

# Nonlinear Wave-Structure Models in Offshore and Naval Industry

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## Overview

This course is devoted to the interactions between ocean waves and marine structures. The linearized theory for wave-structure interactions, which is the basis for the state of the art software used in the industry, is described in details. In addition, different levels of approximation for the nonlinear problem are described, and the influence of second and higher order nonlinear effects is explained and illustrated. The developed software tool to understand the wave-structure interactions from LHEEA will be presented. These numerical models are widely used for research and industrial applications.

The objective of this course is to give a complete presentation of the available models for the determination of marine structures response in a seaway, emphasizing the advantages and drawbacks of each approach.

A complete presentation of the linearized theory of wave-body interactions, treated in a deterministic sense, is first given. Both frequency domain and time domain approaches are described. Fundamental relations between both solutions are systematically emphasized. High and low frequency second order effects are explained and illustrated.

The course will describe the available nonlinear theories and numerical models for wave-structure interactions that are used in the Industry. Different levels of approximation are described, from the simple addition of nonlinear hydrostatics to fully nonlinear time domain models.

Course participants will learn these topics through lectures. Also case studies and assignments will be shared to stimulate research motivation of participants.

<b>Course Dates</b>	<b>27<sup>th</sup> March, 2019 – 02<sup>nd</sup> April, 2019</b> <b>Number of participants for the course will be limited to fifty.</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ you are an ocean engineer/Offshore engineer/naval architect or research scientist interested in designing marine structures.</li> <li>▪ you are Engineer and/or R&amp;D professional from industries and/or R&amp;D professional from government R&amp;D labs interested to learn the development of the numerical models for industry applications.</li> <li>▪ you are a student (M.Tech/MS/PhD or senior level B.Tech) or faculty from academic institution interested in learning how to do research on nonlinear wave structure interactions.</li> </ul>
<b>Fees</b>	<p>The participation fees for taking the course is as follows:  <b>Participants from abroad : US \$500</b>  <b>Students: INR 1000</b>  <b>Industry/ Research Organizations: INR 15000</b>  <b>Academic Institutions: INR 5000</b>  <u>Payment:</u>  <b>Account Name: CCE IIT Madras</b>  <b>Acc. No: 36401111110; Branch: SBI, IIT Madras Branch, Chennai</b>  <b>IFSC Code: SBIN0001055; Swift Code: SBININBB453</b></p> <p>The above fee includes all instructional materials and assignments. The participants will be provided with accommodation on payment basis depending upon the availability.</p>

## The Faculty



**Prof. Pierre FERRANT** is in the faculty of Ecole Centrale de Nantes, France. He is the head of the Research Laboratory in Hydrodynamics, Energetics and Atmospheric Environment (LHEEA). His research interests include Nonlinear water wave generation and propagation, freak waves, impact, sloshing, fluid-structure interaction, nonlinear wave-current-structure interactions, ship flows; Numerical & Experimental approaches: Coupled methods for wave-structure interactions, spectral methods for nonlinear free surface flows, boundary element methods, model basin experiments.



**Dr. V. Sriram** is an Associate Professor at Indian Institute of Technology, Madras. His research interest is numerical modelling of nonlinear wave-structure interactions; Particle method; Hybrid modelling; violent wave – elastic structure interactions; Experimental modelling of wave impacts with structures; Long wave modeling.

## Course Co-ordinator

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