Module specification

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Refer to the module guidance notes for completion of each section of the specification.

Module code	AUR544
Module title	Water Engineering
Level	5
Credit value	20
Faculty	FAST
Module Leader	Louise Duff
HECoS Code	100148
Cost Code	GABE

Programmes in which module to be offered

Programme title	Is the module core or option for this programme
BSc Civil Engineering Studies	Core

Pre-requisites

N/A

Breakdown of module hours

Learning and teaching hours	40 hrs
Placement tutor support	0 hrs
Supervised learning e.g. practical classes, workshops	8 hrs
Project supervision (level 6 projects and dissertation modules only)	0 hrs
Total active learning and teaching hours	**48** hrs
Placement / work based learning	0 hrs
Guided independent study	152 hrs
Module duration (total hours)	200 hrs

For office use only	
Initial approval date	13/4/21
With effect from date	01/09/21
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.

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, 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.
3	Demonstrate knowledge and application of the concepts relating to sustainability in water resource engineering to coastal/river flood defence / flood risk science and management, water and waste water systems and Sustainable Urban Drainage systems.
4	Ability to monitor, interpret and apply the results of analysis and /or modelling in order 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 and the constraints that guide engineers in developing acceptable sustainable solutions to flood and drainage problems.

Assessment

Indicative Assessment Tasks:

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

Assessment 2 will comprise an options report based on aspects of sustainable water management to be delivered via a 20 mins presentation.

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

N/A

Learning and Teaching Strategies

Lectures and problem solving sessions will be delivered on line 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, which will be delivered on campus. The delivery of this module will be enhanced by site visits, guest lecturers and local flood case studies.

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. 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 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.

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.

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

Other indicative reading

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

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

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

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

Wynn, P. (2014), *Hydraulics for Engineers,* London, ICE Publishing.

Websites:

Institution of Civil Engineers

Institution of Structural Engineers

Institute of Highway Engineers

CIHT

IHSTI

Other indicative reading will be made available via the VLE.

Employability skills – the Glyndŵr Graduate

Each module and programme is designed to cover core Glyndŵr Graduate Attributes with the aim that each Graduate will leave Glyndŵr having achieved key employability skills as part of their study. The following attributes will be covered within this module either through the content or as part of the assessment. The programme is designed to cover all attributes and each module may cover different areas.

Core Attributes
Engaged
Ethical

Key Attitudes
Resilience
Confidence
Adaptability

Practical Skillsets
Digital Fluency
Organisation
Critical Thinking
Communication