Module Descriptor

Title	Water Resources Engineering		
Session	2025/26	**Status**	Published
Code	ENGG09014	**SCQF Level**	9
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	S Paudel		

Summary of Module

This module applies the theoretical background to pipe flow and open channel flow provided in Hydraulics (Level 8) to practical design problems in water resources, flood estimation, urban drainage, water supply and treatment, wastewater treatment and hydraulic modelling.

The contents of the module are:

• Hydrology and water resources - Hydrological processes, Rainfall-runoff analysis, Hydrographs,

• Flooding, Flood Estimation Handbook (FEH), Hydrograph routing

• Urban drainage - Combined and separate sewerage systems, Sewage overflows, Strom sewer design, Foul sewer design, Sustainable Urban Drainage systems (SUDs)

• Water supply and treatment - Water quantity, Water quality, Treatment processes, Groundwater pollution

• Wastewater treatment - Wastewater characteristics, Treatment processes, Sludge treatment and disposal

• Pipe network analysis - Application of pipe hydraulics to analyse ring and junction type pipe networks, Nodal method, Hardy-cross method

• Open channel flow - Application of open channel hydraulics to solve Gradually Varying Flow (GVF) and Rapidly Varying Flow (RVF) problems

• Hydraulic modelling - Hydraulic models and similitude, Dimensional analysis, Scale effects and distorted models

The Graduate Attributes related to this module are:

• Academic: Problem-solver; analytical, critical thinker; innovative

• Personal: Motivated; creative

• Professional: Collaborative; research-oriented

Module Delivery Method	On-Campus[1] ☒	Hybrid[2] ☐	Online[3] ☐	Work -Based Learning[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☒ Paisley	☐ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1	☒	Term 2	☐	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
L1	Apply hydrological techniques to estimate flows within river catchments for different return periods.
L2	Perform calculations in relation to pipe networks and unsteady open channel flow.
L3	Analyse water and wastewater treatment systems and evaluate risks associated with wastewater discharge.
L4	Apply hydrograph routing techniques to predict reservoir performance and flood attenuation.
L5	Develop scaled hydraulic models using dimensional analysis and similitude laws.

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	**During completion of this module, there will be an opportunity to achieve core skills in:**
Knowledge and Understanding (K and U)	**SCQF 9** Appreciating the social, economic and environmental implications of water supply, flooding and urban drainage (AHEP LO: SM3b) Demonstrating understanding of the concept of probability and return periods in relation to flow estimation (AHEP LO: SM2b) Demonstrating understanding of risks associated with wastewater discharge to the environment and ground water pollution (AHEP LO: EL6b) Demonstrating understanding pipe network system design and drainage design (AHEP LOs: D4, EA3b)

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

	Demonstrating understanding of the integration of engineering principles with the biological and chemical basis of water and wastewater treatment (AHEP LO: EA1b)
Practice: Applied Knowledge and Understanding	**SCQF 9** Deducing hydrological principles by carrying out measurements of runoff from a model catchment in the laboratory (AHEP LO: P3) Being able to work with limited, conflicting or missing data (AHEP LO: D3b, P8) Applying knowledge and understanding to basic professional design problems in flood estimation, reservoirs, urban drainage and water/wastewater treatment (AHEP LOs: D4, P6)
Generic Cognitive skills	**SCQF 9** Using the hydrograph to estimate rainfall-runoff (AHEP LOs: EA1b, P3) Critically evaluating the validity of hydraulic/hydrological data from the field and/or the laboratory (AHEP LOs: SM3b, P4)
Communication, ICT and Numeracy Skills	**SCQF 9** Using spreadsheets to investigate the factors controlling runoff and the performance of reservoirs and channels in attenuating flood peaks (AHEP LOs:P6, G1) Using literacy and numeracy skills to convey complex information in the form of laboratory reports (AHEP LOs: SM3b, G1)
Autonomy, Accountability and Working with Others	**SCQF 9** Developing an awareness of the legislative framework governing activities in the water industry e.g. the Reservoirs Act and the Water Framework Directive (AHEP LO: EL5b) Assisting peers during paired exercises (AHEP LO: G1) Planning and taking responsibility of self-learning (AHEP LOs: G2, G4)

Prerequisites	**Module Code** ENGG08012	**Module Title** Hydraulics
	Other	
Co-requisites	**Module Code**	**Module Title**

Learning and Teaching
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours. The learning and teaching activity for this module includes lectures, tutorials, laboratories, and independent study. Independent study includes all study, learning, and processing undertaken by a student, outside of the scheduled lectures, tutorials, and laboratories.

Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	24
Tutorial / Synchronous Support Activity	12
Laboratory / Practical Demonstration / Workshop	12
Independent Study	152
n/a	0
n/a	0
TOTAL	200

Indicative Resources

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

• Printed Notes

• Spreadsheets for pipe network analysis

• Spreadsheets for reservoir routing and flood estimation

• HR Wallingford Tables for the design of urban drainage systems

• Flood Estimation Handbook (1999)

Extension Resources: Consultation of the undernoted resources is recommended and material from these resources may be of benefit to the student in the assessment process:

Mansell, M. G. (2003). Rural and Urban Hydrology. London: Thomas Telford

Smith, P. G. & Scott, J. S. (2005). Dictionary of Water and Waste Management. Second Edition. Oxford: Butterworth – Heinemann. London: IWA publishing.

Chadwick, A. J. & Morfett, J. C. (1993). Hydraulics in Civil and Environmental Engineering. Second Edition. London: Spon.

Butler D. & Davies, J. W. (2011). Urban Drainage. Third Edition. London: Spon

Martin, P. (2000). Sustainable Urban Drainage Systems: Design Manual for Scotland and Northern Ireland. London : Construction Industry Research and Information Technology.

Wilson, E.M. (1990). Engineering Hydrology. Solutions to Problems. Fourth Edition. London: MacMillan.

Hamill, L. (2011). Understanding Hydraulics. Third Edition. Hampshire: Palgrave Macmillan.

Kay, M. (2017). Practical Hydraulics and Water Resources Engineering. Third Edition. Boca Raton: CRC Press.

(N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements

In line with the Student Attendance and Engagement Procedure, Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

For the purposes of this module, academic engagement equates to the following:

The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in timetabled sessions. Students will scan their attendance via the attendance scanners each time they are on-campus. Students will have attendance recorded in class and they will be expected to login to the VLE several times per week. Students who are unable to attend a timetabled learning session, due to illness or other circumstance, should notify their Programme Leader. Across the School an 80% attendance threshold is set. Students who fall below this, will be referred to the Student Success Team to see how they can be best supported in their studies.

Equality and Diversity
The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code. Aligned with the University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has lab-based teaching and as such students are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University's policies and regulations.
(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	**Engineering Physical Sciences**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☐ **Yes** ☒ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
School Assessment Board	Civil Engineering and Quality Management
Moderator	Djamalddine Boumezerane
External Examiner	Alison Robinson
Accreditation Details	This module is accredited by the Joint Board of Moderators as part of BEng (Hons) Civil Engineering & GA-BEng (Hons) Civil Engineering.
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	2.16 Assessment changed to Unseen Closed Book Class Test

	Previous changes 2.15 Sections 9 & 10 changed for KIS requirements. Accreditation details updated.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Unseen Closed Book Class Test (60%)
Assessment 2
Assignment (40%) inc. Laboratory
Assessment 3
N/A
(N.B. (i) Assessment Outcomes Grids for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed. (ii) An indicative schedule listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen Closed Book Class Test	☒	☐	☒	☒	☒	60%	2

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Coursework/Design/ Laboratory report	☒	☒	☐	☒	☒	40%	12

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
N/A	☐	☐	☐	☐	☐	0	0
Combined total for all components						100%	14 hours

Change Control

What	**When**	**Who**
Further guidance on aggregate regulation and application when completing template	16/01/2020	H McLean
Updated contact hours	14/09/2021	H McLean

Updated Student Attendance and Engagement Procedure Updated UWS Equality, Diversity and Human Rights Code	19/10/2023	C Winter
Guidance Note 23-24 provided General housekeeping to text across sections	12/12/2023	D Taylor