AERO9660

Advanced Aerospace Propulsion

Term Three // 2020

School of Mechanical and Manufacturing Engineering // UNSW Engineering

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
John Olsen	j.olsen@unsw.edu.au	during consultations	Ainsworth Building 311/C	9385 5217

School Contact Information

Location

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

Hours

9:00–5:00pm, Monday–Friday*

*Closed on public holidays, School scheduled events and University Shutdown

Web

School of Mechanical and Manufacturing Engineering

Engineering Student Support Services

Engineering Industrial Training

UNSW Study Abroad and Exchange (for inbound students)

UNSW Future Students

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

(+61 2) 9385 4097 – School Office**

**Please note that the School Office will not know when/if your course convenor is on campus or available

Email

Engineering Student Support Services – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries

Course Details

Credit Points 6

Summary of the Course

The analysis of two-spool, turbofan, gas-turbine engines.

The concept of exergy analysis for open thermodynamic systems and to apply this idea to the components of gas turbine engines.

Chemical rockets and ion thrusters.

The analysis of heat exchangers and to the basic analysis of heat transfer from spacecraft.

Finite time thermodynamics and apply to internal combustion engines.

High-speed propulsion operation, particularly for military jet aircraft.

Electric and hybrid electric propulsion.

Course Aims

Analyse the thermodynamic operation of a two-spool, gas turbine, turbofan engine.

Understand the concept of exergy and to be able to apply this to simple thermodynamic processes and cycles.

Be able to analyse heat exchangers and to appreciate the difficulties involves in analysing heat transfer with respect to spacecraft.

Understand both chemical rockets and ion thrusters.

Understand high-speed propulsion for military aircraft.

Analyse the behaviour of internal combustion engines using the finite time thermodynamics approach.

Understand the difficulties but also the benefits of electric and hybrid electric propulsion systems.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Analyse of a two-spool, gas turbine, turbofan engine.	PE1.1, PE1.2, PE1.3, PE2.1, PE2.2
2. Exergy analysis	PE1.1, PE1.2, PE1.3, PE2.1, PE2.2

Learning Outcome	EA Stage 1 Competencies
3. Understanding both chemical rockets and ion thrusters.	PE1.1, PE1.2, PE1.3, PE2.1, PE2.2
4. Heat exchanger and radiation heat transfer analysis.	PE1.1, PE1.2, PE1.3, PE2.1, PE2.2

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Assignment 1	10%	28/09/2020 11:00 AM	1, 2
Assignment 2	20%	16/11/2020 11:00 AM	1, 2, 3, 4, 5, 6, 7
Class Test	20%	26/10/2020 09:00 AM	1, 2, 3, 4
Final Exam	50%	Not Applicable	1, 2, 3

Assessment Details

Assessment 1: Assignment 1

Details:Small Assignment

Assessment 2: Assignment 2

Start date: Not Applicable

Details:Larger Assignment

Assessment 3: Class Test

Start date: 26/10/2020 09:00 AM

Details:Class Test

Turnitin setting: This is not a Turnitin assignment

Assessment 4: Final Exam

Details:Final Exam that covers everything.

J. D. Clark, 2017, Ge l grgm l ? l g l dmp k _j fgqrmpw md jgosgb pma i cr npmncjj_ l rq, Rutgers University Press Classics.

T. S. Taylor, 2009, G l rpmbsargm l rm pma i cr qagc l ac _ l b c l eg l ccpg l e, CRC Press, Boca Raton, FL 33487-2742.

A. Hughes & B. Drury, 2013* Cjcarpga k mrmpq _ l b bpg t cq* Ds l b_ k c l r_jq* rwncq _ l b _nnjga_rgm l q, 4th Edition, Newnes.

L. Guzzella & A. Sciarretta, 2013, Tc fgajc npmnsjqgm l qwqrc k q* G l rpmbsargm l rm k mbcjg l e _ l b mnrg k gx_rgm l, 3rd Edition, Springer.

W. W. Pulkrabek, 2004, C l eg l ccpg l e ds l b_ k c l r_jq md r f c g l rcp l _j am k `sqrgm l c l eg l c, 2nd edition, Pearson Prentice Hall.

J.B. Heywood, 1988, G l rcp l _j am k `sqrgm l c l eg l cq ds l b_ k c l r_jq, McGraw Hill.

D. Crane, Nmucpnj_ l r, 2nd Edition, ASA AMT-P2.

J. A. Camberos & D. J. Moorhouse, 2011, Cvcpew _ l _jwqgq _ l b bcqge l mnrg k gx_rgm l dmp _cpmqn_ac tc fgajcq _ l b qwqrc k q, Editor-in-chief, F. K. Lu, Vol. 28, Progress in astronautics and aeronautics, AIAA, resto, Virginia.

J. D. Anderson Jr., 2012, G l rpmbsargm l rm djge f r, McGraw Hill, New York, 10020NY.

Course Evaluation and Development

This is the second time this course has run.

Some matrial has been heavily upgraded.

Laboratory Workshop Information

N/A

Submission of Assessment Tasks

Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

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.

assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

UNSW now has a Fit to Sit / Submit rule, which means that if you attempt 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.

Please note that students will not be required to provide any documentary evidence to support absences from any classes missed because of COVID-19 public health measures such as isolation. UNSW will not be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration will be required for assessment and participation absences – but no documentary evidence for COVID 19 illness or isolation will be required in T3.

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. *Nj_eg_pgqk _r SLQU gq bcdglcb _q sqgle rfc umpbq mp gbc_q md mrfcpq _lb n_qqgle rfck mdd _q wmsp mul,*

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

Academic Information

Credit points

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC

Important Links

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

Image Credit

Synergies in Sound 2016

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	
PE1.6 Understanding of the scope, principle ‰ † applicableb	