

## Liverpool John Moores University

Title: Further Mechanical Principles  
Status: Definitive  
Code: **5517NCCG** (129451)  
Version Start Date: 01-08-2021

Owning School/Faculty: Engineering  
Teaching School/Faculty: Nelson Campus

Team	Leader
Christian Matthews	Y

**Academic Level:** FHEQ5      **Credit Value:** 20      **Total Delivered Hours:** 60  
**Total Learning Hours:** 200      **Private Study:** 140

### Delivery Options

Course typically offered: S1, S2, Sum, NS2 (S2 for Jan)

Component	Contact Hours
Lecture	48
Workshop	12

**Grading Basis:** 40 %

### Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	Assignment	Assignment	100	

<b>Competency</b>	NCC Group Pass/Fail
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### Aims

*The aim of this module is to provide students with advanced knowledge of the mechanical theories associated with engineering applications.*

*Topics included: Poisson's Ratio; the relationship between the elastic constants; the relationship between bending moment, slope and deflection in beams; calculating the slope and deflection for loaded beams; analysing the stresses in thin-walled pressure vessels; and stresses in thick-walled cylinders, flat and v-section belt drive*

*theory, operational constraints of dynamic rotating systems, friction clutches and brakes.*

## **Learning Outcomes**

After completing the module the student should be able to:

- 1 Determine the behavioural characteristics of materials subjected to a variety of loadings
- 2 Assess the strength of loaded beams and pressurised vessels.
- 3 Analyse the specifications of power transmission system elements.
- 4 Examine operational constraints of dynamic rotating systems.

## **Learning Outcomes of Assessments**

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

Assignment	2	3	4
NCC Group Pass/Fail	1		

## **Outline Syllabus**

*Characteristics of materials: Poisson's Ratio, relationship between the elastic constants, characteristics of two-dimensional and three-dimensional loading, calculation of volumetric strain and volume changes*

*Strength: relationship between bending moment, slope and deflection in beams, stresses in thin-walled pressure vessels and in thick-walled cylinders.*

*Power transmission systems: flat and v-section belt drive theory, friction clutches, principles of epicyclic and differential gearing, torques required to accelerate these systems, areas of failure when transmitting power mechanically*

*Dynamic rotating systems: design of both radial plate and cylindrical cams to meet operating specifications, operating principles of flywheels to store mechanical energy, balancing of rotating mass systems, effects of coupling on freely rotating systems*

## **Learning Activities**

### **Lectures**

These will not normally be traditional didactic lectures in which the student plays little active part, but will be delivered in small groups of up to 20 students in which their interaction with their tutor is a key ingredient of their learning experience.

The material of this module requires the development of significant practical skill. This will be taught within the lecture time, making these sessions a blend of lecture and workshop time. The sessions will be timetabled in spaces with physical resources appropriate to the delivered content.

Students will receive approximately 30 hours of taught material, supported by in-class exercises and discussions designed to help student assimilate learning and to provide early informal feedback on their progress.

### Practical Work

This module contains directed practical work that students will undertake under the supervision of teaching staff and/or technicians. Some elements of this practical work will form part of the assessment for this module.

### Independent Study

Students are expected to undertake personal reading and research into topic areas that have been stimulated from the lectures and seminars. This reading will enhance their academic work and enable valid contribution to lectures and seminars.

### VLE support

This will provide links to academic web-sites and on-line journals, facilitate group discussion outside of the classroom, access to outline lecture notes, and provide students with assessment details.

### Notes

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