MODULE DESCRIPTION FORM

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

CL137 Fundamentals of Civil Engineering

Module Registrar: Marcus Perry	**Taught To (Course):** Civil Engineering & Civil and Environmental Engineering		
Other Lecturers Involved: Dr Philippe Sentenac	**Credit Weighting: 20**	**Semesters: 1 and 2**	
Assumed Prerequisites:	**Compulsory**	**Academic Level: 1**	**Suitable for Exchange: N**

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

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
20	20	12					20	128	200

Educational Aim

This course introduces students to the behaviour, strengths and weaknesses of materials commonly used in civil engineering. The course covers fundamentals in continuum mechanics (mechanical and thermal stress and strain), the treatment of errors in civil engineering measurement, and the fabrication, physical / engineering properties and financial / carbon costs of materials. The materials covered in the module are steel, concrete, timber, glass, polymers, stone and soil.

Learning Outcomes

On completion of the course the student is expected to be able to:

Semester 1

LO1 Define mechanical stress and strain, and describe the relationship between stress and strain for ductile, brittle and plastic materials.

LO2 Understand the accuracy and precision of measurements made in civil engineering, and propagate their uncertainty

LO3 Understand the manufacture and physical characteristics of traditional and low-carbon civil engineering materials, using basic physical / engineering properties and financial / carbon cost to assess material suitability for applications

Semester 2

LO4 Describe the physical characteristics of soils used in civil engineering earthworks, and classify soils for engineering purposes, and how to report the results.

LO5 Determine the physical properties and phase relationships of soils.

LO6 Determine the compaction characteristics of soils, and how to report the results.

LO7 Understand the principles and processes used to form earthworks and determine basic quantities for simple earthwork projects

Syllabus

The module will teach the following:

Semester 1

Topic 1: Continuum Mechanics

Definitions and relationships between stress and strain (uniaxial, shear, bulk and thermal). Ductile, plastic and brittle behaviour including definitions of strength and Young's Modulus.

Topic 2: Materials: manufacturing, properties and cost

Manufacturing of concrete and steel. Historical developments and physical and engineering properties of major construction materials including: concrete, steel, timber, polymers, bitumen, and glasses. Embodied carbon and financial cost of civil engineering materials.

Topic 3: Civil engineering measurement

Measurements in civil engineering. Types of measurement – length, areas, volumes, movement, deformation. Measurement instruments. Units. Accuracy, precision, resolution and tolerance.

Semester 2

Topic 4: Introduction to soils and rocks and soil formation

Overview of soils and rocks in civil engineering. Physical characteristics of rock aggregates. Soil formation - physical and chemical weathering of rocks and the main soil minerals. Physical composition of soils.

Topic 5: Physical properties of soils

Engineering description of soils. Classification of coarse-grained and fine-grained soils. Phase relationships, between the various phases of soils.

Topic 6: Soil compaction and earthworks

Soil compaction: processes and controls used to produce engineering fills from different soils. Laboratory compaction tests.

Topic 7: Site investigation

Reasons for carrying out a site investigation. Sources of information. Types of maps and plans – ordnance survey, topographical, geological. The desk study. Ground exploration methods – boreholes and trial pits. Sampling and testing.

Assessment of Learning Outcomes

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

LO1 Define mechanical stress and strain, and describe the relationship between stress and strain for ductile, brittle and plastic materials.
C1 Can calculate the stress and strain of objects under uniaxial, shear, and bulk loading
C2 Can draw and explain stress-strain curves for elastic, plastic and brittle materials
C3 Can qualitatively define material creep, fatigue, hardness and calculate 1D thermal strain.

LO2 Understand the accuracy and precision of measurements made in civil engineering, and propagate their uncertainty
C1 Can describe the difference between resolution, accuracy, precision and tolerance
C2 Can propagate uncertainties for measured quantities derived from basic operations (e.g. multiplication, division)

LO3 Understand the manufacture and physical characteristics of traditional and low-carbon civil engineering materials, using basic physical / engineering properties and financial / carbon cost to assess material suitability for applications
C1 Can describe the terminology and tests used to define the wet and cured properties of concrete
C2 Can use a mix-design process to design a concrete that meets specifications for strength and workability
C3 Can briefly describe the manufacturing processes for concrete, steel, fly ash concrete, timber, and glass-fibre reinforced composite components.
C4 Can use the embodied cost (carbon and financial) of construction components, and their transport modes, to estimate the total costs of getting materials to site

LO4 Describe the physical characteristics of soils used in civil engineering earthworks, and classify soils for engineering purposes, and how to report the results.
C1 Describe the tests used to classify soils.
C2 Classify soils according to recognised standards.

LO5 Determine shear strength under drained and undrained conditions from direct shear and triaxial
test data.
C1 Understand that soil is a three-phase material.
C2 Calculate physical properties of soils.

LO6 Determine the compaction characteristics of soils, and how to report the results.
C1 Describe the process of compaction of soils.
C2 Determine the compaction characteristics of soils.

LO7 Understand the principles and processes used to form earthworks and determine basic quantities for simple earthwork projects.
C1 Understand the principles of earthwork operations.

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/)

Please state briefly how these are incorporated in this module.

1. A range of assessment activities are used including tutorial work, quizzes, laboratory testing and reporting. Model answers for assessment tasks are provided giving opportunities for students to make comparisons against their own work.
2. All assessments are clearly related to the learning outcomes and assessment feedback is provided against clearly stated criteria.
3. Assessments and methods are clearly explained to students at the start of the course.
4. The effectiveness of the assessment and feedback methods are reviewed at the end of the course and any recommended changes are implemented in the next academic year

SEMESTER 1: Assessment Method(s) Including Percentage Breakdown and Duration of Exams

Examinations				Courseworks		Projects	
Number	Month(s)	Duration	***Weighting***	Number	***Weighting***	Number	***Weighting***

	1 x Final Exam	Semester 1 Exam Period	1 hr	20%	MyPlace Quiz 1 MyPlace Quiz 2 MyPlace Quiz 3 MyPlace Quiz 4 MyPlace Quiz 5	4% 4% 4% 4% 4%	Lab 1: concrete and steel	10%
L/Outcomes	1-3				1-3		1-3	

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

SEMESTER 2: Assessment Method(s) Including Percentage Breakdown and Duration of Exams

	Examinations				**Courseworks**		**Projects**	
	Number	Month(s)	Duration	***Weighting***	Number	***Weighting***	Number	***Weighting***
	1 x Final Exam	Semester 2 Exam Period	2 hr	35%			Lab 2 Lab 3	10% 5%
L/Outcomes	4-7						4-7	

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

Coursework / Submissions deadlines (*academic weeks*):

Semester 1

Lab 1: Between week 8 and week 11 depending on lecturer instructions.

MyPlace Quiz 1 – week 2
MyPlace Quiz 2 – week 4
MyPlace Quiz 3 – week 6
MyPlace Quiz 4 – week 8
MyPlace Quiz 5 – week 10

Semester 2

Lab 2: Between week 5 and week 11 depending on lecturer instructions.
Lab 3: Between week 5 and week 11 depending on lecturer instructions.

Resit Assessment Procedures:
Open-book coursework assignment in August diet, answering questions only from the semester(s) which were failed.

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 coursework. 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

* Taylor, G.D., Materials in Construction, 3rd Edn. (2000), Pearson Education, ISBN 0-582-36889-8.
* Evernden, M. (2016). Introduction to Structural Materials, Essential Knowledge Text No.6, Institution of Structural Engineers.
* Evernden, M. (2016). Traditional Structural Materials, Essential Knowledge Text No.7, Institution of Structural Engineers.
* Craig, R.F. (2005). Soil Mechanics, 7th edn., Spon Press ISBN 0-415-32703-2. Available online.
* BS 1377 (1990). Method of Test for Soils for Civil Engineering Purposes, British Standards Institution, London.
* BS 5930 (1999). Code of Practice for Site Investigations, British Standards Institution, London.

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:	CL137	Module Title:	Fundamentals of Civil Engineering

Brief Description of Assessment:

SEMESTER 1

Quizzes (20% weighting in total)
Five MyPlace quizzes, once per fortnight. Quizzes worth 4% weighting each.

Laboratory Classes (10% in total)
Laboratory classes (10% weighting).
CL137 Lab 1: Tensile testing (5% - group report)
CL137 Lab 2: Concrete mix design (5% - group report)

The laboratories are carried out in groups of five students or less. See laboratory timetable for date and time of laboratories for each group. Students must attend all laboratory classes and complete the laboratory work to a satisfactory standard. Each group will answer an assignment sheet for each lab. This is explained in the laboratory handout.

Examinations (20% in total)
End of Semester 1 Exam, 1 Hour Duration (20% weighting).

SEMESTER 2

Laboratory Classes

Two individual laboratory reports (15% weighting).
CL137 Lab 3: Soil Classification Laboratory (10% - individual report)
CL137 Lab 4: Soil Compaction Laboratory (5% - individual report)

The laboratories are carried out in groups of four students. See laboratory timetable for date and time of laboratories for each group. Students must attend all laboratory classes and complete the laboratory work to a satisfactory standard.
Each student will write an individual report for each lab. This is explained in the laboratory handout.

Examinations

End of Semester Exam, 2 Hours Duration (35% weighting).

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
			Online Test		Online Test	Lab 1 set	Online Test	Lab 1 submit Lab 2 set	Online Test	Lab 2 submit	Online Test		Exam

Semester Two	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
					Lab 3 set		Lab 3 submit Lab 4 set		Lab 4 submit				Exam