UNSW AUSTRALIA

Course Outline

Semester 1 2015

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

NAVL3410

Ship Structures 1

Contents

Course Outline

NAVL3410 Ship Structures 1

1. COURSE STAFF

Contact details and consultation times for course convener

Dr Mac Chowdhury
Electrical Engineering (G17), Room 466
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Fax (02) 9663 1222
Email m.chowdhury@unsw.edu.au

Course convener is available for consultation by appointment or can be reached by telephone or e-mail
.

Contact details and consultation times for additional lecturers and tutorial/laboratory teaching staff

Nil

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.

Parallel teaching

There is no parallel teaching in this course.

Summary of the course

The contents of this course may be divided into three parts. The process of structural design and construction of commercial vessels are summarised during the first two weeks. 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 the so-called first principles. The method of Rule based ship structural designs are also introduced. The last three weeks are devoted to fatigue and fracture of ship joints using both S-N curve and Fracture mechanics approaches and a brief outline of hull girder vibrations.

How the course relates to other course offerings and overall program(s) in the discipline

This is first of the two ship structural analyses and design courses. This first course is developed on the methods you have learnt in Engineering Mechanics and Mechanics of Solids courses in first two years of your stay with us.

Some of the related topics will be continued in NAVL3710 Ship Standards and Marine Engineering and will ultimately be applied to your NAVL4120 Ship Design Project A and NAVL4130 Ship Design Project B. The ship design projects and some of the BE theses will also draw materials from NAVL3410 Ship Structures 1 and NAVL4410 Ship Structures 2.

Aims of the course

The main objectives of this course is to develop a clear understanding of the methods of analysis of ship structures and structural component based on so called **first principles.** The first principles in this context mean use of established theories of structural mechanics.

However, in practice most ship structural designs are based on the Classification Society Rules rather than explicit application of first principles. This course will also attempt to correlate these two methods with the help of practical design problems.

Student learning outcomes

By the end of this course it is expected that you will be able to:

- calculate the still water and wave induced loading on a ship.
- calculate the required section modulus of the midship section
- modify the midship section to alter the primary stress level.
- calculate section modulus of a midship section constructed of two or more materials, such as steel hull with aluminum superstructures.
- predict the fatigue and fracture behavior of various joints.
- predict the fatigue life of a strategic joint.

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

A statement of broad graduate attributes has meaning when expressed in the context of the discipline. The graduate attributes contextualised for engineering are shown at
http://teaching.unsw.edu.au/sites/default/files/upload-files/GradAttrEng.pdf

In this course, you will be encouraged to develop graduate attributes 1(a)-(d), 1(g), 1(h), 2(c), 3(a), 3(c) 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 5.

3. RATIONALE FOR INCLUSION OF CONTENT AND TEACHING APPROACH

This first course in Ship Structures will provide the students with a clear picture of the physical structure of various types of commercial vessels and then train them to analyse the ship hull girder and major components using first principles. They will also gain adequate knowledge about wave-induced loading on a floating structure.

Effective learning is supported if you are actively engaged in the learning process and by a climate of enquiry. 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.

The assignments will be usually handed back within a week with feedback and discussions.

4. TEACHING STRATEGIES

Lectures in the course are designed to cover the methodology of ship structural analysis. These are mostly the theories of structural mechanics applied to ship structures. These lectures will be further developed by practical application in tutorial classes. You will be performing your own calculations under the supervision of the tutor. Tutorials are designed to provide you with feedback and discussion on the assignments, and to investigate problem areas in greater depth. In this course the lecturer will also act as tutor and the tutorials will be conducted during the lecture hour as and when required.

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

5. ASSESSMENT

General

In this course you are assessed by way of assignments and examination, both involving calculations and descriptive material to test your grasp of the principles involved, but more emphasis will be on numerical calculations.

There will be a number of assignments and some of those will be handed over at the beginning of the term; the remaining ones when the course has progressed.

The final assessment is in two parts: 40% on Assignments and 60% on end of semester Examination.

These are typical of the calculations, decisions and reports that you will be expected to make as a graduate naval architect.

Assignments

The set assignments during the semester are shown below. Assignments will be handed out in hard copy in the 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)

Submission

Assignments are due on the scheduled day of the class in the week nominated below. Assignments should be submitted direct to the lecturer in class or at his office on the due date, rather than via the assignment boxes.

Late submissions attract a penalty of ten percent per *day*, unless prior dispensation has been given; i.e. contact the lecturer concerned before the due date to avoid penalty. In exceptional circumstances the late penalty may be waived.

No.	Assignment	Mark	Learning outcome assessed	Graduate attributes assessed					Week due
1	1	5	Ship Construction Details	1a	1b	1g			3
2	2	5	Simple application of Class rules	1d	1f	3a	3c	4a	5
3	3,4	10	Rational design calculations-1	1c	1d	1h	2c	3b	8
4	5,6	10	Rational design calculations -2	1c	1d	1h	2c	3b	10
5	7,8	10	Fatigue life of Catamaran	1c	1d	1h	2c	3b	12
	Total	**40**							

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

Examinations

There will be a three-hour examination at the end of the semester. This examination will include all materials covered during the whole semester.

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
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 "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 *Administrative Matters for All Courses*, available on 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

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 of the course, including tutorials, are given by Dr Mac Chowdhury.

Tuesday 1500–1800 EEE221 and
Thursday 1500–1800 Mathews307

Week	Topic
1	Ship construction – materials, welding and cutting methods
2	Shipyard practice, Classification society rules
3	Introduction to rationally-based design and optimization
4	Loading and responses in ships and offshore structures
5	Hull girder longitudinal bending – linear deterministic approach
6,7	Statistical predictions of wave induced loads
8	Application of extended beam theory to the analysis of open deck vessels
9	Fundamentals of fatigue and fracture, fatigue of welded construction
10	S-N curve approach to assess fatigue life of steel and aluminum structures and introduction to fracture mechanics
11	Fracture mechanics approach, crack growth and fatigue life prediction and hull girder vibrations
12	Revision and exam details tutorial

The schedule shown above may be subject to change at short notice to suit exigencies.

8. RESOURCES FOR STUDENTS

Textbooks

Printed notes will be handed out whenever needed. The following are the two main sources of course contents but you need not purchase these texts; relevant portions will be handed over to you as hard copies.

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

Additional materials provided in Moodle

This course has a website on Moodle which includes:

- previous examination papers in this course from 2010 onwards;
- answers to the numerical questions in the examinations from 2010 onwards.

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 online, where others don't, e.g. Lloyd's Register. The Australiam Maritime Safety Authority website offers the National Standard for Commercial Vessels and its predecessor, the Uniform Shipping Laws Code. Try the following:

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

Other useful websites will be advised in class.

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.

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.

Dr Mac Chowdhury
20 February 2015