Fluid Mechanics and Hydraulics for Civil Engineering

Module Information

2022.01, Approved

Summary Information

Module Code	5505ICPDCE
Formal Module Title	Fluid Mechanics and Hydraulics for Civil Engineering
Owning School	Civil Engineering and Built Environment
Career	Undergraduate
Credits	20
Academic level	FHEQ Level 5
Grading Schema	40

Teaching Responsibility

LJMU Schools involved in Delivery
LJMU Partner Taught

Partner Teaching Institution

Institution Name
International College of Business and Technology

Learning Methods

Learning Method Type	Hours
Lecture	15
Practical	6

Module Offering(s)

Display Name	Location	Start Month	Duration Number Duration Unit
SEP-PAR	PAR	September	12 Weeks

Aims and Outcomes

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.

After completing the module the student should be able to:

Learning Outcomes

Code	Number	Description
MLO1	1	Evaluate the forces associated with static fluid systems
MLO2	2	Analyse the behavioural characteristics and parameters of fluid flowing in pipelines
MLO3	3	Determine pipe size and pumping requirements for fluid flowing in pipelines
MLO4	4	Apply theories of fluid behaviour in open channel systems to civil engineering problems

Module Content

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 gatesRelationship 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 basinsFluid 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 flowSteady 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 dischargeFlow measurement in pipes and channels: Pitot static tube, current meters, Venturi meter, Orifice meter, rectangular notch, V notch
Module Overview	
Additional Information	

Assessments

Assignment Category	Assessment Name	Weight	Exam/Test Length (hours)	Module Learning Outcome Mapping
Exam	Examination	100	3	MLO1, MLO2, MLO3, MLO4

Module Contacts

Module Leader

Contact Name	Applies to all offerings	Offerings
Alison Cotgrave	Yes	N/A

Partner Module Team

Contact Name	Applies to all offerings	Offerings