University of the West of Scotland

Module Descriptor

Session:

Last modified:

Status:

Thermodynamics and Aircraft Propulsion

Code: ENGG08029	**SCQF Level: 8 (Scottish Credit and Qualifications Framework)**	**Credit Points: 20**	**ECTS: 10 (European Credit Transfer Scheme)**
School:	School of Engineering and Computing		
Module Co-ordinator:	Stephanie Docherty		

Summary of Module

This module is designed to provide students with an understanding in the topics of thermodynamics, propulsion, and heat transfer within the context of aircraft systems. The module aims to show the importance of thermodynamics and heat transfer in the design/analysis of aircraft systems, with focus placed on aircraft propulsion systems.

Outcome 1 is intended to develop the student's understanding of key concepts in thermodynamics, including the first and second laws of thermodynamics, and the use of steam tables. Students will apply their understanding to analyse thermodynamic systems relevant to aircraft propulsion, such as compressors, turbines, and nozzles.

Outcome 2 is intended to provide the student with an understanding of the thermodynamics of gas turbine aircraft propulsion. The Brayton cycle will be analysed in detail.

Outcome 3 is intended to provide the student with an understanding of jet engine performance. The performance of turbojet, turbofan and turboprop engines will be examined, including estimation of key performance characteristics such as thrust.

Outcome 4 is intended to provide the student with an understanding of key concepts in heat transfer. Students will apply their understanding to analyse heat conduction and convection problems relevant to aircraft systems.

By undertaking this module, students will have the opportunity to develop their UWS Graduate Attributes (https://www.uws.ac.uk/current-students/your-graduate-attributes/), including critical thinking, problem solving, effective communication, autonomy and creativity.

Module Delivery Method

Face-To-Face	Blended	Fully Online
	✓	

Face-To-Face

Term used to describe the traditional classroom environment where the students and the lecturer meet synchronously in the same room for the whole provision.

Fully Online

Instruction that is solely delivered by web-based or internet-based technologies. This term is used to describe the previously used terms distance learning and e learning.

Blended

A mode of delivery of a module or a programme that involves online and face-to-face delivery of learning, teaching and assessment activities, student support and feedback. A programme may be considered “blended” if it includes a combination of face-to-face, online and blended modules. If an online programme has any compulsory face-to-face and campus elements it must be described as blended with clearly articulated delivery information to manage student expectations

Campus(es) for Module Delivery

The module will **normally** be offered on the following campuses / or by Distance Learning (D/L) (ie.Virtual Campus): (Provided viable student numbers permit)

Paisley:	Ayr:	Dumfries:	Hamilton:	D/L Virtual Campus:	Other:
✓					

Learning Outcomes: (maximum of 5 statements)

At the end of this module the student will be able to: L1. Analyse thermodynamics problems relevant to mechanical and aircraft systems, including the use of tabulated data. L2. Solve problems in gas turbine thermodynamics. L3. Analyse and predict jet engine performance, and the role this plays in aircraft performance and design. L4. Analyse heat transfer problems relevant to mechanical and aircraft systems.

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	During completion of this module, there will be an opportunity to achieve core skills in:
Knowledge and Understanding (K and U)	SCQF Level 8. Demonstrating a broad and integrated knowledge and understanding of the main areas of thermodynamics and heat transfer, and their importance for aircraft systems. Demonstrating a critical understanding of a selection of principal theories, principles, concepts and terminology.
Practice: Applied Knowledge and Understanding	SCQF Level 8. Use a selection of the principal skills, techniques, practices and/or materials associated with engineering and industrial tasks. Practice routine searches for thermophysical data of fluids.
Generic Cognitive skills	SCQF Level 8. Be able to compare suggested solutions with expected values.
Communication, ICT and Numeracy Skills	SCQF Level 8. The ability to report in writing and orally on experimental findings. Use a range of IT applications to facilitate calculations and provision of report and presentations. Interpret and evaluate numerical and graphical data and use it to design and analyse equipment and systems.
Autonomy, Accountability and Working with others	SCQF Level 8. Take some responsibility for use of appropriate data resources.

	Practice in ways which take account of own role and responsibilities. Work under guidance with qualified practitioners.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code: ENGG07002	**Module Title:** Applied Engineering Science
	Other:	
Co-requisites	**Module Code:**	**Module Title:**

* Indicates that module descriptor is not published.

Learning and Teaching

The learning and teaching activity for this module include lectures, tutorials and problem based learning.

Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Categories**	**Student Learning Hours** (Normally totalling 200 hours): (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture/Core Content Delivery	Scheduled	18
Tutorial/Synchronous Support Activity	Scheduled	18
Laboratory/Practical Demonstration/Workshop	Scheduled	2
Independent Study	Independent	162
		200 Hours Total

****Indicative Resources: (eg. Core text, journals, internet access)**

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

Access to appropriate laboratories.

Course notes and presentations will be provided.

Texts:

Cengel, Y. A, J M Combala and R H Turner, Fundamentals of Thermal-Fluid Science, McGraw-Hill, 4th Edition, 2012

Dunn, D J, Fundamental Engineering Thermodynamics, Longman, 2001

Cengel, Y A and M A Boles, Thermodynamics: An Engineering Approach, McGraw-Hill, 7th Edition, 2010

Moran, M J et al, Principles of Engineering thermodynamics, John Wiley & Sons, 7th Edition, 2011

Eastop T D and McConkey A, Applied Thermodynamics for Engineering Technologies. 5th edition, Prentice Hall. 1993

Flack R D, Fundamentals of Jet Propulsion with Applications, 1st edition, Cambridge University Press, 2005

Rogers G F C and Mayhew Y R, 1992, Engineering Thermodynamics, Work and Heat Transfer, 4th edition, Longman, 1992

Frank P, Introduction to Heat Transfer, John Wiley, 5th edition, 2007

(**N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance Requirements

It is expected that students will attend all scheduled classes or participate with all delivered elements as part of their engagement with their programme of study. Please refer to UWS Regulation 5.3.6.

Course Reference Numbers (CRNs) (if known)

Paisley:	Ayr:	Dumfries:	Hamilton:	D/L Virtual Campus:	Other:
Not known					

Term (s) for Module Delivery

(Provided viable student numbers permit).

Term 1		Term 2	✓	Term 3	

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Subject Development Group (SDG)	Mechanical & Chemical Engineering
Assessment Results (Pass/Fail)	No
Subject Panel	Design
Moderator	Tony Leslie
External Examiner	E Tingas
Accreditation Details	IMechE
Changes/Version Number	

Assessment: (also refer to Assessment Outcomes Grids at end of document)
Formative assessment will be provided in the form of class quizzes and example problems during tutorial sessions and as part of preparation for written submissions. Summative assessment will be in the form of two class tests; and one case study. A minimum overall 40% is required to achieve a pass in this module. Summative Assessment Category 1: Two class tests worth 70% (equal weighting) of the final mark.
Summative Assessment Category 2: Case study based on engine performance worth 30% of the final mark.
(N.B. (i) **Assessment Outcomes Grids** for the module (one for each main assessment category) can be found at the end of this descriptor which clearly demonstrate how the learning outcomes of the module will be assessed. (ii) An **indicative schedule** listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Handbook.)

Assessment Outcome Grids (Footnote A.)

Assessment Category 1

Assessment Category	Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Assignment	Class test (written)	✓	✓		✓	70	4

Assessment Category 2

Assessment Category	Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Weighting (%) of Assessment Element	Timetabled Contact Hours
Assignment	Case Study			✓		30	0
Combined Total For All Assignment Categories						100%	4 hours

Footnotes

A. Referred to within Assessment Section above

B. Identified in the Learning Outcome Section above

Note(s):

1. More than one assessment method can be used to assess individual learning outcomes.
2. Schools are responsible for determining student contact hours. Please refer to University Policy on contact hours (extract contained within section 10 of the Module Descriptor guidance note).
3. This will normally be variable across Schools, dependent on Programmes &/or Professional requirements.

Equality and Diversity

This module is suitable for any student with appropriate engineering background, however it should be noted that in order for you to complete this module the laboratory element of coursework will require to be undertaken, special support can be provided where necessary, consequently, if special support is needed to complete this part of the module, then the University's Health and Safety Officer should be consulted to make sure that safety in the laboratory is not compromised.

Current University Policy on Equality and Diversity applies.

UWS Equality and Diversity Policy

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)