Liverpool John Moores University

Title:	FLUID MECHANICS AND HYDRAULICS FOR CIVIL ENGINEERING
Status:	Definitive
Code:	**5505ICPDCE** (127072)
Version Start Date:	01-08-2021
Owning School/Faculty:	Civil Engineering and Built Environment
Teaching School/Faculty:	ICBT, Colombo

Team	Leader
Alison Cotgrave	Y

Academic Level:	FHEQ5	**Credit Value:**	20	**Total Delivered Hours:**	24
Total Learning Hours:	200	**Private Study:**	176		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	15
Practical	6

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	Written Examination (Closed Book)	100	3

Aims

The aim of this unit is to develop learners' skills in determining hydrostatic principles, fluid and hydraulic parameters for pipelines and channels in civil engineering projects.

Learning Outcomes

After completing the module the student should be able to:

1. Evaluate the forces associated with static fluid systems
2. Analyse the behavioural characteristics and parameters of fluid flowing in pipelines
3. Determine pipe size and pumping requirements for fluid flowing in pipelines
4. Apply theories of fluid behaviour in open channel systems to civil engineering problems

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Examination	1	2	3	4

Outline Syllabus

Properties of fluids: Density, viscosity, surface tension, compressibility. Hydrostatic pressure: Static pressure and head, pressure at a point, centres of pressure on submerged planes, both inclined and vertical, buoyancy and stability of floating bodies.
Pipe systems and networks: equations for frictional loss, Darcy/Manning's/Hazen-Williams formulae, relationships between coefficients, Moody diagram, iterative methods for pipe network analysis (Hardy Cross method), transient flow in pipes, incompressible water column theory, elastic theory of water hammer, sudden/gradual closure and valve opening, strain energy water hammer theory, fundamental differential equation of water hammer, velocity of propagation end conditions, reflection at a reservoir, surge tanks (purpose, type, frictional effect, theory of mass), oscillation (simple finite difference methods of solution, solutions using scale models)
Uniform flow in open channels: normal depth, economic/optimum section, flow under sluice gates
Relationship between inlet and discharge: critical depth, minimum specific energy in a rectangular channel, discharge through Venturi flumes, and flow over broad crested and crump weirs (discharge-head equations), flow through channels, compound sections, e.g. flooded river channels, flow from reservoirs and entry losses, planned energy losses at dam spillways and stilling basins
Fluid flow concepts for pipes and open channels: streamlines, velocity variations and velocity profile across pipe and channel sections, significance of Reynolds and Froude number, laminar and turbulent flow
Steady and unsteady flow in channels: channel transitions and over weirs, flow profile through a Venturi flume, formation of hydraulic jumps downstream of spillways, weir and gates, discharge characteristics of weirs, measure the velocity of approach, preparation of head discharge and coefficient of discharge
Flow measurement in pipes and channels: Pitot static tube, current meters, Venturi meter, Orifice meter, rectangular notch, V notch

Learning Activities

Students will be supported in their learning, to achieve the above learning outcomes, in the following ways:

By a series of lectures and tutorials and through participation within lab practical sessions for problem solving.
Self-managed investigative study to analyse cases related to the industry
In-class participation and case studies are key features of this module.
A recommended resource list - indicating key reading, internet support and physical learning assistance, is provided to help enable students to undertake self-directed study.

Notes

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