

Module Details	
Module Title	Water Engineering
Module Code	CSE5013-B
Academic Year	2022/3
Credits	20
School	Department of Chemical Engineering
FHEQ Level	FHEQ Level 5

Contact Hours	
Type	Hours
Lectures	28
Tutorials	20
Laboratories	12
Directed Study	140

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year

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

Outcome Number	Description
01	Understand and review fluid flow and principles, and examine, and quantify, their applications to common engineering fields;
02	Interpret and justify laboratory experimental data by using available information and propose solutions to problems arising from that analysis;
03	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 online 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 online lab sessions, where all learning outcomes are delivered. Assessments of this module are conducted by one examination and a laboratory-based calculative assessment. These assessments both summative will cover all LOs 1-3, and they will thoroughly assess students' understanding of this module.

Mode of Assessment

Type	Method	Description	Weighting
Summative	Examination - Closed Book	Closed book examination (Fluid Mechanics) (2 Hrs)	50%
Summative	Examination - Closed Book	Closed book examination (Open Channel) (2 Hrs)	50%

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.

© University of Bradford 2022

<https://bradford.ac.uk>