Module Descriptor

Title	Aerothermodynamics & Aircraft Propulsion		
Session	2025/26	**Status**	Published
Code	ENGG08029	**SCQF Level**	8
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	B Rakhshani		

Summary of Module

This module is designed to provide students with understanding of the thermodynamics and heat transfer principles and theories and their governing equations. It will consider aspects of the thermodynamics that apply to propulsion systems. The module aims to show the importance of thermodynamics and heat transfer in the design, analysis and performance of aircraft jet engines.

Topics that the module will cover are;

- learning the key concepts in thermodynamics, including the first and second laws of thermodynamics, and the use of steam tables.

- application of thermodynamic cycles and processes in propulsion systems.

- understanding the jet engine and its components performance, and its operational cycle analysis.

- understanding the key concepts in heat transfer to solve and analyse problems in heat conduction and convection.

- use experimental and computational methods to analyse engine cycles and performance.

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	On-Campus[1] ☒	Hybrid[2] ☐	Online[3] ☐	Work -Based Learning[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☒ Paisley	☐ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1	☐	Term 2	☒	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
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.
L5	Apply analytical, computational and experimental method to analyse thermodynamic systems including propulsion 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 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 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.

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

Generic Cognitive skills	**SCQF 8** Be able to compare suggested solutions with expected values.
Communication, ICT and Numeracy Skills	**SCQF 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 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.

Prerequisites	**Module Code**	**Module Title**
	Other	
Co-requisites	**Module Code**	**Module Title**

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours. The learning and teaching activity for this module include lectures, laboratories, 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:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	18
Tutorial / Synchronous Support Activity	18
Laboratory / Practical Demonstration / Workshop	12
Independent Study	152
n/a	0
n/a	0
TOTAL	200

Indicative Resources
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: 1) Moran, M.J., Shapiro, H.N., Boettner, D.D., Bailey, M.B. (2011) Principles of Engineering thermodynamics. 7th Ed. Hoboken, N.J.: John Wiley.

2) Frank, P. (2007) Introduction to Heat Transfer, 5Th Ed. Hoboken, N.J. : John Wiley.

3) Cizmas, P.G.A. (2021) Aerothermodynamics & jet propulsion. Cambridge: Cambridge University Press.

4) El-Sayed, A.F. (2008) Aircraft propulsion and gas turbine engines. Boca Raton, FL: CRC Press.

5) Flack, R.D. (2024) Fundamentals of jet propulsion with power generation applications. 2nd Ed. Cambridge: Cambridge University Press.

(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 and Engagement Requirements

In line with the Student Attendance and Engagement Procedure, Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

For the purposes of this module, academic engagement equates to the following:

The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. Students will scan their attendance, via the attendance scanners, each time they are on-campus, they will have their attendance recorded in class and they will be expected to login to the VLE several times per week. Students who are unable to attend a timetabled session, due to illness or other circumstance, should notify their Programme Leader. Across the School an 80% attendance threshold is set. Students who fall below this, will be referred to the Student Success Team to see how they can be best supported in their studies.

Equality and Diversity

The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code.

Aligned with the University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has laboratory-based teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University's policies and regulations.

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

Supplemental Information

Divisional Programme Board	**Engineering Physical Sciences**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☐ **Yes** ☒ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**

School Assessment Board	Design
Moderator	N Kamaruddin
External Examiner	E Tingas
Accreditation Details	This module is part of the IMechE accredited programmes BEng/MEng (Hons) Aircraft Engineering
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	2.16 Module Descriptor copied to 2025/26 template and resources list updated to reflect ILR feedback, Attendance, Engagement and EDI statements updated. MC updated from N Kamaruddin to B Rakhshani. MM updated from T Leslie to N Kamaruddin.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Unseen Closed-book Class Test (50%)
Assessment 2
Laboratory Report (25%)
Assessment 3
Computational Coursework (25%)
(N.B. (i) Assessment Outcomes Grids for the module (one for each component) can be found below 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 Module Handbook.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen Closed-Book Class Test	☒	☒	☒	☒	☐	50	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Laboratory Report	☒	☐	☐	☒	☒	25	0

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**

Computational Coursework	☐	☐	☒	☐	☒	25	0
Combined total for all components						100%	2 hours

Change Control

What	**When**	**Who**
Module Descriptor copied to 2025/26 template and resources list updated to reflect ILR feedback, Assessment structure changed to reflect School decision on components, Attendance, Engagement and EDI statements updated. MC updated from N Kamaruddin to B Rakhshani. MM updated from T Leslie to N Kamaruddin.	March 2025	B Rakhshani