



**UNSW**  
AUSTRALIA

# Course Outline

Semester 1 2015

Never Stand Still

Faculty of Engineering

School of Mechanical and Manufacturing Engineering

## **AVEN1920**

# **INTRODUCTION TO AIRCRAFT ENGINEERING**

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## Course Outline

### AVEN1920 Introduction to Aircraft Engineering

#### 1. COURSE STAFF

##### Contact details and consultation times for course convener

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Consultation concerning this course is primarily by email. If you would like to meet please email to schedule a meeting time. Minor matters can be discussed after class.

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

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#### 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.

### **Summary of the course**

This is an introductory course for the aviation program. Its aim is to set the scene for later engineering studies and familiarise the students with the terms used in aeronautical engineering, while at the same time introducing them to basic engineering mechanics and aerodynamics.

The course is divided into three main parts: mechanics, aerodynamics, and aeronautical engineering.

### **Aims of the course**

This course enables you to gain a basic understanding of aeronautical engineering principles, and develop skills and problem solving methods in fundamental engineering applications as they apply to aircraft systems. During the course, an overview of the history of aircraft development will be introduced to give context to the current state of aeronautical engineering.

### **Student learning outcomes**

At the conclusion of this course, it is expected that you will be able to:

- Have a basic core understanding of principles of engineering mechanics
- Explain basic concepts related to the aerodynamic efficiency of an aircraft
- Understand the fundamentals behind airfoil design
- Apply basic engineering concepts to the analysis of aircraft systems: structures, powerplants, stability and control, avionics and materials

### **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

In this course, you will be encouraged to develop graduate attributes 1(a,c,d,f,g), and 3(a,b) by undertaking the selected activities and knowledge content. These attributes will be assessed within the prescribed assessment tasks, as shown in the assessment table in Section 5.

You will be supported in developing the above attributes through:

- (i) the design of academic programs;
- (ii) course planning and documentation;
- (iii) learning and teaching strategies; and
- (iv) assessment strategies.

As a first year course it is important that on successful conclusion of the course you have developed self-motivated learning skills within a university environment. You are also expected to cultivate the ability to work within a professional environment, behave in a professional manner, and develop the ability to critically assess data sources.

### **3. RATIONALE FOR INCLUSION OF CONTENT AND TEACHING APPROACH**

This course is included to give you an understanding of the principles of aeronautical engineering, particularly in the application of mechanics and aerodynamics in the analysis of aircraft systems.

Effective learning is supported when you are actively engaged in the learning process and by a climate of enquiry, and these are both an integral part of the lectures and tutorials.

Dialogue is encouraged between you, others in the class and the lecturer. Diversity of experiences is acknowledged, as some students in each class have prior experience. Your experiences are drawn on to illustrate various aspects, and this helps to increase motivation and engagement.

### **4. TEACHING STRATEGIES**

Lectures in the course are designed to cover the terminology and core concepts and theories. Example problems will be worked out in class and provided on Moodle for you to practice at home.

### **5. ASSESSMENT**

#### **General**

You will be assessed by way of assignments and examinations, both of which involve calculations and descriptive material.

Basic Mechanics    25%

The assessment for this part of the course will be based on a test held in week 7 lasting 50 minutes. Only calculators with “approved” stickers will be able to be used for this test.

Aerodynamics        25%

This assessment will be based on an individual project.

Aeronautical Engineering 50%

Assessment for this part of the course comprises one 50-minute in-class quiz (10 marks), a book report (10 marks), and a final exam (30 marks).

In order to pass the course, you must achieve an overall mark of at least 50%.

## Book Report

You are required to choose **one** book from the following list, and submit a report on it. The books are available in the UNSW book shop, and some copies are available at the library. Other options are to purchase the book elsewhere or borrow it from any other library.

The books are:

1. R. Bach, *A Gift of Wings*
2. R. Bach, *Stranger to the Ground*
3. E. K. Gann, *Fate is the Hunter*
4. C. Yeager, *An Autobiography*
5. L. Kessler, *The Happy Bottom Riding Club: The Life and Times of Pancho Barnes*

The report should be written in an **essay** style. In your report, include the following:

- A brief outline of the book – What is it about? How is it structured? Who is the author?
- What is the most memorable part of the book for you? Why?
- Does the book relate to your current or past knowledge about aviation? This could include personal experience, coursework taken, and non-university studies.
- A personal reflection – your thoughts on the book, did you find it interesting? Did it spark any new interests? What are your reactions to it? It is fine to critique the book as long as you back up your claims with well thought-out arguments.

Your report should be at least 1500 words and strictly no more than 2500 words long. Please include a word count at the end of the report.

The report should be submitted on Moodle, as a PDF file, by the due date. Note that any form of plagiarism will result, at the very least, in 0 points awarded for the report, and in severe cases other actions may be taken (see Section 6).

Late submission of assignments attracts a penalty of ten percent per *day*, unless prior dispensation has been given; i.e. see the lecturer *before* the due date to avoid penalty.

The book report is worth 10 marks. Marks will be given based on the following criteria:

- Was the book summarised in a concise yet thorough manner?
- Was a personal reflection included which shows the student read the book in a meaningful manner?
- Was the book and its meaning [to the student] put into a larger context?

- Does the report comply with university standards (English language and grammar, professional presentation, adherence to word count)?
- Is the report written clearly, with well-thought out structure?
- Are ideas presented logically and backed up with appropriate arguments?

The Learning Centre provides resources and advice on academic writing and presentation skills, <http://www.lc.unsw.edu.au/olib.html#6>

## Examination

You will need to provide your own calculator, of a make and model approved by UNSW, for the examination. 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 Engineering Student Centre prior to the examination. Calculators not bearing an “Approved” sticker will not be allowed into the examination room.

The quiz will be given in-class and is worth 10 marks. You are allowed to bring only an approved calculator and a pen.

## 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 from the School website. [http://www.engineering.unsw.edu.au/mechanical-engineering/sites/mech/files/u41/S1-2015\\_Admin-Matters.pdf](http://www.engineering.unsw.edu.au/mechanical-engineering/sites/mech/files/u41/S1-2015_Admin-Matters.pdf)

## 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

Aerodynamics (Assoc. Prof. N.A. Ahmed)  
 Mechanics (Dr Kana Kanapathipillai)  
 Aeronautical Engineering (Dr N. Tsafnat)

<b>Week</b>	<b>Mechanics</b>	<b>Aerodynamics</b>	<b>Aeronautical Engineering</b>
	Fri 14:00 – 16:00 Colombo Theatre B (B16 LG04)	Fri 14:00 – 16:00 Colombo Theatre B (B16 LG04)	Mon 12:00 – 14:00 OMB K15 room 149
1	Forces		Course intro Lecture 1
2	Forces		Lecture 2
3	Moments		Lecture 3
4	Equilibrium		Lecture 4
5	Equilibrium		<b>Quiz</b> Lecture 5
Mid-semester break			
6	Rigid body Motion		Lecture 6
7	<b>Exam</b>		Lecture 7

8		Introduction to basic aerodynamics	Lecture 8
9		Mechanics of lift production	Lecture 9
10		Drag reduction Techniques	Lecture 10
11		Bernoulli's equation, indicated and corrected speed	Lecture 11
12		Families of airfoils and aerodynamic load	Revision + overflow

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

## 8. RESOURCES FOR STUDENTS

### Textbooks

There is no textbook for this course. The book list for the book report is presented in Section 5.

### Suggested additional readings

J.D. Anderson, *Introduction to Flight*. 7<sup>th</sup> ed, McGraw Hill

W. Langewiesche, *Stick and Rudder*.

### Additional materials provided in Moodle

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, and may or may not respond to questions on the forum.

### 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:

[www.library.unsw.edu.au/servicesfor/index.html](http://www.library.unsw.edu.au/servicesfor/index.html)

## 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. This document contains important information on student responsibilities and support, including special consideration, assessment, health and safety, and student equity and diversity.

*N. Tsafnat*  
20 February 2015