

Module Details	
Module Title:	Water Engineering
Module Code:	CSE5013-B
Academic Year:	2019-20
Credit Rating:	20
School:	Department of Civil and Structural Engineering
Subject Area:	Civil and Structural Engineering
FHEQ Level:	FHEQ Level 5
Pre-requisites:	
Co-requisites:	

Contact Hours	
Type	Hours
Lectures	26
Practical classes and workshops	6
Tutorials	10
Laboratory	6
Directed Study	152

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year (Sept - May)

Module Aims
To examine the principles of fluid flow, with an emphasis on the analysis of flows that are common in engineering fields. To understand hydraulic principles of free surface flows; and to solve practical engineering problems of free surface flows.

Outline Syllabus

Semester 1 includes: (1) Fundamental principles: Flow acceleration, continuity and energy equations and their applications; (2) Reynolds number and head losses in real flows; (3) Features of laminar and turbulent flows in pipes and conduits with velocity profiles, pressure drops, friction factors and Moody diagram; (4) Pipe systems including pipes in series, pipes in parallels and branching pipelines; (5) Pipe connections with pumps and siphons; (6) Introduction to the no slip condition and the boundary layer; (7) Momentum equation and fluid force on structures. Semester 2 includes: (1) Concepts of free surface flows: hydraulic radius; flow resistance and Froude number; (2) Uniform flow hydraulics and basic uniform flow calculations; (3) Gradually varied flow: Flow transitions and regimes (critical, sub-critical and super-critical flows); specific energy; critical depth and water surface profiles; (4) Rapidly varied flow: Hydraulic jump and hydraulic drop; (5) Hydraulic control structure calculations: Weir and sluice flows; (6) Hydraulic design rules and concepts; (7) Elementary sediment mechanics: Bed load; suspended load; inception motion of sediment; sediment transport capacity and total load transport; (8) Simple design practice.

Learning Outcomes

1	Understand and review fluid flow and principles, and examine, and quantify, their applications to common engineering fields;
2	Interpret and justify laboratory experimental data by using available information and propose solutions to problems arising from that analysis;
3	Understand and review general hydraulic principles and flows with free surfaces, and examine their applications to common engineering fields.

Learning, Teaching and Assessment Strategy

Theoretical understanding and problem solving through lectures, staff-led tutorial/worked example classes, directed study and self-reading to enhance learning, and practical skills of data interpretation and justification gained from lab sessions, where all learning outcomes are delivered.

Assessments of this module are conducted by two examinations and a formative laboratory-based calculative assessment. These assessments both formative and summative will cover all LOs 1-3, and they will thoroughly assess students' understanding of this module.

Mode of Assessment

Type	Method	Description	Length	Weighting
Summative	Laboratory Report	Lab coursework Open Channel Hydraulics	-1500 words	15%
Formative	Laboratory Report	Laboratory Concepts Assessment through Open Channel Hydraulics Flow Calculations (Formative Assessment)		%

Summative	Examination - closed book	Exam (Fluid Mechanics part)	2 hours	50%
Summative	Examination - closed book	Exam (Open Channel Hydraulics part)	1.5 hours	35%

Reading List

To access the reading list for this module, please visit <https://bradford.rl.talis.com/index.html>.

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.