MODULE DESCRIPTOR 2020/21

CL315 WATER ENGINEERING 1

Registrar: Mrs Sarah Lavery	**Taught To (Programme):** Civil Engineering; Civil and Environmental Engineering	
Other Lecturers Involved: Dr Kamila Nieradzinska	**Credit Weighting:** 20crs	**Semester:** 1 & 2
Assumed Pre-requisites: CL216 Hydraulics and Hydrology	**Compulsory~~/ optional/ elective class~~**	**Academic Level:** UG Year 3

Class Format and Delivery (hours):

Lecture	Tutorial	Laboratory	Coursework	Project	Private Study	**Total**
40	44	2	30	30	54	200

Class Aim(s)

This class aims to introduce common concepts, applications and design calculation methods used in water engineering. The class will develop students to be able to examine hydraulics in common water engineering situations such as for steady flows in pipes and flow in pipe networks. The class also aims to build on engineering hydrology knowledge through developing students understanding of the concept of turbomachinery and provides an introduction to its theory and design as well as familiarises students with the concept of sustainability and renewable energy production with use of water. This class also, includes knowledge on water resource systems planning, management and water resources risk management.

Learning Outcomes

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

LO1 Calculate friction and minor energy losses in pipes, analyse and/or design flows in pipelines and small networks.

LO2 Examine and explain the underpinning hydraulic principles and operations of a range of common water engineering structures, applications and equipment, including understanding turbomachinery with an introduction to green energy production, turbines and pumps turbine selection and system design.

LO3 Understand water resource systems planning, management and water resources risk management and appreciating the underlying relationships and uncertainties in hydrology.

Syllabus

The class will teach the following:

- Incompressible flow in pipes and pipe networks.
- Major frictional head loss and minor losses in pipes.
- Moody diagram to estimate the friction factor in a pipeline.
- Pipe in series, parallel and branched pipelines.
- Pipe network analysis.
- Pipe roughness and hydraulics research charts.
- Common hydraulic concepts and principles and systems.
- Appreciate application of turbo-machinery in hydro power.
- Power generation from water.
- Water resource systems planning, management and water resources risk management.

Assessment Criteria

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

LO1 Calculate friction and minor energy losses in pipes, analyse and/or design flows in pipelines and small networks.
C1 Ability to characterise and identify types of flow, and calculate relevant parameters
C2 Ability to work with simple models of fluid flow and flow in pipes
C3 Ability to perform analysis and design calculations on pipelines and pipe networks

LO2 Examine and explain the underpinning hydraulic principles and operations of a range of common water engineering structures, applications and equipment, including understanding turbomachinery with an introduction to green energy production, turbines and pumps turbine selection and system design.
C1 The ability to identify common and relevant hydraulic concepts, relationships and systems
C2 The ability to examine water engineering systems and develop detailed understandings or demonstrations of their underlying principles and operations
C3 The ability to explain and communicate these clearly to wider audiences

LO3 Understand water resource systems planning, management and water resources risk management and appreciating the underlying relationships and uncertainties in hydrology.
C1 The ability to identify common and relevant hydraulic concepts, relationships and systems
C2 The ability to examine water engineering systems and develop detailed understandings or demonstrations of their underlying principles and operations.
C3 The ability to explain and communicate these clearly to wider audiences.

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.

Principle 1. Assessment and feedback practices promote effective student learning
1. Coursework and lab assignments are designed to focus student learning on key topics and learning material.
2. Tutorial problems with answers to encourage and guide private study are provided.
3. Tutorial classes are held frequently for one-to-one interaction between instructors and students and timely feedback.

Principle 2. Assessment and feedback practices are appropriate, fair, and transparent
1. All assignments and assessments combine straightforward and challenging tasks.
2. Model solutions are provided for some coursework assignments.

Principle 3. Assessment and feedback practices are clearly communicated to students and staff
1. All assessed coursework assignments are open to view within a reasonable time before the deadline.
2. All assessed coursework assignments are returned to students with feedback including annotations and comments.

Principle 4. Assessment and feedback practices are continuously reviewed
1. Interim student feedback is taken during each semester to review progress and resolve current issues; final semester student feedback taken upon completion of lecture courses to monitor student experience.
2. Coursework assignment and examination marks reviewed at end of year to monitor attainment and compared to student experience.

Recommended Reading

- L Hamil. Understanding Hydraulics, 4th Ed., Palgrave
- LJF Douglas, JM Gasiorek, JA Swaffield, LB Jack. Fluid Mechanics, Prentice Hall
  YA Cengel, JM Cimbala. Fluid Mechanics, McGraw-Hill
- Chadwick & Morfett. Hydraulics in Civil and Environmental Engineering, E&FN Spon
- MC Potter, DC Wiggert and BH Ramadan, Mechanics of Fluids, Cengage Learning
  Featherstone and Nalluri, Civil Engineering Hydraulics, BSP
- Wilson. Engineering Hydrology, 4th Ed., Palgrave MacMillan
- Shaw. Hydrology in Practice, 4th Ed., Routledge, Taylor Francis

PLEASE NOTE:
Students need to 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.

Resit Arrangements

Sem. 1 resit: ***Formal examination*** in August with same format as in December.
Sem. 2 resit: ***Formal examination*** in August with same format as in May/June.

NB: The August examination marks are 100% of the resit marks. Students will be advised as to what semester exams they are required to resit by the module lecturers.

Approved

Programme Director Signature:
Date of Last Modifications: August 2021

Assessment and Feedback Schedule

Class Code	CL315	Class Title	Water Engineering 1

Brief Description of Assessment

The summative assessment opportunities are provided through courseworks, a lab activity, Myplace quizzes, and end of semester exams.

The formative assessment opportunities are provided through question and answer sessions during class time, feedback sessions with the students, tutorial sessions and pre-exam tutorial questions.

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).

Semester 1*

Assessment type (& title)	LOs	Weight (%)	Individual / Group	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
Online Quizzes x 4	1	5	Individual			Quiz 1 (H)	Quiz 2 (H)	Quiz 1 (S/F)	Quiz 3 (H) Quiz 2 (S/F)		Quiz 3 (S/F) Quiz 4 (H)		Quiz 4 (S/F)		
Pipe Flow Lab	1	10	Individual					H (Group 1)	H (Group 2)	S (Group 1)	S (Group 2)	F (Group 1)	F (Group 2)		
Coursework (Pipe Network Analysis)	1	10	Group							H		S		F	
Exam	1	25	Individual												E

* *Subject to Change*

Semester 2*

Assessment type (& title)	LOs	Weight (%)	Individual / Group	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
Report and video	2 and 3	25	Group								S				F
Online Quizzes	2 and 3	5	Individual					H S				HS			
Exam	2 and 3	20	Individual												E

* *Subject to Change*

Mapping Module Learning Outcomes to AHEP

Module Learning Outcome	**Engineering Council AHEP competencies: Knowledge, Understanding and Ability**
LO1 Calculate friction and minor energy losses in pipes, analyse and/or design flows in pipelines and small networks.	**Integrated Masters (MEng) Degrees** • Understanding of engineering principles and the ability to apply them to undertake critical analysis of key engineering processes. • Knowledge and understanding of the commercial, economic and social context of engineering processes. • Understanding of contexts in which engineering knowledge can be applied (eg operations and management, application and development of technology, etc) • Understanding of different roles within an engineering team and the ability to exercise initiative and personal responsibility, which may be as a team member or leader. • Apply their skills in problem solving, communication, working with others, information retrieval and the effective use of general IT facilities. **BEng (Hons) Degrees accredited as partially meeting the education requirement for CEng** • Understanding of engineering principles and the ability to apply them to analyse key engineering processes. • Understanding of, and the ability to work in, different roles within an engineering team. • Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities • Exercise initiative and personal responsibility, which may be as a team member or leader.

LO2 Examine and explain the underpinning hydraulic principles and operations of a range of common water engineering structures, applications and equipment, including understanding turbomachinery with an introduction to green energy production, turbines and pumps turbine selection and system design.	**Integrated Masters (MEng) Degrees** • Awareness of developing technologies related to own specialisation. • Understanding of engineering principles and the ability to apply them to undertake critical analysis of key engineering processes. • Ability to use fundamental knowledge to investigate new and emerging technologies. • Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards. • Communicate their work to technical and non-technical audiences • Knowledge and understanding of the commercial, economic and social context of engineering processes. • Understanding of contexts in which engineering knowledge can be applied (eg operations and management, application and development of technology, etc). • Ability to apply relevant practical and laboratory skills. • Apply their skills in problem solving, communication, working with others, information retrieval and the effective use of general IT facilities. **BEng (Hons) Degrees accredited as partially meeting the education requirement for CEng** • Understanding of engineering principles and the ability to apply them to analyse key engineering processes. • Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards • Apply advanced problem-solving skills, technical knowledge and understanding, to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem including production, operation, maintenance and disposal. • Communicate their work to technical and non-technical audiences. • Knowledge and understanding of the commercial, economic and social context of engineering processes. • Understanding of contexts in which engineering knowledge can be applied (eg operations and management, application and development of technology, etc). • Ability to apply relevant practical and laboratory skills

	• Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities • Exercise initiative and personal responsibility, which may be as a team member or leader.
LO3 Understand water resource systems planning, management and water resources risk management and appreciating the underlying relationships and uncertainties in hydrology.	**Integrated Masters (MEng) Degrees** • Awareness of developing technologies related to own specialisation. • Understanding of engineering principles and the ability to apply them to undertake critical analysis of key engineering processes. • Ability to use fundamental knowledge to investigate new and emerging technologies. • Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards. • Communicate their work to technical and non-technical audiences • Knowledge and understanding of the commercial, economic and social context of engineering processes. • Understanding of contexts in which engineering knowledge can be applied (eg operations and management, application and development of technology, etc). • Ability to apply relevant practical and laboratory skills. • Apply their skills in problem solving, communication, working with others, information retrieval and the effective use of general IT facilities. **BEng (Hons) Degrees accredited as partially meeting the education requirement for CEng** • Understanding of engineering principles and the ability to apply them to analyse key engineering processes. • Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards • Apply advanced problem-solving skills, technical knowledge and understanding, to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem including production, operation, maintenance and disposal. • Communicate their work to technical and non-technical audiences. • Knowledge and understanding of the commercial, economic and social context of engineering processes.

	• Understanding of contexts in which engineering knowledge can be applied (eg operations and management, application and development of technology, etc). • Ability to apply relevant practical and laboratory skills • Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities • Exercise initiative and personal responsibility, which may be as a team member or leader.

JBM Programme Threads

Thread	Primary	Secondary	Contributory
Design	X		
Health, Safety & Risk Assessment			X
Sustainability		X	
Maths for Engineers	X		
Industrial Engagement		X	
Digital Technologies			X