Module Descriptor Form

Civil and Environmental Engineering

CL420 - Water Engineering 2

Module Code	CL420	**Module Title**	Water Engineering 2				
Module Registrar	Nieradzinska, Dr Kamila						
Other Staff Involved							
Credit Weighting	20	**Semester**	1/2	**Elective**	No	**Academic Level**	4
Pre-requisites							
Required for							

Module Format and Delivery (hours):

Lectures	Tutorials	Assignments	Labs	Private Study	Total
40	16	100	6	38	200

Educational Aim

This module aims to:

This class aims to develop an understanding of a wide range of water engineering theory and processes including open channel flow, complex free surface flows, hydraulics structures and hydropower systems processes as well as the ability to undertake design calculations sufficient to produce a concept and detailed design of simple hydraulic structures and hydropower systems. In Semester 1 this class builds on the knowledge gained in Water Engineering 1 in terms of understanding the application of hydraulics to open channel flows. In Semester 2 this class builds on the knowledge gained in hydraulics, hydrology, and open channel flow by applying it to common water engineer processes such as structures for flow control and power generation, sediment transport and erosion, and flood risk management.

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Syllabus

This module will teach the following:

Rapidly varied channel flow (RVF) (specific force)
Gradually varied flow (GVF) in a channel
River engineering
River modelling and engineering
River routing calculations
Hydraulic models
Dimensional analysis and Model Similarity
Hydraulic structures
Unsteady free surface flows and waves
Unsteady pipe flow, surges in pipelines
Surge protection

Potable water, water sources and demand
Water treatment processes
Wastewater characteristics, standards and legislation
Primary, secondary and tertiary wastewater treatment
Sludge treatment
Small scale wastewater treatment, including wastewater treatment issues in the Developing World
Industrial wastewater treatment
Case studies

Learning Outcomes

On Completion of the module, the student is expected to be able to:

LO: 1	Undertake calculations of basic hydraulic parameters (flow, head, velocity, depth) in open channels subject to uniform flows and use this information to optimise the channel conveyance and where, appropriate, develop suitable hydraulic modelling approaches for laboratory studies.
LO: 2	Undertake basic hydraulic calculations (involving flow, head, velocity, depth) for open channels subject to complex and changing free surface flows (steady non-uniform: GVF and RVF, unsteady flow).
LO: 3	Understand the role hydraulic structures systems can play in managing channel flows and undertake a range of simple calculations for common hydraulic assets based on an understanding of the hydraulic principles of operation for each asset and their operating opportunities and constraints.
LO: 4	Understand the role hydraulic modelling can play in representing river system behaviour and be able to undertake a range of simple design calculations and activities based on an understanding of the hydraulic principles of operation of river channels and hydraulics, additionally to understand how to control water flow in the channel.

(UK SPEC suggests no more than 4 learning outcomes per module. Statements must be broad and be syllabus free and link in with the intended learning outcomes on the programme specifications.)

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Assessment of Learning Outcomes - Criteria

Learning Outcome: **1**

	Criteria
1	C1 The ability to identify common and relevant hydraulic concepts and relationships
2	C2 The ability to work with simple channel sections of fluid flow and open channel flow concepts
3	C3 The ability to estimate channel conveyance, optimise the channel shape and control channel flows/discharges

Learning Outcome: **2**

	Criteria
1	C1 The ability to identify common and relevant hydraulic parameters
2	C2 The ability to identify and evaluate the controlling or dominant hydraulic components
3	C3 The ability to solve complex hydraulic calculations through identifying, resolving or balancing common terms or determining unknowns

Learning Outcome: **3**

	Criteria
1	C1 The ability to identify the function of common hydraulic structures and the role they play in the environment.
2	C2 The ability to identify and evaluate the relevant hydraulic parameters and assess the controlling or dominant hydraulic components, resolving equations based on these
3	C3 Design simple hydraulic structures based on hydraulic theory to achieve desired outcomes or effects on channel hydraulics.

Learning Outcome: **4**

	Criteria
1	C1 The ability to identify and explain the function of the key components of river systems.
2	C2 The ability to conceptually design and hydraulically model river systems, including selection of appropriate hydraulic assets and model parameters.
3	C3 The ability to assess hydraulic modelling outputs, assess they hazards they may represent and the potential impacts of these on the environment.

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

To Pass the module, students need to gain a summative mark of: 40%

Description	Semester	Start Week	Duration	Weight	Submission Week	Linked Criteria
Quiz 1 – Open channel flow fundamentals . Closed Book	1		2.00	5%	2	
Quiz 2 – GVF pre-lab quiz . Closed Book	1		2.00	5%	3	
Quiz 3 – RVF pre-lab quiz . Closed Book	1		2.00	5%	4	
GVF and RVF	1	2		30%	6	
Quiz 4 – Unsteady and complex flow quiz . Closed Book	1		2.00	5%	8	
Exam. Closed Book	1		2.00	50%	E	
Quiz 1. Closed Book	2		2.00	5%	4	
Quiz 2. Closed Book	2		2.00	5%	6	
Flood Risk Assessment Project	2	3		40%	10	
Exam. Closed Book	2		2.00	50%	E	

Principles of Assessment Feedback

Principles of Feedback are incorporated in class teaching and practical work through (1) provision of exemplar technical and lab reports to indicate and clarify levels of performance, (2) class examples to support student development of learning about the wider engineering community; (3) class laboratory pre-activity and post activity facilitates the development of self-assessment and reflection; (4) summative laboratory and technical assessments shape preparations of the subject areas for class exams.

Feedback is encouraged through frequent informal class/group/individual discussions with teaching staff and incorporated through formative assessment of both class and laboratory work. Student feedback is taken at regular opportunities to identify assessment timing and feedback dates where possible and to support shaping of teaching to suit perceived knowledge or experience gaps, closing any gap between current and desired knowledge or performance and encouraging students to spend time and effort on their learning.

Additional Information

Students must gain a summative mark of 40% to pass the module. Attendance at both end of semester exams is a requirement of this module and absence from the exam will result in an Absence [ABS] being returned. For all group submissions, the students name must appear on the copy of the submitted report, otherwise a Mark Withheld [FO] will be returned. Students who fail the module at the first attempt will be re-examined during the August diet. This re-examination will consist entirely of the exam. No marks from any previous attempts will be transferred to a new resit attempt.

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Resit Procedure

Sem. 1 resit: 2-hour formal examination in August with same format as in December.
Sem. 2 resit: 2-hour formal examination in August with same format as in May/June.

NB: The August examination marks (50%) are combined with the coursework, project and quiz marks from Semesters 1 and 2 (50%). Students will be required to undertake both resit exams unless otherwise directed by the course director.

Recommended Reading

Chadwick & Morfett. Hydraulics in Civil and Environmental Engineering 3rd Ed. E & FN Spon.
Chanson. The Hydraulics of Open Channel Flow. Arnold.
Hamill. Understanding Hydraulics. 2nd Ed. Palgrave.
Massey. Mechanics of Fluids Chapman & Hall.
Novak, Moffat, Nalluri & Narayanan. Hydraulic Structures Unwin Hyman.
Reeve, Chadwick & Fleming, `Coastal Engineering? Spon
Metcalf and Eddy. Wastewater Engineering: Treatment and Reuse, 4th Edition, 2003.
Parsons and Jefferson. Introduction to Potable Water Treatment Processes, 2006.

Module Timetable

Week	Semester 1	Semester 2
0		
1		
2	Test 5%	
3	Test 5%	
4	Test 5%	Test 5%
5		
6	Lab 30%	Test 5%
7		
8	Test 5%	
9		
10		Lab 40%
11		
E	Examination 50%	Examination 50%

Date of Last Modification

11-09-2025