Prifysgol Wrecsam
Wrexham University

Module specification

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Module Code	AUR5A7
Module Title	Water Resource Management
Level	5
Credit value	20
Faculty	Faculty of Arts, Computing & Engineering
HECoS Code	100986
Cost Code	GABE

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BEng (Hons) Civil Engineering Degree Apprenticeship	Core
BSc Civil Engineering Studies	Core

Pre-requisites

None

Breakdown of module hours

Learning and teaching hours	30 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	6 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	36 hrs
Placement / work-based learning	0 hrs
Guided independent study	164 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	3rd July 2024
With effect from date	September 2024
Date and details of revision	
Version number	1

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 and flood risk management.

Module Learning Outcomes - at the end of this module, students will be able to:

1	Select and apply appropriate analysis to hydrostatic and water engineering problems, apply technology and implement engineering processes.
2	Develop the methodology (including risk assessment), practice and reporting of laboratory experiments, assimilate and apply relevant knowledge with reference to open channel flow problems and augment with computer modelling software, relevant to the engineering technology discipline.
3	Demonstrate knowledge of legislation and application of the concepts relating to sustainability in water resource engineering to coastal/river flood defence / flood risk science and management, water and wastewater systems and Sustainable Urban Drainage systems.
4	Monitor, interpret and apply the results of analysis and /or modelling to bring about continuous improvement and design solutions according to customer and user needs.
5	Demonstrate awareness of the framework of legislation and policies that govern flood risk management, the role of regulating bodies, commercial frameworks and contracts and the constraints that guide engineers in developing acceptable sustainable solutions to flood and drainage problems.

Assessment

Indicative Assessment Tasks:

This section outlines the type of assessment task the student will be expected to complete as part of the module. More details will be made available in the relevant academic year module handbook.

Assessment 1 will comprise a series of engineering problems to be solved using analytical methods via an on-line 2hrs in-class test.

Assessment 2 will comprise an options report based on aspects of sustainable water management to be delivered via a 15 mins presentation, including 5 mins question and answers.

Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)
1	1,2	In-class test	50
2	3,4,5	Presentation	50

Derogations

None

Learning and Teaching Strategies

The module will be presented to students through planned lecture series and programmed workshops and tutorials. An active and inclusive approach is used to engage students in the topics and will involve individual, group work and flipped learning experiences aligned to the university's Active Learning Framework (ALF). The approach offers students a flexible and adaptive learning experience that can accommodate a range of options that includes both on campus learning and remote learning where appropriate.

The Moodle VLE and other on-line materials and resources will be available to support learning. ALF offers a balance between the classroom elements and digitally enabled activity incorporating flexible and accessible resources and flexible and accessible feedback to support learning.

Students, in general will work individually but group work will be beneficial for practical laboratory sessions and the use of simulation software, which will be delivered on campus.

The delivery of this module will be enhanced by site visits, guest lecturers and local flood case studies.

Tutorials – Close interaction with students ensuring that the work presented during lectures has been understood, with specific help being given to overcome any learning problems, should they occur.

Indicative 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.

Sustainability in water resource engineering to coastal/river flood defence / flood management, water and wastewater 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 techniques available to adapt to flooding and climate change, including Natural Flood Management.

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.

Indicative Bibliography:

Please note the essential reads and other indicative reading are subject to annual review and update.

Essential Reads

Chadwick, A., Morfett, J. and Borthwick, M. (2021), *Hydraulics in Civil and Environmental Engineering*. 6th ed. Boca Raton: CRC Press.

Other indicative reading

Ainger, C. and Fenner, R. (2016), *Sustainable Water*, London: ICE Publishing.

Butler, D., Digman, C.J., Makropoulos, C. and Davies, J.W. (2017), *Urban Drainage.* 4th edition. Boca Raton: CRC Press.

Douglas, J.F., Gasoriek, J.M., Swaffield, J. and Jack, L. (2011), *Fluid Mechanics.* 6th edition. Harlow: Pearson Prentice Hall.

Holden, J. (2019), *Water Resources: An Integrated Approach*. 2nd edition. London: Routledge.

Marriott, M. (2016), *Nalluri & Featherstone's Civil Engineering Hydraulics: Essential Theory with Worked Examples.* 6th edition. Chichester: Wiley.

Wynn, P. (2023), *Hydraulics for Engineers,* 2nd edition. London: ICE Publishing.

Other sources

Royal Institution of Chartered Surveyors www.rics.org

Chartered Institute of Architectural Technologists www.ciat.org.uk

Chartered Institute of Building www.ciob.org.uk

Ordnance Survey www.ordnancesurvey.co.uk/

Royal Institution of Chartered Surveyors www.rics.org

Institution of Civil Engineers www.ice.org.uk

Royal Institute of British Architects www.architecture.com

Designing Buildings Wiki www.designingbuildings.co.uk

Institution of Structural Engineers (www.istructe.org.uk)

IHS Database www.ihsti.com