Liverpool John Moores University

Title:	Hydrodynamics
Status:	Definitive
Code:	**6121MECH** (125072)
Version Start Date:	01-08-2018
Owning School/Faculty:	Maritime and Mechanical Engineering
Teaching School/Faculty:	Maritime and Mechanical Engineering

Team	Leader
Allan Carrier	Y

Academic Level:	FHEQ6	**Credit Value:**	20	**Total Delivered Hours:**	68
Total Learning Hours:	200	**Private Study:**	132		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	44
Tutorial	22

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Portfolio	AS1	Portfolio	30	
Exam	AS2	Examination	70	2

Aims

The principles of dynamic response of marine systems
Linear and nonlinear wave theories and their applications to marine systems (Fixed and floating vessels)
The concepts of potential flow theory and boundary element methods (panel method) applicable to finite and infinite flow
domains.
The concept of numerical methods to solving panel method problems.

Developing mathematical models to solve wave-structures interactions and to evaluate the hydrodynamic performance of the systems.

Learning Outcomes

After completing the module the student should be able to:

1	Apply the concepts of mathematical modelling of marine systems behavior in waves using mathematical functions to describe flows around simple geometries
2	Develop equations for solving flow problems for coupled fluid-structure-interaction problems based on basic knowledge of wave dynamics (wave types, flow regimes, boundary conditions and their effects on marine systems)
3	Apply appropriate numerical modelling techniques to develop mathematical models for solving potential flow problems involving flow superposition around bodies, flow separation and vortex shedding and lifts.
4	Critically evaluate the principles of marine systems behaviour in an ocean environment.

Learning Outcomes of Assessments

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

Portfolio	2	3		
Examination	1	2	3	4

Outline Syllabus

General revision of topics in fluid dynamics, Euler's equation of motions, Equation continuity, velocity potential, Bernoulli's equation, Laplace's equation, stream function, simple flows, conformal transformations, viscosity and lifting surface characteristics.

Wave characteristics: free surface conditions, linear waves, nonlinear effects, superposition of linear waves, ship response in waves (wave excitation forces and moments) – wave diffraction and radiation theories, added mass and damping.

Introduction to numerical modeling of marine hydrodynamic problems; finite difference method; finite element method and boundary element methods, inviscid and potential flows modeling using numerical method.

Ship behaviour in waves: see keeping, ship motions in regular and irregular waves, hydrostatic and hydrodynamic coefficients

Learning Activities

A combination of lectures and tutorials.

Notes

This module will provide a good grounding for those students wishing to pursue a career in the following marine related disciplines or industries: Marine Engineering Operations, Marine Engineering Design, Offshore Engineering, Ship design, Subsea Engineering and Shipbuilding.