MODULE DESCRIPTOR 2019/20

CL132 – Engineering Mechanics

Registrar: Dr Alessia Amabile	**Taught To (Programme):** BEng/MEng Civil Engineering, BEng/MEng Civil and Environmental Engineering	
Other Lecturers Involved: Dr Kamila Nieradzinska	**Credit Weighting:** 20 credits	**Semester:** 1
Assumed Pre-requisites: Higher Maths & Higher Physics (or equivalents)	**Compulsory**	**Academic Level:** 1

Class Format and Delivery (hours):

Lecture	Tutorial	Laboratory	Coursework	Project	Private Study	**Total**
30	10	10(4+6)	30		120	200

Class Aim(s)

This class aims to revise basic mechanics and to provide an introduction to many of the basic concepts used by civil engineers to solve problems in structures, geotechnics, materials and hydraulics.
Develop an understanding of the water systems at work in the environment and the role of water engineers in practice.
Revise basic mechanics to provide a basic introduction to fluid mechanics and to lay the foundation for subsequent classes in water engineering

Learning Outcomes

On completion of the class the student is expected to be able to

LO1 Derive and apply relationships between basic dimensions and convert their units

LO2 Find the resultant of a system of forces

LO3 Draw free body diagrams and analyse equilibrium for 2D systems

LO4 Define and calculate work done by forces acting on a body

LO5 Understand the water systems at work in the environment and the role of water engineers in practice

LO6 Understand the significance of fluid properties and how they define the application of fluid mechanics at work in water engineering systems

LO7 Analyse hydrostatic forces on simple floating bodies and structures surrounded by water

Syllabus

The class will teach the following:

Weeks 1 – 5 (AA)

- Basic dimensions, units, conversion and dimensional analysis
- Forces and resultants
- Newton's laws
- Resolution of forces
- Moments and couples
- Equilibrium conditions
- Free body diagrams

- Friction
- Work

Weeks 6 – 10 (KN)

- Properties of Fluids including density, compressibility, viscosity, vapour pressures, surface tension and capillary action
- Pressure
- Pressure Measurement
- Hydrostatics, Pascal's Law, Fluid pressure, centre of pressure, centroid of area, hydrostatic forces on submerged plane and curved surfaces
- Stability of Floating Bodies: Archimedes Principle, Centre of Buoyancy, Meta-centric height

Assessment Criteria

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

LO1 Derive and apply relationships between basic dimensions and convert their units
C1 Can do basic calculations involving basic and derived quantities
C2 Can convert and derive units of basic and derived quantities
C3 Can check equations are dimensionally correct

LO2 Find the resultant of a system of forces
C1 Can find the resultant of a system of forces
C2 Can resolve a force in its components both graphically and analytically
C3 Can calculate moments and replace a force by a force – couple system.

LO3 Draw free body diagrams and analyse equilibrium for 2D systems
C1 Can use trigonometry and geometry to draw free body diagrams of forces on different systems
C2 Can draw and interpret free body diagrams for bodies experiencing friction on level and inclined surfaces
C3 Can analyse equilibrium of simple mechanical systems including pulleys, inclines, levers.

LO4 Define and calculate work done by forces acting on a body
C1 Can demonstrate an understanding of the concept of work
C2 Can calculate the work done by forces acting on a body

LO5 Understand the significance of fluid properties and how they define the application of fluid mechanics at work in water engineering systems
C1 Ability to solve problems involving properties of fluids
C2 Ability to solve problems involving fluid properties, shear stress and viscosity
C2 Ability to use absolute and gauge pressures, piezometers and manometers

LO6 Analyse hydrostatic forces on simple floating bodies and structures surrounded by water
C1 Ability to understand and solve problems on the hydrostatic force on floating bodies
C2 Ability to understand and solve problems on the hydrostatic force on plane submerged surfaces
C3 Ability to understand and solve problems on the hydrostatic force on curved submerged surfaces

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

Principles of Assessment and Feedback (*https://www.strath.ac.uk/staff/policies/academic/*)

Please state briefly how these are incorporated in this module.

1. All assignments and assessments combine straightforward and challenging tasks.
2. Model solutions are provided for guidance.
3. Tutorial problems with answers to encourage and guide private study are provided.
4. A one-hour tutorial class is held every week for one-to-one interaction between instructors and students and timely feedback.

Recommended Reading

OpenStax College. University Physics, Volume 1. Rice University.
https://www.openstaxcollege.org/textbooks/university-physics

Hamil,L. (2011) Understanding Hydraulics, 3rd Ed, Palgrave MacMillan.

PLEASE NOTE:
Students need to gain a summative mark of 40% ***(please delete as appropriate)*** **to pass the module. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of exam.**

Resit Arrangements

Resit examination in August diet (2h) counting for 100% of the mark

Approved

Programme Director Signature:
Date of Last Modifications:

Assessment and Feedback Schedule

Class Code	CL132	Class Title	Engineering Mechanics

Brief Description of Assessment

LabA - Laboratory – Tallest toy tower (5%)

LabB - Laboratory – Centre of Pressure (5%)

CT - Class test (20%)

E - 2 hour end of semester exam (70%)

Indicate in the tables below the Hand-Out (H), Submission (S) and Feedback (F) dates for each lab report/coursework/project and the timing of each Exam/Class Test (E), (T). Include duration of exam in brackets (e.g. E (2)).

Semester 1

Assessment type (& title)	LOs	Weight (%)	Individual / Group	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
LabA	LO1	5	G			H[1]	H[2]	H[3], S[1]	S[2]	S[3]	F				
LabB	LO5, LO6	5	G								H[1]	H[2], S[1]	S[2]	F	
CT	LO1-LO6	20	I								CT			F	
E	All	70	I												E(2h)