previous examination papers and answers to numerical problems from 2010 onwards; 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

All classification societies maintain websites with varying levels of information available. Some, e.g. American Bureau of Shipping and DNV GL, offer their rules and regulations free online, where others don't, e.g. Lloyd's Register (but note that LR's rules are now on the computer system in the MECH labs under *Rulefinder*).

The Australian Maritime Safety Authority website offers the National Standard for Commercial Vessels and its predecessor, the Uniform Shipping Laws Code free online.

Try the following:

ABS	www.eagle.org
DNV GL	www.dnvgl.com
LR	www.lr.org
AMSA	www.amsa.gov.au

Other useful websites will be advised in class.

Other resources

If you wish to explore any of the lecture topics in more depth, then many other resources are available, and assistance may be obtained from the UNSW Library: *http://info.library.unsw.edu.au/web/services/services.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 provision of sample calculations for large assignments in class, and more-detailed comments on assignments concerning errors.

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

M. Chowdury
29 February 2016

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