Liverpool John Moores University

Title:	Applied Mechanics 2
Status:	Definitive
Code:	**5509USST** (126438)
Version Start Date:	01-08-2021
Owning School/Faculty:	Engineering
Teaching School/Faculty:	University of Shanghai For Science and Technology

Team	Leader
Ariyan Ashkanfar	Y
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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	44
Tutorial	22

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS2	Examination	60	2
Test	AS1	In course 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 Apply the equations of motion for rigid bodies undergoing translation, rotation about fixed axes and general plane motion. Analyse the dynamical behaviour of systems with one-degree-of-freedom by applying the notions of stiffness, damping, natural frequency, rate decay.
4 Apply mathematical models for systems with two-degree-of-freedom, analyse their dynamical behaviour in terms of natural frequencies and modes and evaluate solutions for vibration control.

Learning Outcomes of Assessments

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

Examination	1	2	3	4
In course 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 Lame'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 body diagrams. Two-dimensional kinematics and dynamics of rigid bodies. Applications.

1DOF systems. Free vibration of undamped/damped systems. Harmonic

motion/Damped motion. Response of one-degree-of-freedom systems to harmonic excitations.

4 Vibration 2

2DOF systems. Free vibration of two-degree-of-freedom systems. Eigenvalues and modes. Frequency response function. Vibration isolation. Vibration transmission.

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.