

Liverpool John Moores University

Title: HYDRAULICS, WATER AND WASTEWATER
Status: Definitive
Code: **4111BEUG** (118099)
Version Start Date: 01-08-2016

Owning School/Faculty: Civil Engineering
Teaching School/Faculty: Civil Engineering

Team	Leader
Clare Harris	Y
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Academic Level: FHEQ4 **Credit Value:** 24 **Total Delivered Hours:** 91
Total Learning Hours: 240 **Private Study:** 149

Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	48
Practical	16
Tutorial	24

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Exam	AS1	EXAM	70	3
Artefacts	AS2	ARTEFACT	15	
Report	AS3	REPORT	15	

Aims

To introduce and then consolidate students' knowledge to the concepts, theory and application of fluid mechanics, Hydraulics and wastewater and establish their relevance in civil engineering.

To demonstrate and explore key hydraulic phenomena through experimentation.

To study further problems concerning open channel flow.

To study engineering design principles of pipe networks.

Learning Outcomes

After completing the module the student should be able to:

- 1 Identify the properties and nature of a fluid, and evaluate the forces associated with static and dynamic fluids.
- 2 Analyse the flow of water in open channels and pipelines and apply Pipe Network Analysis in conjunction with the knowledge of fluid properties to design simple pipe networks.
- 3 Identify and select appropriate pump characteristics to suit a given hydraulic situation.
- 4 Discuss and critically analyse the concepts of sewage, sewerage and water and wastewater treatment and the sustainable design of the various plants involved.
- 5 Assess the environmental impact of water and wastewater
- 6 Present appropriate findings of experimental work.
- 7 Report on experimental work, including a risk assessment exercise.
- 8 Appreciate the errors in experimental work and how this can be evaluated.

Learning Outcomes of Assessments

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

Examination	1	2	3	4	5
Artifact	6				
Report	7	8			

Outline Syllabus

Properties of fluids: Density, viscosity, surface tension, compressibility.

Hydrostatic pressure: Static pressure and head, pressure at a point, Pascal's Law, relationship between pressure and head, measurement of fluid pressure and pressure differentials, centres of pressure on submerged planes, both inclined and vertical, buoyancy and stability of floating bodies.

Fluid dynamics; continuity equation, energy and momentum of a fluid, Bernoulli's equation for frictionless flow, practical flow measurement devices, energy losses in pipelines, design of gravity pipelines, pipe network analysis.

Hydraulic machines; pump characteristics, performance of a pump, pumps in series and parallel, specific speed, sustainable design of pump systems gradually varied flow, use of hydraulic structures for flow measurement, rise in bed level, flow Resistance, channel design, unsteady flow in open channels.

Introduction to Public Health Engineering; Sewage, composition, strength and quantity; Sewerage systems; Sewer flows and sizing.

Water Treatment: Introduction; water quality and standards, legislation, water classification and treatment systems. Coagulation, softening, mixing, flocculation, sedimentation, filtration, disinfection, adsorption, water plant waste management. Wastewater Treatment: legislation, municipal wastewater treatment, pretreatment, primary treatment, secondary treatment, sludge treatment, sludge disposal. Environmental impact of water and wastewater treatment works, water distribution systems, sewerage and hydraulic machinery. Sustainable design and water and wastewater treatment works.

Learning Activities

Lectures, tutorials and laboratory practicals.

Notes

The module provides students with an introduction to the inherent properties of fluids, predominantly water, both at rest and in motion and examines the behaviour of fluids in civil engineering applications. The module also includes an introduction to the principles of Municipal Engineering and sewerage systems. Water and Wastewater treatment principles are also examined.