MODULE DESCRIPTION FORM

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

ME963 STRUCTURAL INTEGRITY

Module Registrar: Prof D Mackenzie d.mackenzie@strath.ac.uk	**Taught To (Course): MSc Advanced Mechanical Engineering**	
Other Lecturers Involved: none	**Credit Weighting: 10**	**Semester: 2 (Online Learning)**
Optional class	**Academic Level: 5 / PG**	**Suitable for Exchange: N**

Required prerequisites

Note: It is the responsibility of ALL students to ensure that they satisfy the prerequisite knowledge for this module BEFORE adding as part of curriculum selection. If unsure, please contact the Module Registrar or discuss with your Programme/Year Adviser of Studies.

Elastic-Plastic Deformation of Metals:
Uniaxial stress-strain curve, yield, strain hardening, ductile rupture.

Mechanics & Structures:
2D stress and strain, stress and strain transformation, principal stress and principal strain. Engineer's bending theory, analysis of beams in bending.

Module Format and Delivery (HOURS i.e. 1 credit = 10hrs of study):

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
					10		30	60	100

Educational Aim

This module aims to introduce students to the concepts and principles of Structural Integrity and Structural Integrity Assessment, in particular assessment of failure of metal structures by ductile collapse, fracture, fatigue and creep.

Learning Outcomes

On completion of the module the student is expected to be able to:

LO1 Understand the main failure modes related to structural integrity of metal structures: plastic deformation, creep, fracture and fatigue.

LO2 Determine the failure state of basic engineering components for given operating conditions and material properties.

LO3 Appreciate the role of the various potential failure modes in engineering design by analysis and structural integrity assessment with reference to international Codes and Standards.

Syllabus

The module will teach the following:

Overview of Structural Integrity and Assessment frameworks. Plasticity and ductile failure: limit load, shakedown & ratcheting. Creep failure at elevated temperature: models of creep behaviour, statically determinate creep, creep relaxation. Failure of brittle materials: Linear Elastic Fracture Mechanics. Fatigue Failure: Low & high cycle fatigue, stress life approach, fracture mechanics crack propagation. Structural integrity assessment in engineering practice.

Assessment of Learning Outcomes

Criteria

For each of the Module Learning Outcomes the following criteria will be used to make judgements on student learning:

LO1 Understand the nature of the various major failure modes considered and be able to define and develop analytical assessment models for simple geometries and boundary conditions
C1 The ability to understand the basic plastic deformation, fracture, fatigue and creep failure mechanisms
C2 The ability to understand the role of material properties and type of loading on failure modes and limiting conditions

LO2 Demonstrate the ability to perform structural integrity assessment for basic configurations
C1 The ability to identify potential failure modes
C2 The ability to identify appropriate failure criteria for different structural configurations
C3 The ability to define the structural problem mathematically and solve the resulting analytical models

LO3 Appreciates the role of Structural Integrity in engineering practice
C1 Awareness of alternative assessment approaches and methodologies
C2 Be familiar with the approaches and requirements of Structural Integrity Codes and Standards

The standards set for each criterion per Module Learning Outcome to achieve a pass grade are indicated on the assessment sheet for all assessment.

Principles of Assessment and Feedback
(within Assessment and Feedback Policy at: https://www.strath.ac.uk/professionalservices/staff/policies/academic/)

The class is assessed through three assignments, to be completed during the semester.

Formative feedback will be available to students through class forums prior to submission of each assignment.

Written summative feedback will be provided through Myplace for each assessment activity within 15 working days of submission.

Individual students may request clarification of feedback or further feedback through personal communication with the lecturer.

Assessment Method(s) Including Percentage Breakdown and Duration of Exams *(individual weightings)*

Examination				**Coursework**		**Practical**		**Project**	
Number	Month(s)	Duration	***Weighting***	Number	***Weighting***	Number	***Weighting***	Number	***Weighting***
				3	33.3% each				
*				* All		*		*	

* ***L/Os:*** *Indicate which Learning Outcomes (L01, L02, etc) are to be assessed by exam/coursework/practical/project as required.*

Coursework / Submissions deadlines (*academic weeks*): Semester 2 weeks 5, 8 & 11

Resit Assessment Procedures:

Submission of alternate ^^coursework(s) prior to commencement of the July/August exam diet.

^^Students must contact the module Registrar for details as soon as results confirm that a resit is required.

PLEASE NOTE:
Students must gain a summative mark of 50% to pass the module. Students who fail the module at the first attempt will be re-assessed prior to the July/August exam diet. This re-assessment will consist entirely of coursework. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

****Highly recommended reading**

N.E. Dowling, Mechanical Behaviour of Materials, Pearson

Additional Student Feedback
(Please specify details of when additional feedback will be provided)

Date	Time	Room No

Session: 2024/25

Approved:

Programme Lead/Director Signature: Dr A McLaren

Date of Last Modifications: 19/08/2024

(MAE template updated July 2024)

MODULE TIMETABLE

Module Code:	**ME963**	**Module Title:**	**Structural Integrity**

Brief Description of Assessment:

3 Assignments, equal weighting.

Assessment Timing

Indicated on the table below are the start/submission dates for each assignment/project and the timing of each exam/assessment.

Please note: Timings could change during unforeseen periods of disruption; this should only be used as a guide.

Semester One	W&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item.

Semester Two	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Course work Set	Choose an item. Choose an item.	Course work Submit Course work Set	Course work Set	Choose an item. Choose an item.	Course work Submit Course work Set	Course work Set	Choose an item. Choose an item.	Course work Submit	Choose an item.