



UNSW  
AUSTRALIA

# Course Outline

Semester 2 2015

Never Stand Still

Engineering

Mechanical and Manufacturing Engineering

NAVL4410

SHIP STRUCTURES 2







### 3. Teaching strategies

Lectures in Module A are designed to give a summary of the fundamentals of finite elements and then emphasize hands on applications of finite element software for analysing the assignment problems.

Lectures in Module B are designed to give a clear understanding of the properties of structural composite materials, followed by analysis for stress, deformation and failure. A number of problems are solved in the class with your active participation.

### 4. Course schedule

MODULE A: FINITE ELEMENT ANALYSIS		
Week	Lecture (1 Hour)	Demonstration (2 Hours)
1	Introduction to FEA & ANSYS overview	Control box cover for MECH3410 Creating a simple boat for NAVL4410
2	One dimensional FEA Linear spring explanation Elementary calculation & procedures in FEA Stiffness matrix for truss element	A simple truss Stress in a cylinder
3	Beam element, example, derivation Stiffness matrix Beam end releases	Bike frame Subframe Remote loads and name selection Modeling TV unit
4	Assembly, application of boundary conditions, solutions etc. Setting up boundary conditions in ANSYS Analysis types including Thermal	Plate with a hole Midsurface creation Result procesing
5	2-D FEA 2D- element for stress analysis Triangular element for axisymmetric analysis Quadrilateral element for 2D stress Isoparametric element	Pump assembly Mesh control crankshaft
6	Brick Element Solid Shell Compare Solid vs. Shell element result	Pressure cap 2D/3D comparison Optimisation demonstration
7	Interface with CAD Contact issues Modal analysis	Effect of contact stiffness on convergence Bolt pretension Spring nonlinear diagnostics Fatigue analysis Modeling Composites

9	Linear buckling	Fishing Rod Large deflection Linear buckling
10	FSI	
11		
12	Optimisation, Wrap up	

MODULE B : STRUCTURAL COMPOSITES	
Week	Lecture (1 Hour)
1	Composites materials classification and definitions
2	Fibres, matrices and interface
3	Geometrical aspects, volume fraction etc and fabrication technology
4	
5	Elastic properties of lamina
6	
7	Laminate theory and analysis
8	
9	
10	Failure theories of composite laminates
11	Sandwich construction

## Module B



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 report-style assignments the following criteria will be used:

- x Identification of key facts and the integration of those facts in a logical development.
- x Clarity of communication this includes development of a clear and orderly structure and the highlighting of core arguments.
- x Sentences in clear and plain English this includes correct grammar, spelling and punctuation.
- x Correct referencing in accordance with the prescribed citation and style guide.

All other assignments involve numerical calculations, for which the following criteria will be used:

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

### Examinations

There will be two final exams for this subject: a 2-hour examination in Module A and one 3-hour examination in Module B. These examinations will be held during exam week and will cover all materials in each module for the whole semester.

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 [Administrative Matters](#)

### 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 <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  
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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 [Administrative Materials](#) available on the School website and on Moodle, and the information on UNSW [Special Consideration page](#)

## 6. Expected Resources for students

### Module A

Course notes will be distributed in lecture classes & available on the Moodle website.

### Textbook

Cook, R.D., Malkus, D.S., Plesha, M.E. and Witt, R.J. (2002), Concepts and Applications of Finite Element Analysis, Fourth Edition, Wiley.

### Finite element programs

The School has licenses for ANSYS. Geometry may be created in ANSYS or in CATIAv5 or Pro/ENGINEER.

### Additional materials provided in Moodle

The Moodle website will be used to distribute notes, assignments and grades. The announcements tool will be used to answer general questions, correct errors that may appear from time to time in assignments and handouts and alert of any known traps in the modelling process.

### Recommended Internet sites

There are many websites giving lectures and guidance for finite element modeling. These are maintained by the software developers. For example:





## 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 proactive 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