

## University of the West of Scotland

## Module Descriptor

Session: 2024/25

<b>Title of Module: Water Resources Engineering</b>			
<b>Code: ENGG09014</b>	<b>SCQF Level: 9 (Scottish Credit and Qualifications Framework)</b>	<b>Credit Points: 20</b>	<b>ECTS: 10 (European Credit Transfer Scheme)</b>
<b>School:</b>	School of Computing, Engineering and Physical Sciences		
<b>Module Co-ordinator:</b>	Shakun Paudel		
<b>Summary of Module</b>			
<p>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.</p> <p>The contents of the module are:</p> <ul style="list-style-type: none"> <li>• Hydrology and water resources - Hydrological processes, Rainfall-runoff analysis, Hydrographs,</li> <li>• Flooding, Flood Estimation Handbook (FEH), Hydrograph routing</li> <li>• Urban drainage - Combined and separate sewerage systems, Sewage overflows, Storm sewer design, Foul sewer design, Sustainable Urban Drainage systems (SUDs)</li> <li>• Water supply and treatment - Water quantity, Water quality, Treatment processes, Groundwater pollution</li> <li>• Wastewater treatment - Wastewater characteristics, Treatment processes, Sludge treatment and disposal</li> <li>• Pipe network analysis - Application of pipe hydraulics to analyse ring and junction type pipe networks, Nodal method, Hardy-cross method</li> <li>• Open channel flow - Application of open channel hydraulics to solve Gradually Varying Flow (GVF) and Rapidly Varying Flow (RVF) problems</li> <li>• Hydraulic modelling - Hydraulic models and similitude, Dimensional analysis, Scale effects and distorted models</li> </ul> <p>The Graduate Attributes related to this module are:</p> <ul style="list-style-type: none"> <li>• Academic: Problem-solver; analytical, critical thinker; innovative</li> <li>• Personal: Motivated; creative</li> <li>• Professional: Collaborative; research-oriented</li> </ul>			
<b>Module Delivery Method</b>			

Face-To-Face	Blended	Fully Online	HybridC	Hybrid 0	Work-Based Learning
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>See Guidance Note for details.</b>					

Campus(es) for Module Delivery						
The module will <b>normally</b> be offered on the following campuses / or by Distance/Online Learning: (Provided viable student numbers permit) (tick as appropriate)						
Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Add name

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1	<input checked="" type="checkbox"/>	Term 2	<input type="checkbox"/>	Term 3	<input type="checkbox"/>

Learning Outcomes: (maximum of 5 statements) These should take cognisance of the SCQF level descriptors and be at the appropriate level for the module. At the end of this module the student will be able to:	
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	
<b>SCQF Headings</b>	During completion of this module, there will be an opportunity to achieve core skills in:

Knowledge and Understanding (K and U)	<p>SCQF Level <b>9</b></p> <p>Appreciating the social, economic and environmental implications of water supply, flooding and urban drainage (AHEP LO: SM3b)</p> <p>Demonstrating understanding of the concept of probability and return periods in relation to flow estimation (AHEP LO: SM2b)</p> <p>Demonstrating understanding of risks associated with wastewater discharge to the environment and ground water pollution (AHEP LO: EL6b)</p> <p>Demonstrating understanding pipe network system design and drainage design (AHEP LOs: D4, EA3b)</p> <p>Demonstrating understanding of the integration of engineering principles with the biological and chemical basis of water and wastewater treatment (AHEP LO: EA1b)</p>
Practice: Applied Knowledge and Understanding	<p>SCQF Level <b>9</b></p> <p>Deducing hydrological principles by carrying out measurements of runoff from a model catchment in the laboratory (AHEP LO: P3)</p> <p>Being able to work with limited, conflicting or missing data (AHEP LO: D3b, P8)</p> <p>Applying knowledge and understanding to basic professional design problems in flood estimation, reservoirs, urban drainage and water/wastewater treatment (AHEP LOs: D4, P6)</p>
Generic Cognitive skills	<p>SCQF Level <b>9</b></p> <p>Using the hydrograph to estimate rainfall-runoff (AHEP LOs: EA1b, P3)</p> <p>Critically evaluating the validity of hydraulic/hydrological data from the field and/or the laboratory (AHEP LOs: SM3b, P4)</p>
Communication, ICT and Numeracy Skills	<p>SCQF Level <b>9</b></p> <p>Using spreadsheets to investigate the factors controlling runoff and the performance of reservoirs and channels in attenuating flood peaks (AHEP LOs:P6, G1)</p> <p>Using literacy and numeracy skills to convey complex information in the form of laboratory reports (AHEP LOs: SM3b, G1)</p>
Autonomy, Accountability and Working with others	<p>SCQF Level <b>9</b></p>

	<p>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)</p> <p>Assisting peers during paired exercises (AHEP LO: G1)</p> <p>Planning and taking responsibility of self-learning (AHEP LOs: G2, G4)</p>	
<b>Pre-requisites:</b>	Before undertaking this module the student should have undertaken the following:	
	<b>Module Code:</b> <b>ENGG8012</b>	<b>Module Title: Hydraulics</b>
	<b>Other:</b>	
<b>Co-requisites</b>	<b>Module Code:</b>	<b>Module Title:</b>

\*Indicates that module descriptor is not published.

<b>Learning and Teaching</b>	
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.	
<p><b>Learning Activities</b> During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:</p>	<p><b>Student Learning Hours</b> (Normally totalling 200 hours): (Note: Learning hours include both contact hours and hours spent on other learning activities)</p>
Lecture/Core Content Delivery	24
Tutorial/Synchronous Support Activity	12
Laboratory/Practical Demonstration/Workshop	12
Independent Study	152
	200 Hours Total
<b>**Indicative Resources: (eg. Core text, journals, internet access)</b>	

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

- Printed Notes
- Spreadsheets for reservoir routing and flood estimation
- 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, *Rural and Urban Hydrology*. Thomas Telford (2003)
- Smith P G and Scott J S *Dictionary of Water and Waste Management* (2005)
- Chadwick and Morfett, *Hydraulics in Civil and Environmental Engineering* (2004)
- Butler D and Davies J W, *Urban Drainage*, Spon (2000)
- Martin P, "Sustainable Urban Drainage Systems" a Design Manual for Scotland and Northern Ireland (2000) Wilson, E.M, *Engineering Hydrology*, 5th Edition, Palgrave (1990)

(\*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:

### 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](#).

Please ensure any specific requirements are detailed in this section. Module Co-ordinators should consider the accessibility of their module for groups with protected characteristics..

(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

<b>Divisional Programme Board</b>	Engineering
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<b>Assessment Results (Pass/Fail)</b>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
<b>School Assessment Board</b>	Civil Engineering and Quality Management
<b>Moderator</b>	Djamalddine Boumezerane
<b>External Examiner</b>	Alison Robinson
<b>Accreditation Details</b>	This module is accredited by the Joint Board of Moderators as part of BEng (Hons) Civil Engineering & GA-BEng (Hons) Civil Engineering.
<b>Changes/Version Number</b>	2.16 Assessment changed to Unseen Closed Book Class Test  Previous changes 2.15 Sections 9 & 10 changed for KIS requirements. Accreditation details updated.

<b>Assessment: (also refer to Assessment Outcomes Grids below)</b>
Assessment 1 – Unseen Closed Book Class Test (60%)
Assessment 2 – Assignment (40%) inc. Laboratory
(N.B. (i) <b>Assessment Outcomes Grids</b> 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 <b>indicative schedule</b> listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

### Assessment Outcome Grids (See Guidance Note)

Component 1							
Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Learning Outcome (4)	Learning Outcome (5)	Weighting (%) of Assessment Element	Timetable Contact Hours
Class Test (Written)	✓	✓	✓	✓	✓	60%	2

<b>Component 2</b>							
<b>Assessment Type (Footnote B.)</b>	<b>Learning Outcome (1)</b>	<b>Learning Outcome (2)</b>	<b>Learning Outcome (3)</b>	<b>Learning Outcome (4)</b>	<b>Learning Outcome (5)</b>	<b>Weighting (%) of Assessment Element</b>	<b>Timetabled Contact Hours</b>
Design/ Diagram/ Drawing/ Photograph /Sketch	✓	✓		✓	✓	40%	12
<b>Combined Total for All Components</b>						<b>100%</b>	<b>14 hours</b>