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| 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 | |
| <i>On successful completion of this module the learner should be able to:</i> | |
| 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 <i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i> | |
| No recommendations listed | |
| Incompatible Modules <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i> | |
| No incompatible modules listed | |
| Co-requisite Modules | |
| No Co-requisite modules listed | |
| Requirements <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i> | |
| Bachelor of Engineering (Ordinary) in Civil Engineering | |

Module Content & Assessment

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| 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 | | | | |
|------------------------|-------------------------------|--------------------------|-------------------|------------------------|
| <i>Assessment Type</i> | <i>Assessment Description</i> | <i>Outcome addressed</i> | <i>% of total</i> | <i>Assessment Date</i> |
| Project | No Description | 1,2,3,4,5,6 | 40.00 | n/a |

No Practical

| End of Module Formal Examination | | | | |
|---|-------------------------------|--------------------------|-------------------|------------------------|
| <i>Assessment Type</i> | <i>Assessment Description</i> | <i>Outcome addressed</i> | <i>% of total</i> | <i>Assessment Date</i> |
| 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

Module Workload

| Workload: Full Time | | |
|----------------------------|--------------------|--|
| <i>Workload Type</i> | <i>Frequency</i> | <i>Average Weekly Learner Workload</i> |
| 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 |