Module Definition Form (MDF)

Module code: MOD002281	**Version:** 7 **Date Amended:** 13/Jun/2024

1. Module Title
Hydraulics

2a. Module Leader
Maryam Imani

2b. School
School of Engineering and the Built Environment

2c. Faculty
Faculty of Science and Engineering

3a. Level
5

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions

Type	Module Code	Module Name	Condition
Pre-requisite:	MOD007035	Applied Engineering Mathematics	Compulsory
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	None		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

The Hydraulics module provides a comprehensive understanding of fluid mechanics and hydraulic systems, essential for civil engineering. It covers fundamental principles, including fluid properties, hydrostatics, conservation of energy, momentum, and continuity in hydraulic systems. The focus is on both theoretical concepts and practical applications. Students explore topics such as flow behaviour in pipes and open channels, hydrostatic force on structures, and basic drainage system design. Emphasis is placed on real-world problem-solving and analysis of hydraulic systems, preparing students for advanced studies and professional practice in the field. Practical sessions and laboratory work complement the theoretical knowledge, enabling students to apply concepts to real-life scenarios and engineering projects.

6b. Outline Content

Knowledge Base Units: fundamental, derived and working units in hydraulics and drainage Hydrostatics: effect of hydrostatic pressure on plane, curved and inclined surfaces; buoyancy and stability of floating bodies Types of Flow: steady / unsteady, uniform / non uniform, laminar / turbulent Flow Equations: continuity, momentum, energy, total energy lines, hydraulic gradients Closed Conduit Flow: head losses, D'arcy - Weisbach and Colebrook - White equations, network analysis Open Channel Flow: normal and critical depth, critical flow and specific energy, weirs and sluices, hydraulic jump and conjugate depth, fundamentals of surface water profiles; environmental considerations in design of open channels Surface Water Drainage: principles, rainfall intensity and duration, use of Lloyd Davis rational method for the design of drainage networks, overview of commercial computer packages, principles of sustainable drainage systems Measurement of pressures and flows: venturi meter, flumes Skills Development - Producing calculations in a clear way - Tackling and solving mathematical problems - Modelling with mathematics - Assimilating, memorising and recalling knowledge - Contextualising knowledge to show understanding - Analysing and solving problems - Making informed judgements based on evidence - Questioning current theories and practice

6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources

Hydraulics laboratory equipment

7. Learning Outcomes (threshold standards)

No.	Type	On successful completion of this module the student will be expected to be able to:
1	Knowledge and Understanding	Demonstrate knowledge and understanding of hydrostatic, hydrodynamic and hydrostatic principles through the appropriate application of these in the analysis and design of water installations
2	Knowledge and Understanding	Evaluate the limitations of traditional engineering approaches to hydraulic design
3	Intellectual, practical, affective and transferrable skills	Co-operate effectively with others in the performance of laboratory experiments and the communication of the results

8a. Module Occurrence to which this MDF Refers				
Year	**Occurrence**	**Period**	**Location**	**Mode of Delivery**
2024/5	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	**Hours**	**Learning Outcomes**	**Details of Duration, frequency and other comments**
Lectures	18	1-3	18 hours of practical work 3 hour weekly sessions (2 of these sessions will require access to the hydraulics laboratory)
Other teacher managed learning	18	1-3	18 hours of practical work 3 hour weekly sessions (2 of these sessions will require access to the hydraulics laboratory)
Student managed learning	114	1-3	Students will need to meet outside of timetabled sessions to develop laboratory reports
TOTAL:	150		

9. Assessment for the above Module Occurrence					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
010	Practical	1,3	50 (%)	Fine Grade	30 (%)
Group poster presentation of the laboratory experiments and the results, 1500-word equivalent. This element is aligned with Engineering Council AHEP4 Learning Outcomes: C1, C12 and C16. This element is aligned with JBM thread: Fluid Mechanics.					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Examination Chelmsford	1,2	50 (%)	Fine Grade	30 (%)
Examination: 1.5 hours This element is aligned with Engineering Council AHEP4 Learning Outcomes: C2. This element is aligned with JBM thread: Fluid Mechanics.					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]