

Module specification

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Module Code	ENG6A9
Module Title	Advanced Structures and Vibrations
Level	6
Credit value	20
Faculty	FAST
HECoS Code	100579
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng Aeronautical Engineering	Option

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	24 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	0 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	24 hrs
Placement / work based learning	0 hrs
Guided independent study	176 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	
With effect from date	
Date and details of revision	

For office use only	
Version number	1

Module aims

- To develop critical understanding on aircraft structures and structure design and analysis.
- To develop analytical models for vibration systems and conduct critical analysis on free vibrations and forced damped vibrations in multiple-degree-of-freedom systems and continuous systems.
- To develop a critical understanding on vibration control.

Module Learning Outcomes - at the end of this module, students will be able to:

1	Critically analyse complex structures in aircraft.
2	Critically analyse different vibrating systems from first principles, and critically evaluate the vibrating features of mechanical structures or systems.
3	Design and analyse vibration controls for a mechanical structure or system.
4	Select from a range of analysis methods and possible solutions to suit different practical and design situations.

In addition, to the module learning outcomes, student will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: C1, C2, C3, C4, C13 and C17

Assessment

Indicative Assessment Tasks:

This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

The module will be assessed by means of a written assignment – several exercises developing knowledge and skills for critically analysing aircraft structures and structural vibration. All outcomes will be covered by this assessment. Word Count 4000 Words.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1 to 4	Written Assignment	100%

Derogations

A derogation from regulations has been approved for this programme which means that whilst the pass mark is 40% overall, each element of assessment (where there is more than one assessment) requires a minimum mark of 30%.

Learning and Teaching Strategies

The module is taught through a combination of lectures and workshops. An active and inclusive approach is used to engage learners in the topics and will involve individual, group work and flipped learning experiences aligned to the university's Active Learning Framework (ALF). The approach offers students a flexible and adaptive learning experience that can accommodate a range of options that includes both on campus learning and remote learning where appropriate.

The Moodle VLE and other on-line materials and resources will be available to support learning. ALF offers a balance between the classroom elements and digitally enabled activity incorporating flexible and accessible resources and flexible and accessible feedback to support learning.

Indicative Syllabus Outline

Structures: basic structural elements, beams, single and multi-celled structures, plates and shells, tensile, torsional and shear loads on aircraft structural components, aircraft structure design.

Vibration systems and modelling: Free vibrations, calculation of natural frequencies and dynamic deflections etc, determination of modal shapes. Systems incorporating damping and forced vibrations, dynamic stiffness coefficients.

Vibration control: Concept of vibration absorbers, undamped vibration absorbers, merits of damped vibration absorbers.

Multi-degree of freedom systems: Solution by eigenvalues and eigenvectors, matrix iteration etc, modal shapes, orthogonality of principal modes, free vibrations and forced vibrations of multi-degree of freedom system.

Vibration Measurement and condition monitoring: Practical measurement of displacement, velocity and acceleration. Measurements in frequency domain by spectral analysis, Vibration analysis for condition monitoring.

Indicative Bibliography:

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads

S.S. Rao, *Mechanical Vibrations*, 6th ed. Pearson, 2017

Other indicative reading

T.H.G. Megson, *Aircraft Structures for Engineering Students*; 6th ed. Elsevier, 2016.

D.J. Inman, *Engineering Vibrations*, 4th ed. Pearson, 2013

Employability skills – the Glyndŵr Graduate

Each module and programme is designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

Core Attributes

Engaged
Creative

Key Attitudes

Commitment
Curiosity
Resilience
Confidence
Adaptability

Practical Skillsets

Digital Fluency
Critical Thinking
Communication