Computational Methods in Hydroelasticity

……

Overview

Hydroelasticity deals with the mutual interaction among hydrodynamic forces with flexible structures. In this class of problems, the elastic deformations of the body are dependent on the hydrodynamic forces and vice versa, requiring simultaneous solution to both the elastic and fluid equations of motion. In the last two decades, there has been a growing interest in hydroelastic problems due to their wideranging applications in different branches of science and engineering, such as biology, medicine, ocean and polar engineering. In ocean and polar engineering, hydroelasticity deals typically with the interaction of hydrodynamic forces with flexible structures such as the ice covered ocean, long pipelines used for carrying oil and gas from the sea floor to tankers, very large floating structures such as floating airports, floating bridges, floating terminals, very large ships, floating oil storage tanks, flexible breakwaters, floating flexible cages and many more. One of the main advantages of hydroelasticity theory is that it allows more accurate prediction of the coupled fluid-structure system. In contrast to the problems associated with fluid interaction with rigid bodies, the mathematical theory of hydroelasticity and the associated mathematical methods for solving the complex hydroelastic problems are not well-developed in the literature, and are the subject of significant current research.

In the proposed course, the basics of water waves and flexible structures arising in the field of ocean engineering will be introduced. Thereafter, the importance of hydroelasticity and the difficulties of handling the associated problems will be discussed. Various numerical tools, their background, advantages and disadvantages, and the global trends for future developments in the computational methods will be covered through a sequence of lectures. The participants will be made aware of the international state of the art in the computational approaches to hydroelastic problems arising in Marine Technology and Arctic Engineering. The emphasis will be on Boundary Integral Equation Methods (BIEM), Boundary Element Methods (BEM), Finite Element Methods (FEM) and Spectral methods. Several case studies both in frequency domain and time domain which have application in the area of Marine Science and Technology as well as Cold Region Science and Technology will be discussed. These case studies will begin with simple models which will be developed and expanded to analyse marine structures as complex as very large container ships. The course is planned and offered as per the norms set by IIT Kharagpur for GIAN programme.

Module	• **Brief review on modelling typical problems which arise in hydroelasticity.** • **Computational methods for solving analytically and numerically the mathematical problems of hydroelasticity** **Duration: 12 -16, December, 2016** **Number of participants for the course will be limited to fifty.**
You Should Attend If…	This course is designed for B.Tech / M.Tech / Ph. D. students of Ocean Engineering and Naval Architecture, Mechanical Engineering, Civil Engineering, Mathematics and Physics, who will benefit by learning contemporary computational approaches to solve hydroelastic problems which arise in the field of Ocean Engineering. Moreover, industry experts, young faculty and researchers from industry, academic institutions and technical institutions are welcome to register for this course.
Fees	**Registration fees are waived for the internal candidates** **Participants from abroad**: US $400 **Industry/ Research Organizations:** Rs. 10000/- **Academic Institutions:** **College/University Teachers:** Rs. 5000/- **Students:** Rs. 3000/- The above fees include all instructional materials, computer use for tutorials, 24 hr free internet facility. The participants will be provided with single bedded accommodation on payment basis.

The Faculty

Dr. Mike Meylan is currently an Associate Professor of Mathematics in the School of Mathematical and Physical Sciences at The University of Newcastle in Newcastle, Australia. He is an expert in wave scattering in both the time and frequency domain. Much of his research has been connected with water wave scattering, especially with hydroelasticity. However, he has also worked in photonics and more general wave scattering theory. He has strong interests in the connection between the frequency and time domain problems and in the phenomena of near trapping. Another major focus of his research has been on understanding the process of wave scattering in the Marginal Ice Zone. This is an extremely complicated wave scattering problem which is very poorly understood. He has been involved in the developement of some of the most important models in wave-ice interaction in the last twenty years.

Professor Trilochan Sahoo is at present the head of the Department of Ocean Engineering and Naval Architecture, Indian Institute of Technology Kharagpur. His area of specialization is Marine hydrodynamics. His research interests are devoted in the fields of Hydroelasticity, Wave-Structure Interaction and Coastal Engineering.

Dr. Joydip Bhattacharjee is an Assistant Professor in the Department of Ocean Engineering and Naval Architecture, Indian Institute of Technology Kharagpur. His research interest lies in the broad area of Marine Hydrodynamics that includes dynamics of wave energy converters, floating and submerged flexible breakwater systems, wave interaction with variable bottom topography and other related wave-structure interaction problems.

Course Co-ordinator

Principal Coordinator:

Professor Trilochan Sahoo
Professor & Head
Department of Ocean Engineering
and Naval Architecture
IIT Kharagpur
Tel: +91 3222 282958 (O), 282959 (R)
Mobile: +91 9434017379
Email: tsahoo1967@gmail.com

Co-Coordinator:

Dr. Joydip Bhattacharjee
Assistant Professor
Department of Ocean Engineering
and Naval Architecture
IIT Kharagpur
Tel: +91 3222 283794 (O), 260340 (R)
Mobile: +91 7797437020
Email:
joydip.bhattacharjee@gmail.com

.....