Module specification

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Module Code	ENG766
Module Title	Structural Integrity & Optimisation
Level	7
Credit value	20
Faculty	FAST
HECoS Code	100202
Cost Code	GAME

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
MSc Engineering (Mechanical Manufacture) MSc Engineering (Mechanical Manufacture) with Advance Practice MEng Mechanical Engineering	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	10 hrs
Placement tutor support	0 hrs
Supervised learning e.g., practical classes, workshops	20 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**30** hrs
Placement / work-based learning	0 hrs
Guided independent study	170 hrs
Module duration (total hours)	200 hrs

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Initial approval date	Jun 2018
With effect from date	Sept 2022
Date and details of revision	Aug 2022: learning outcomes, assessment and syllabus update in engineering revalidation
Version number	2

Module aims

- To develop further the students' knowledge of different failure mechanisms in static structures.
- To allow students to develop their understanding of how material degrade over time and how this affects the overall structural strength.
- To be able to perform numerical structural optimisation using ANSYS and evaluating structural mechanics, fatigue, and life cycle.

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

In addition, to the module learning outcomes, student will also cover the following accreditation of higher education programme (AHEP) fourth edition learning outcomes: **M1, M2** & **M3**

1	Demonstrate a conceptual knowledge of material allowable and how they are developed.
2	Recognise failure mechanisms in metallic structures and state the suitability of their use in applications.
3	Demonstrate a critical evaluation of structural integrity, fatigue failure, and how design can be used to reduce the effect of cyclic loading, using Finite Element Analysis (FEA) to evaluate sutural optimisation and fatigue analysis.

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.

Assessment One: An individual written coursework in which interpretation, specification and implementation of an engineering system is to be analysed through computer modelling simulation. Assessment one is a written coursework (5000 words) and represents 100% of the overall mark

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1-3	Coursework	100%

Derogations

Credits shall be awarded by an assessment board for those Level 7 modules in which an overall mark of at least 50% has been achieved with a minimum mark of 40% in each assessment element.

Learning and Teaching Strategies

A series of workshop style lectures with student-led seminars and computer tutorials. Directed learning using library and internet resources will be facilitated using Moodle. This module will also follow the ALF (Active Learning Framework) guidelines, which will include alternative methods of assessment and a blended approach to delivery, with some theory and software sessions being delivered online (depending on requirements and student experience).

Indicative Syllabus Outline

- Metallic structures, shear forces and bending moments diagrams.
- Traditional and advanced methods on how to monitor structural integrity.
- Pyramid of testing, A and B basis allowable.
- Outline of different failure criterion and how they are used in design and optimisation.
- Computational modelling of fatigue and life cycle using Finite Element Analysis.

Indicative Bibliography:

Essential Reads

D.R. Askeland and W. Wright, *Essentials of materials science and engineering*. 4th ed. Boston, MA: Cengage Learning, 2019.

Other indicative reading

T. L. Anderson, *Fracture Mechanics: Fundamentals and Applications.* 4th ed. Boca Raton: CRC Press, 2017.

A. Pytel, et. al., *Mechanics of materials.* Stamford, CT: Cengage Learning, 2012.

A. Blake, *Practical stress analysis in engineering design.* New York: M. Dekker, 1990

Plus, various others to be signposted on Moodle.

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
Ethical

Key Attitudes
Commitment

Curiosity
Resilience
Confidence
Adaptability

Practical Skillsets
Digital Fluency
Organisation
Critical Thinking
Communication