ENGR H4505: Hydraulics I

Module Title:	Hydraulics I
Language of Instruction:	English

Credits:	10

NFQ Level:	8

Module Delivered In	2 programme(s)

Teaching & Learning Strategies:	Lectures 90 hours; Project Work 20 hours; Practicals/ Site Visits 10 hours; Private Study 90 hours

Module Aim:	The aims of this module are: to develop an understanding of the concepts of hydraulics; to equip students to solve problems in hydraulics; to prepare the students for further study in the area of hydraulic engineering, where fundamental principles can be applied in a practical way

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Describe & examine (a) the properties of fluids (b) the scientific laws of fluids at rest. (c) the different flow characteristics & the concepts of fluids in motion. (d) the different types of flow measurement devices. (e) Newton's Laws of Motion.
LO2	Derive & apply (a) expressions from the scientific laws of fluids at rest, to engineering problems, specifying underlying assumptions & limitations. (b) expressions from the concepts of fluids in motion, to broadly- defined engineering problems, specifying underlying assumptions & limitations (c) expressions for flow measurement devices, to broadly- defined engineering problems, specifying underlying assumptions & limitations. (d) the energy equation to broadly-defined pipeline problems, specifying underlying assumptions & limitations.
LO3	Derive, apply & estimate the flow-rate to broadly-defined open channel problems, specifying underlying assumptions & limitations.
LO4	Derive, apply & analyse (a) the flow in broadly-defined pipe network problems, specifying underlying assumptions & limitations. (b) the flow in broadly-defined pumped system problems, specifying underlying assumptions & limitations.
LO5	Carry out tests and analyse & interpret data on fluids & hydraulic structures.
LO6	Use appropriate software tools to present findings from tests on fluids & hydraulic structures.

Pre-requisite learning
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*
No recommendations listed
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*
Bachelor of Engineering (Ordinary) in Civil Engineering

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Module Content & Assessment

Indicative Content
Fluid Properties (a) Fluids Vs Solids (b) Newtonian & Non-Newtonian Fluids (c) Properties of Fluids
Statics (a) Pascal's Law (b) Pressure measurement using manometers (c) Forces on Submerged Surfaces
Fluid Dynamics (a) Flow Characteristics (b) Streamlines & Streamtubes (c) Fluids in Motion- Conservation of Mass, Energy and Momentum (d) Venturimeters & Orifices (e) Weirs and Notches
Real Fluids (a) Laminar, Transitional & Turbulent Flows (b) Boundary Layers
Flow of Water in Pipes (a) Ideal fluid flow in a piped system (b) Real Fluid flow in a piped system (c) Frictional head losses (d) Local Head losses
Open Channel Flow (a) Types of Flow (b) Properties of Open Channels (c) Fundamental Equations (Conservation of Mass, Energy & Momentum) (d) Velocity Distribution in Open Channels (e) Laminar and Turbulent Flow (f) Critical, sub-critical and super-critical flow (g) Froude Number (h) Uniform Flow: (i) Application of Energy equation for Rapidly Varied Flow; (ii) Application of Momentum equation for Rapidly Varied Flow (i) Gradually Varied Flow: (i) Classification of profiles; (ii) How to determine the surface profile; (iii) Method of solution for the Gradually Varied Flow equation (j) Critical Depth Meters
Pipe Network Analysis (a) Loop Method (b) Nodal Method (c) Matrix Method
Pumps (a) Hydraulic gradient in pump-pipeline systems (b) Multiple pump systems (c) Variable speed pump operation (d) Suction lift limitations

Assessment Breakdown	%
Project	40.00%
End of Module Formal Examination	60.00%

No Continuous Assessment

Project				
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Project	No Description	1,2,3,4,5,6	40.00	n/a

No Practical

End of Module Formal Examination				
Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	No Description	1,2,3,4	60.00	End-of-Semester

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	30 Weeks per Stage	3.00
Estimated Learner Hours	30 Weeks per Stage	4.00
	Total Hours	210.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_CMHCE_B	Bachelor of Engineering (Honours) in Civil Engineering - Ab Initio	5	Mandatory
CW_CMCEN_B	Bachelor of Engineering (Honours) in Civil Engineering - Add On	1	Mandatory