NUMERICAL SHIP AND OFFSHORE HYDRODYNAMICS

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PRE-REQUISITES : Basic Fluid Dynamics, Numerical Methods (Optional)

INTENDED AUDIENCE : BE/ME/Ph,d Student in the field of Ocean Engineering and Naval Architecture, Mechanical Engineering, Civil Engineering, Industry personnel from Ship and Offshore Industry, Classification societies etc.

INDUSTRY SUPPORT : IRS (Indian Register for Shipping), Indian Navy, GRSE, Offshore Companies

COURSE OUTLINE :

This course will provide the thorough understanding of the several numerical methods in the domain of ocean engineering, broadly in the domain of wave structure interaction. The proposed course mostly focuses on different numerical methods based on potential theory, for example, zero and forward speed 3D frequency and time domain panel method, strip theory, time domain method based on Impulse response function etc. Also, at latter stage of the course, Hydroelasticity of ship will also be discussed. This is a comprehensive and contemporary course for industry personnel, undergraduate, masters and PhD level students in the domain of ocean engineering/ mathematics/civil engineering.

ABOUT INSTRUCTOR :

Prof. Ranadev Datta is now an associate professor in the department of Ocean Engineering Naval Architect, Indian Institute of technology Kharagpur, India. He did his PhD in the same department in Numerical Ship and Offshore Hydrodynamics. He worked in IST Lisbon, during 2009 to 2012. The primary research interest of Dr. Ranadev Datta is related to ship and offshore structure seakeeping, Hydroelasticity. He developed a higher order 3D time domain panel method to solve ship motion problems during his graduation. Presently, his research area includes hydroelasticity, nonlinear fluid structure interaction problem, computational geometry etc. He is now involved in a project supported by the Naval Research Board where they are trying to solve hydroelasticity problem by coupling the boundary element method (BEM) and finite element method (FEM) in time domain. Also working on the nonlinear wave- structure interaction problem; the focus is to find an efficient way to couple the classical potential flow method with popular CFD solvers; so that the local phenomenon such as deck wetness/ slamming can be modelled using CFD. Dr. Datta has worked on several industries related projects. He has helped IRS (International register for shipping) to develop their classification rule book. He also developed stability software for jack up Rigs with Green Palm Marine Consultancy. Apart from that, he did many small scale routine consultancy type project as well. Apart from his work related to numerical ship and offshore structure hydrodynamics, he is also keen in developing an automated meshing engine for ship like structure using the key concept of computational geometry.

COURSE PLAN :

Week 1: Basic Seakeeping with Tutorial
Week 2: Basic Wave Hydrodynamics with Tutorial
Week 3: Introduction to Boundary Element Method (Part 1)
Week 4: Boundary Element Method (Part 2) with Coding Tutorial that will be applied to solve finding added mass of a body in infinite fluid domain.
Week 5: 3D Frequency Domain Panel Method (Part 1)
Week 6: 3D Frequency Domain Panel Method (Part 2)
Week 7: Time Domain Panel Method using IFR with Coding Tutorial. The tutorial will help you to write a code to predict motion of a ship using IRF. Introduce non linear load such as slamming load in IRF solution.
Week 8: Strip Theory With Coding Tutorial on how to calculate 2-D added mass of ship shape body
Week 9: Time Domain Panel method (Part 1)
Week 10: Time Domain Panel Method (part 2) With Coding Tutorial on numerically calculate the Green’s function.
Week 11: Numerical Method for Hydroelasticity