Wrexham glyndŵr UNIVERSITY

MODULE SPECIFICATION PROFORMA

Module Title:	Water Engineering	**Level**:	5	**Credit Value**:	20

Module code:	AUR524	New ✓ Existing ☐	**Code of module being replaced**:	

Cost Centre:	GABE	JACS3 **code**:	H141

Trimester(s) in which to be offered:	1, 2	**With effect from:**	September 16

School:	Applied Science, Computing & Engineering	**Module Leader:**	Louise Duff

Scheduled learning and teaching hours	48 hrs
Guided independent study	152 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Programme(s) in which to be offered	Core	Option
BSc Civil Engineering Studies	✓	☐

Office use only
Initial approval August 16
APSC approval of modification *Enter date of approval* Version 1
Have any derogations received SQC approval? N/A

Module Aims
This module aims to provide an opportunity to develop skills required to solve hydrostatic and flow problems. It also aims to provide students with the opportunity to undertake practical laboratory work and utilise software applications. Students will be provided with an overview of the concepts of sustainable water management.

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

At the end of this module, students will be able to		Key Skills	
1	Select and apply appropriate analysis to hydrostatic and water engineering problems, apply technology and implement engineering processes.	KS1 KS4	KS3 KS10
2	Develop the methodology, practice and reporting of laboratory experiments with particular reference to open channel flow problems and augment with computer modelling software, relevant to the engineering technology discipline.	KS1 KS4	KS2 KS10
3	Demonstrate knowledge and application of the concepts relating to sustainability in water resource engineering to include coastal and river erosion, coastal/river flood defence / flood risk science and management, water and waste water systems and Sustainable Urban Drainage systems.	KS1 KS7	KS6 KS10
4	Ability to monitor, interpret and apply the results of analysis and modelling in order to bring about continuous improvement and design solutions according to customer and user needs.	KS3 KS10	KS4
5	Demonstrate awareness of the framework of legislation and policies that govern flood risk management and the constraints that guide engineers in developing acceptable sustainable solutions to flood and drainage problems.	KS1	KS6

Transferable/key skills and other attributes
Analytical competence Problem solving Report Writing Independent learning Presentation skills

Derogations
None

Assessment: Please give details of indicative assessment tasks below.
Assessment 1 will comprise a series of engineering problems to be solved using analytical methods via an in-class test. Assessment 2 will comprise a report based on aspects of sustainable water management to be delivered via a presentation.
Please indicate the type(s) of assessment (eg examination, oral, coursework, project) and the weighting of each (%). Normally, each intended learning outcome should be assessed only once.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration (if exam)	Word count (or equivalent if appropriate)
1	1,2,	In-class test	60%	2hrs	
2	3,4,5	Presentation	40%	15 minutes	

Learning and Teaching Strategies:
Lectures and problem solving sessions will be delivered to provide the underlying knowledge of the subject. Students, in general will work individually but group work will be beneficial for practical laboratory sessions and the use of simulation software. The delivery of this module will be enhanced by site visits, guest lecturers and local flood case studies.

Syllabus outline:
Hydrostatic forces on immersed surfaces and fluid dynamics (forces due to momentum change, conservation of energy - Bernoulli equation) Analysis relating to pipeline and open channel flow problems. (laminar & turbulent flows, losses in pipe systems, Darcy - Weisbach formula, Reynolds number & variation in pipe friction factor, uniform flow Chezy and Manning equations.) Laboratory experiments to test the theoretical concepts considered in the module. This will include experiments such as empty channel flow to determine the Manning coefficient and verify Chezy equation, flow through weirs to demonstrate the use of weirs as simple flow regulators, flow under sluice gates and hydraulic jump. Collecting and recording data, analysing data and assessing accuracy and errors, together with consideration of health and safety risks.

Sustainability in water resource engineering to include coastal and river erosion, coastal/river flood defence / flood management, water and waste water systems and Sustainable Urban Drainage systems - techniques, policy and design.

Flood risk mapping. Flood forecasting, flood warning and communication. Understanding the fundamentals of the modelling process, problem definition, the selection of modelling software, data acquisition and Flood Risk / Consequence Assessments and integration into the Building/ Digital Information Model. Flood resilience and resistance and techniques available to adapt to flooding and climate change.

Roles of Regulatory bodies and funding authorities such as Environment Agency, Natural Resources Wales, Lead Local Flood Authorities and other Risk Management Authorities.

Legislation and policy, River Basin Districts, Catchment Flood Management Plans, Shoreline Management Plans, National and Local Strategies, Flood Risk Regulations, Flood and Water Management Act. Land Drainage Act, Coastal Protection Act etc.

Bibliography:

Essential reading

Ainger,C., Fenner,R., (2016) *Sustainable Water*, London, ICE Publishing.
Butler, D., Davies,J W., (2011),*Urban Drainage*, 3rd Edn, Oxon, Spon Press.
Chadwick, A, Morfett, J and Borthwick, M, 2013, *Hydraulics in Civil and Environmental Engineering*, 5th Edn, London, Spon Press.
Featherstone R.E. and Nalluri C., (2009), *Civil Engineering Hydraulics*, 5th Edn, Oxford, Wiley-Blackwell.
Watson, D.,Adams, M., (2011), *Design for Flooding*, New Jersey, John Wiley & Sons.
Wynn, P., (2014), *Hydraulics for Engineers,* London, ICE Publishing.

Other indicative reading

Douglas, J.F., Gasoriek, J.M, Swaffield, J. and Jack, L, (2005), *Fluid Mechanics*, 5th Edn, England, Pitman Publishing Ltd.
Hamil, L., *Understanding Hydraulics* 3rd edition, (2011), ,Basingstoke,Palgrave Macmillan.
Holden, J., *Water Resources: An Integrated Approach*, (2014), Oxon, Routledge.

www.ice.org.uk
www.istructe.org.uk
www.theihe.org.uk
www.ciht.org.uk
www.ihsti.com

Other indicative reading will be made available via the VLE.