UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Water Engineering
Module Code	CSE5013-B
Academic Year	2024/5
Credits	20
School	School of Built Environment, Architecture & Creative Industries
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

Water is an important element in life. This module aims to study problems and day-to-day occurrences for fluid and water that relevant to sustainability and society.
The aims include:
1. To examine the principles of fluid flow, with an emphasis on the analysis of flows that are common in engineering fields.
2. To understand hydraulic principles of free surface flows; and to solve practical engineering problems of free surface flows useful for sustainability and design aspects.

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, and cross-sectional design that relevant to sustainability: hydraulic radius; flow resistance, Froude number, and cross-sectional consideration (i.e. useful for minimising building materials for channel);
(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 relevant to extreme flow or flood applications: Hydraulic jump and hydraulic drop;
(5) Hydraulic control structure calculations: Weir and sluice flows;
(6) Hydraulic design rules and concepts;
(7) Elementary sediment mechanics for pollutant transport investigation: 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 design solutions to problems arising from that analysis;
03	Understand and review general hydraulic principles and flows with free surfaces, and examine their sustainable applications to common engineering and environmental fields.

Learning, Teaching and Assessment Strategy

Theoretical understanding and design 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. These assessments both summative will cover all LOs 1-3, and they will thoroughly assess students' understanding of this module.
In terms of assessment strategy, Fluid Mechanics exam is covering fluid flow engineering problems. It uses lecture, tutorial and lab materials and formulae to explore the key fluid mechanic concepts. On the other hand, Open Channel Hydraulics exam covers the practical aspect of open channel hydraulics related to actual and real-world applications. Various materials and formulae from water and free-surface flow taught during lectures, tutorials and labs will be used in this assessment.

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 Hydraulics) (2.5 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.

---

https://bradford.ac.uk