Course Outline

Semester 1, 2015

AERO3410

Aerospace Structures

Contents

Student learning outcomes

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

1. describe the layout of aircraft structures and the role played by different components;
2. decide upon materials to be used for specific aerospace applications based on design drivers, material properties and ageing constraints;
3. use methods for determining stress and deflections of thin walled single and multi-celled stiffened structures for axial loads, bending and shear and apply these techniques to the analysis of wing and fuselage structures in aircraft;
4. analyse the buckling of thin walled structures under compression, bending and shear and be able to determine the collapse load of structures under compression loads;
5. describe and predict the onset of aeroelastic phenomena in fixed wing aircraft;
6. generate and critique a research proposal.

Graduate attributes

Please refer to UNSW graduate attributes:
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

Graduate attributes targeted and developed in this course are marked with an asterisk (*).

3. TEACHING STRATEGIES

You learning in the course will be supported by best practice teaching methodologies. The approach to teaching in the course is based on

Demonstrations

You need to acquire a *demonstration book*. Any exercise book will do. The book will serve as a record of all the demonstrations you have attempted, including the adaptive demonstrations (more info on these in a moment). Each time you attempt a demonstration you should complete it in your demonstration

Proposal Abstract (2 Marks)

Create a research proposal of 100 words or less. Examples of research proposals are given on Moodle. Submit your proposal draft along with the topic name by the end of week 4.

Select your research topic from within the broad fields of:

Composite materials
Advanced aerospace alloys
Aircraft aging: fatigue, corrosion, wear, NDI
Advanced aircraft mechanics: vibration, buckling, aeroelasticity
Novel manufacturing and joining techniques for aircraft structures

The key to a successful project will be a topic that has excellent research potential but also is interesting to you personally.

In this course, supplementary assessment will only be provided for the final examination and is still at the discretion of the course authority. Special consideration for other assessment tasks, if granted, will allow the assessment task to be removed from the final grade and the other grades will be adjusted accordingly.

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

8. RESOURCES FOR STUDENTS

Learning Management System

The Moodle LMS, https://moodle.telt.unsw.edu.au/ will be used for this course. Lecture notes, demonstrations, assignments, links and forums will be available on Moodle. Moodle is a powerful tool that you are encouraged to use for all course needs.

Textbooks

Required Textbook

Megson, T.H.G. *Aircraft Structures for Engineering Students,* Fifth Edition. Elsevier 2012. (4th Edition will suffice with minor inconvenience)

Recommended Background Knowledge

Cutler, J. Understanding Aircraft Structures, Fourth Edition. Blackwell, 2005.

Suggested Textbooks

Flabel, J.C. *Practical Stress Analysis for Design Engineers*. Lake City Publishing Company, 1997.

Recommended Reading

Daniel, I.M. and Ishai, O. *Engineering Mechanics of Composite Materials*. Oxford University Press, 1994.
Niu, M.C.Y. *Airframe Structural Design*. Conmilit Press, 1988.
Niu, M.C.Y. *Composite Airframe Structures*. Conmilit Press, 1992.
Baker A., Dutton S. and Kelly, D. *Composite Materials for Aircraft Structures*, 2nd Edition. AIAA Education Series, 2004.

Recommended Internet sites

There are many websites giving lectures, papers and data. These websites will be identified in the lectures and on Moodle.

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 the library website: www.library.unsw.edu.au/.

9. COURSE EVALUATION AND DEVELOPMENT

Aerospace Structures was
curriculum review project in 2013, it was decided that AERO3410 needed to present a much more comprehensive approach to aircraft structural analysis while removing some of the content that could be taught to a more general audience, such as the finite element method (FEM). As a result, AERO3410 and AERO4410 were disbanded and a new AERO3410 was designed with the best parts of the two old courses and some brand new content as well.

In 2014 the course was received very well. The only concern from most students was

that
things around. Instead, the size and complexity of each assessment task will be reduced somewhat in 2015.

10. ADMINISTRATIVE MATTERS

You are expected to have read and be familiar with *Administrative Matters for All Courses*, available from the school website:
http://www.engineering.unsw.edu.au/mechanical-engineering/forms-and-guidelines.