

## Liverpool John Moores University

Title: Applied Mechanics 2  
Status: Definitive  
Code: **5104MECH** (121287)  
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering  
Teaching School/Faculty: Engineering

Team	Leader
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**Academic Level:** FHEQ5  
**Credit Value:** 20  
**Total Delivered Hours:** 68  
**Total Learning Hours:** 200  
**Private Study:** 132

### Delivery Options

Course typically offered: Semester 1

Component	Contact Hours
Lecture	22
Online	22
Tutorial	22

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS2	Examination	60	2
Test	AS1	Coursework - V.L.E. based tests	40	

### Aims

*To provide the means for solving many basic engineering problems by learning the principles of mechanics for rigid and deformable solid bodies.*

### Learning Outcomes

After completing the module the student should be able to:

- 1 Determine stresses and strains in an elastic continuum
- 2 Assess modes of failure for components under bending and torsional loading
- 3 Analyse dynamic behaviour of systems with one-degree-of-freedom by applying the notions of stiffness, damping, natural frequency and rate decay.
- 4 Determine equivalent models for rigid body systems, analyse and evaluate their dynamic behaviour by using notions of experimental dynamics.

## Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Examination	1	2	3	4
VLE Based Tests	1	2	3	4

## Outline Syllabus

### 1 Continuum Stress Analysis

*Elasticity of a continuum. 2D stress/strain transformations, Mohr's Circle (stress/strain). Use of strain gauges to determine strains in loaded components. Practical examples.*

*Thin and thick walled cylinders. Application of thin wall pressure vessel theory. Cylindrical and spherical vessels. Application of Lamé's equations .*

### 2 Failure Modes

*Yield criteria. Application of Rankine, Tresca and Von-Mises theories to components under bending and torsional loading conditions. Application to brittle and ductile materials.*

*Elastic instability. Critical buckling loads. Use of Euler, Rankine-Gordon and Perry-Robertson methods.*

*Fatigue. S-N curves and endurance limit. Factors affecting the endurance limit and their application. Effects of non-zero mean stress.*

### 3 Dynamics. Vibration 1

*Free vibration of one-degree-of-freedom systems, modelling, equation of motion, harmonic motion and spectral analysis.*

### 4 Vibration 2

*Forced vibration of damped and undamped systems, time and frequency response, natural frequencies and modes, notions of experimental dynamics.*

## **Learning Activities**

Lectures and tutorials

## **Notes**

The module extends previous studies in mechanics by examining more applied problems, which relate to real mechanical systems. It helps to strengthen the student's knowledge for successful mechanical design.