UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Term 2 2019

AERO4110

Aerospace Design 2

Contents

1. Staff contact details

Contact details and consultation times for course convenor

Name: Dr Sonya A Brown
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Moodle: https://moodle.telt.unsw.edu.au/login/index.php

Consultation time will be available during the last section of some lectures (depending on weekly content). Additionally, I will attend the first half-hour of each tutorial session. It is preferred for any queries to be addressed in this time. If this is not possible, please email me.

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

Name: Arthur Tan
Role: Demonstrator
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Name: Angus Wills
Role: Demonstrator
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2. Important links

- Moodle
- Lab Access
- Computing Facilities
- Student Resources
- Course Outlines
- Engineering Student Support Services Centre
- Makerspace
- UNSW Timetable
- UNSW Handbook
- UNSW Mechanical and Manufacturing Engineering

3. Course details

Credit points

This is a 6 unit-of-credit (UoC) course and involves 5 hours per week (h/w) of face-to-face contact.

The normal workload expectations of a student are approximately 25 hours per term for each UoC, including class contact hours, other learning activities, preparation and time spent on all assessable work.

You should aim to spend about 13 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 / Consultations	Monday	2pm - 3pm	Mathews (D23) Theatre C (Weeks 1, 3-9)
	Thursday	2pm - 3pm	Mathews (D23) Theatre C (Weeks 1-9)
Tutorial	Monday	3pm - 5pm	Mathews (D23) 103 (Weeks 1, 3-9, 11)
	Thursday	3pm - 4pm	Mathews (D23) 103 (Weeks 1-9)
Presentations	Friday Week 10	12midday - 6pm	Physics Theatre (K14)

Please refer to your class timetable for the learning activities you are enrolled in and attend only those classes.

Summary and Aims of the course

This course is a capstone aerospace design project. In design teams, students develop a preliminary design of an aircraft to meet a given request for proposal. The course aims to give a holistic approach to the aerospace design process. Students are required to consider the requirements of several disciplines including conceptual design, configuration, weights, sizing, payload, aerodynamics, propulsion, structures, systems, stability and control, performance, and cost. The course will give students the opportunity to integrate these elements into a single congruous design of an aircraft. Team work, report writing, and presentation skills are a focus to develop important professional skills for industry.

Students are expected to have a sound understanding of aerospace regulations, aerodynamics, flight performance, propulsion, structural design and analysis, materials, flight dynamics, and aerospace systems prior to attempting this course.

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.	Produce a preliminary aircraft design to meet request for proposal and regulatory requirements.	PE 1.5, PE 2.1, PE 2.3, PE 3.3
2.	Apply aerospace cross-disciplinary principles appropriately for a congruous design.	PE 1.3, PE 1.4, PE 2.3, PE 3.4
3.	Cooperatively manage and contribute to an engineering team.	PE 1.6, PE 2.4, PE 3.5, PE 3.6
4.	Professionally communicate design concepts and information.	PE 3.2, PE 3.3

4. Teaching strategies

This course is a capstone aerospace design project to meet a given request for proposal. Students will address the design challenge in teams. Lectures will introduce the design project and briefly outline / review some of the required areas for design. Consultation time will be available during the last section of some lectures (depending on weekly content). Detailed technical information relevant to each group's design should be sought outside of class from appropriate engineering sources to make and justify design decisions. Tutorials will include weekly design meetings for each group, plus general time for groups to work together on their projects with teaching staff support. Team work is central to this course to assist in developing the communication and interpersonal skills critical for industry. The final designs will be presented to the class and industry representatives to improve professional communication and generate links between students and the local aerospace industry.

5. Course schedule

Week	Topic	Suggested Readings
0	Video - RFP explanation and group selection, Design Process	
1	Conceptual Design and Configuration Existing Aircraft Comparisons & Weight Sizing	Raymer Ch 2 Roskam Part I Ch 2
2	Existing Aircraft Comparisons & Weight Sizing	Raymer Ch 6, §19.3
3	T/W, W/S, Sizing	Raymer Ch 5, Ch 6, §19.4 & §19.5
4	Aerodynamics	Raymer Ch 4, §7.8, §7.9
5	Configuration & Payload	Raymer Ch 7, Ch 8, Ch 9
6	Propulsion	Raymer Ch 10
7	Structures & Materials	Raymer Ch 14
8	Weight & Balance, Stability and Control	Raymer Ch 15, Ch 16 Roskam Part V
9	Performance Envelopes, Cost	Raymer Ch 17, Ch 18 Roskam Part VIII
10	Presentations	

6. Assessment

Assessment overview

Assessment	Group Project? (# Students per group)	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Progress Design Reports (2) (Group [1,2,3,4])	Yes (7-8)	30 pages max [5]	30%	1, 2, 3 and 4	Design report; drawings; design choices; ability to meet RFP; integration of disciplines. Peer evaluation.	1: 11:50pm Monday Week 4	1: 11:50pm Thursday Week 4	Two weeks after submission
		30 pages max [5]				2: 11:50pm Monday Week 8	2: 11:50pm Thursday Week 8	Two weeks after submission
Final Design Report (Group [1,2,3,4]) [6]		100 pages max [5]	50%	1, 2, 3 and 4	Design report; drawings; design choices; ability to meet RFP; integration of disciplines. Peer evaluation.	4:00pm Thursday August 22nd	N/A	Upon release of final results
Presentation (Group [1,2,3,4]) [7]		TBA	20%	3 & 4	Content; feasibility; presentation skills, verbal communication; clarity. Model and brochure. Peer evaluation.	12:00midday Friday Week 10	N/A	Upon release of final results

Notes:

1. The group mark will be moderated by academic review and peer evaluation to give an individual mark for each assessment.

2. For each assessment, an individual statement of claim of contributions must be submitted electronically by the assessment due date. Failure to submit an individual statement of claim for any assessment will result in an individual penalty of 10% of the maximum mark possible for the assessment.
3. For each assessment, a peer evaluation must be completed electronically. Peer evaluations for Progress Reports and the Presentation must be completed by one week after each assessment due date. Peer evaluations for the Final Design Report must be completed by 4:00pm Tuesday August 27th. Failure to complete the peer evaluation by the required deadline for any assessment will result in an individual penalty of 10% of the maximum mark possible for the assessment.
4. Weekly design meetings must be documented with minutes, these should be uploaded electronically to the appropriate Moodle forum each week.
5. Maximum page numbers exclude front matter, references and appendices.
6. The Final Design Report is required to be submitted in hard copy (soft bound), as well as electronically.
7. Multiple hard copies of your brochure will be required to distribute to audience members. Presentation slides, and a soft copy of your brochure, must be submitted electronically. Your physical model should be presented and submitted at your design presentation.

Further assessment details may be found on the course Moodle once released.

Assignments

Attendance

Attendance is required at all tutorials. If your absence equates to more than 20% of tutorials, you may fail the course, or be denied special consideration.

Presentation

All non-electronic 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 and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Submission

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

a. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
b. Online quizzes where answers are released to students on completion, or
c. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
d. Pass/Fail assessment tasks.

Marking

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Examinations

You must be available for all tests and examinations. Final examinations for each course are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates.

For further information on exams, please see the Exams webpage.

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 available 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 Engineering Student Supper Services Centre

prior to the examination. Calculators not bearing an “Approved” sticker will not be allowed into the examination room.

Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

Please note that UNSW now has a Fit to Sit / Submit rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW’s Special Consideration page.

7. Expected resources for students

Required Texts

- Daniel P. Raymer, Aircraft Design: A Conceptual Approach, Fifth Edition, AIAA Education Series, 2012

Recommended Reading

- Jan Roskam, Airplane Design Parts I-VIII, DARcorporation
- Jane’s All the World’s Aircraft (online database available via UNSW Library)
- Federal Aviation Regulations, FAR 23, Airworthiness Standards: Normal Category Airplanes
- Federal Aviation Regulations, FAR 25, Airworthiness Standards: Transport Category Airplanes
- Ian Moir and Allan Seabridge, Aircraft Systems – Mechanical, electrical, and avionics subsystems integration, Third Edition, AIAA Education Series 2008
- Ian Moir and Allan Seabridge, Design and Development of Aircraft Systems, Second Edition, AIAA Education Series 2013
- FAA-H-8083 Aviation Maintenance Technician Handbook - Airframe
- Jean-Claude Flabel, Practical Stress Analysis for Design Engineers, First Edition, Lake City Publishing Company 1997
- E. F. Bruhn, Analysis and Design of Flight Vehicle Structures, Jacobs Publishing, Inc. 1973
- Michael C. Y. Niu, Airframe Structural Design, Second Edition, Hong Kong Conmilit Press Ltd. 2006
- DOT/FAA/AR-MMPDS, Metallic Materials Properties Development and Standardization (MMPDS), (previously MIL-HDBK-5)
- CMH-17, Composite Materials Handbook, (previously MIL-HDBK-17)

Leganto Reading List available via the course Moodle.
UNSW Library website: https://www.library.unsw.edu.au/
Moodle: https://moodle.telt.unsw.edu.au/login/index.php

8. Course evaluation and development

Feedback on the course is gathered periodically using various means, including the UNSW 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:

- Weekly meetings to be a set designated time for each group.
- Final Design Report due date has been pushed back to allow students more time, and to allow feedback from the Design Presentations to be incorporated.

9. 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, visit: 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

10. Administrative matters and links

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

- Attendance
- UNSW Email Address
- Computing Facilities
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Student Equity and Disabilities Unit
- Health and Safety
- Lab Access

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	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