MODULE DESCRIPTION FORM

**DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING**

# CL132 Engineering Mechanics

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| **Module Registrar:** | **Taught To (Course):**<br>BEng/MEng Civil Engineering,<br>BEng/MEng Civil and Environmental Engineering | | |
| **Other Lecturers Involved:** Dr. Gloria Castro | **Credit Weighting:** 20 | **Semester:** 1 | |
| **Assumed Prerequisites:**<br>Higher Maths & Higher Physics (or equivalents) | **Compulsory class** | **Academic Level:**<br>1 | **Compulsory class** |

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

| Lecture | Tutorial | Laboratory | Groupwork | External | Online | Project | Assignments | Private Study | **Total** |
|---|---|---|---|---|---|---|---|---|---|
| 19 | 15 | 11 | | | | | 30 | 125 | 200 |

**Educational Aim**

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

LO6 Analyse hydrostatic forces on simple floating bodies and structures surrounded by water

**Syllabus**

The module will teach the following:

Weeks 1 – 5 (GC)

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

- Equilibrium conditions
- Moments and couples
- Support reactions and static determinacy
- Work

Weeks 6 – 10 (TBC)

- 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 of Learning Outcomes**

**Criteria**

For each of the Module 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 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/staff/policies/academic/*http://www.strath.ac.uk/learnteach/informationforstaff/staff/assessfeedback/12principles/ *)*

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.

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

| | Examinations | | | | Courseworks | | Projects | |
|---|---|---|---|---|---|---|---|---|
| | Number | Month(s) | Duration | ***Weighting*** | Number | ***Weighting*** | Number | ***Weighting*** |
| | 1 | May | 2h | 70 | 3 | 30 | | |
| **L/Outcomes** | All | | | | All | | | |

*Indicate which learning outcomes (L01, L02 etc) are to be assessed by exam/coursework/project as required.*

**Coursework / Submissions deadlines (*academic weeks*):**
Lab A: week 5
Lab B: week 11
Weekly online quizzes

**Resit Assessment Procedures:**
2 hr examination in May diet. No coursework resubmission required.

**PLEASE NOTE:**
**Students must gain a summative mark of 40% 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. No marks from any previous attempts will be transferred to a new resit attempt.**

**Recommended Reading**

*****Purchase recommended **Highly recommended reading *For reference**

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

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

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

| Date | Time | Room No |
|---|---|---|
| | | |

Session:

**Approved:**

**Course Director Signature:**

**Date of Last Modifications:**

(Updated May 2018)

# MODULE TIMETABLE

| **Module Code:** | **CL132** | **Module Title:** | **Engineering Mechanics 1** |
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**Brief Description of Assessment:**

*Quizzes (18% weighting in total)*
Nine MyPlace quizzes, one per week except week 9, worth 2% weighting each.

*LabA - Laboratory – Tallest toy tower (5%)*
*LabB - Laboratory – Centre of Pressure (7%)*

*CT - Class tests*
Two class tests provide an opportunity for students to get exempt from the final exam in May. One class test in week 8 evaluates content covered during weeks 1 to 5 (LO1 TO LO4). The second class test on week 11 evaluates the content covered during weeks 6 to 10 (LO5 and LO6).
If the student pass both class tests they will gain an exemption from the final exam in May. In this case, the final exam grade will correspond to an average of the two class test grades.

*E - 2 hour final exam (70%)*

**Assessment Timing:-**

Indicate on the table below the start/submission dates for each assignment/project and the timing of each exam/assessment using the dropdowns provided. Dropdowns can be left blank. Add extra notes below the dropdowns.
**Please note: Timings can and will change, 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. | Online Test Choose an item. | Online Test Choose an item. | Online Test Lab | Online Test Choose an item. | Online Test Lab Report Submission | Online Test Choose an item. | Online Test Choose an item. | Online Test Choose an item. Class Test | Choose an item. Lab | Online Test Choose an item. | Lab Report Submission Class Test | Exam (May) |