MODULE DESCRIPTION FORM

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

CL420 Water Engineering 2

Module Registrar: Olayemi Olanlokun	**Taught To (Course):** UG Civil & Environmental Engineering		
Other Lecturers Involved: James Minto	**Credit Weighting:** 20crs 20	**Semester:** 1 + 2	
Assumed Prerequisites: CL216 Hydraulics and Hydrology, CL315 Water Engineering 1	**Compulsory**	**Academic Level:** 4	**Suitable for Exchange:** Yes

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

Lecture	Tutorial	Laboratory	Groupwork	External	Online	Project	Assignments	Private Study	**Total**
40	16	6				40	60	38	200

Educational Aim

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.

Learning Outcomes

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

LO1 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.

LO2 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).

LO3 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.

LO4 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.

Syllabus

The module will include the following:

Semester 1 (CL420 & CL442)
Common hydraulic concepts, principles and systems
Channel conveyance and optimisation
Roughness and channel conveyance (flow forces and energy)
Complex flows including Gradually varied flow (GVF) in a channel and Rapidly varied channel flow (RVF) (specific force)
Compound Channels

Unsteady Free Surface Flows
Channel Controls

Semester 2 (CL420 & CL443)
Common Hydraulic structures including weirs, orifices, dams and culverts
River systems and flooding
Design of stable channels
River engineering: sediment transport and scour
An introduction to Hydraulic modelling

Assessment of Learning Outcomes

Criteria

LO1 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 simple flow studies.
C1 The ability to identify common and relevant hydraulic concepts and relationships
C2 The ability to work with simple channel sections of fluid flow and open channel flow concepts
C3 The ability to estimate channel conveyance, optimise the channel shape and control channel flows/discharges

LO2 Undertake calculations of basic hydraulic parameters (flow, head, velocity, depth) in open channels subject to complex and changing free surface flows (non-uniform, GVF, RVF and unsteady flow)
C1 The ability to identify common and relevant hydraulic parameters
C2 The ability to identify and evaluate the controlling or dominant hydraulic components
C3 The ability to solve complex hydraulic calculations through identifying, resolving or balancing common terms or determining unknowns

LO3 Undertake a range of simple calculations for common hydraulic structures based on an understanding of the hydraulic principles of operation for each asset and the operating constraints they face.
C1 The ability to identify the function of common hydraulic structures and the role they play in the environment.
C2 The ability to identify and evaluate the relevant hydraulic parameters and assess the controlling or dominant hydraulic components, resolving equations based on these
C3 Design simple hydraulic structures based on hydraulic theory to achieve desired outcomes or effects on channel hydraulics.

LO4 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.
C1 The ability to identify and explain the function of the key components of river systems.
C2 The ability to conceptually design and hydraulically model river systems, including selection of appropriate hydraulic assets and model parameters.
C3 The ability to assess hydraulic modelling outputs, assess they hazards they may represent and the potential impacts of these on the environment.

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.

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.

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	S1 exam period	2 hrs	50%	1 lab report 1 presentation 4 quizzes	15% 15% 20%		
L/Outcomes	LO1, LO2				LO1, LO2			

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	S2 exam period	2 hrs	50%	2 quizzes	10%	1	40%
L/Outcomes	LO3, LO4				LO3, LO4		LO3, LO4	

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

Coursework / Submissions deadlines (*academic weeks*):

Semester 1:
Quiz 1 – Open channel flow fundamentals – Week 2
Quiz 2 – GVF pre-lab quiz – Week 2
Quiz 3 – RVF pre-lab quiz – Week 3
Quiz 4 – Unsteady and complex flow quiz - Week 7
H41 GVF lab – Week 6
H43 RVF lab – Week 6
Presentation – Week 8

Semester 2:
Quiz 1 – Week 4
Quiz 2 – Week 6
Project management documents – Week 7
Communication product – Week 10
Technical report – Week 10

Resit Assessment Procedures:
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 marks from Semesters 1 and 2 (50%). Students will be required to undertake both resit exams unless otherwise directed by the course director.

PLEASE NOTE:
Students must gain a summative mark of 40% / 50% *(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 / coursework / viva *(delete as appropriate)*. No marks from any previous attempts will be transferred to a new resit attempt.

Recommended Reading

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

**Hamill. Understanding Hydraulics. 4th Ed. Palgrave
**Chadwick & Morfett. Hydraulics in Civil and Environmental Engineering 3rd Ed. E & FN Spon.
Butler and Davies, Urban Drainage, 2nd Edition, SPON
Wilson, Engineering Hydrology, 4th Ed, Palgrave MacMillan
Chanson. The Hydraulics of Open Channel Flow. Arnold..
Massey. Mechanics of Fluids Chapman & Hall.
Novak, Moffat, Nalluri & Narayanan. Hydraulic Structures Unwin Hyman

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

Date	Time	Room No

Session: 2022/23

Approved:

Course Director Signature:

Date of Last Modifications: 19 Aug 2022

(Updated May 2018)

MODULE TIMETABLE

Module Code:	**CL420**	**Module Title:**	**Water Engineering 2**

Brief Description of Assessment:

The summative assessment opportunities are provided through coursework, 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.

Both semesters conclude with an exam worth 50% and include MyPlace quizzes. Semester 1 includes lab practicals, semester 2 includes a groupwork project.

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.	Choose an item. Choose an item.	Online Test Choose an item.	Lab Online Test	Lab Online Test	Choose an item. Choose an item.	Lab Report Submission Choose an item.	Online Test Choose an item.	Presentation Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Exam

Semester Two	C&D Wk	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9	WK10	WK11	Exam Period
	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Online Test Choose an item.	Choose an item. Choose an item.	Online Test Choose an item.	Project Submission Choose an item.	Choose an item. Choose an item.	Choose an item. Choose an item.	Project Submission Project Submission	Choose an item. Choose an item.	Exam