

# ENGR H4505: Hydraulics I

Module Title:		Hydraulics I				
Language of Instruction:		English				
Credits:	Credits: 10					
NFQ Level:	8					
Module Deli	vered In	2 programme(s)				
Teaching & Strategies:	Learning	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 Ou	itcomes					
On successf	ul completion	f 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 & 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. (d) the energy equation to broadly-defined pipeline problems, specifying underlying assumptions.					
LO3	Derive, apply & estimate the flow-rate to broadly-defined open channel problems, specifying underlying assumptions & limitations.					
LO4		& analyse (a) the flow in broadly-defined pipe network problems, specifying underlying assumptions & ) the flow in broadly-defined pumped system problems, specifying underlying assumptions & limitations.				
LO5	Carry out tes	ts and analyse & interpret data on fluids & hydraulic structures.				
LO6	Use appropr	ate software tools to present findings from tests on fluids & hydraulic structures.				
Pre-requisit	e learning					
	ommendation earning (or a p	s ractical 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						
<b>Requirements</b> This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.						
Bachelor of E	or of Engineering (Ordinary) in Civil Engineering					



## ENGR H4505: Hydraulics I

## **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 council of Cliffication 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 % of Assessment Date addressed total 60.00 Formal Exam No Description 1,2,3,4 End-of-Semester

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



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# Workload Frequency Workload Type Frequency Average Weekly Lecture 30 Weeks Solution Estimated Learner Hours 30 Weeks 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			