

# Extreme Waves in Ocean Engineering

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## Overview

The planning and design of any offshore installation requires the operational and extreme wave characteristics as a primary input. This course will describe the theoretical background for the prediction/ estimation of extreme waves based on the sound physical principles and statistical analysis.

An overview of theories to represent ocean waves for marine engineering is described in this course. Theory of wind generated waves is firstly proposed. Then, the Quasi Determinism theory for representing wave groups when a high wave occurs is introduced. The formal derivation as well as the applications for marine engineering is described, both for linear waves (Gaussian sea) and including non-linear effects. Some application to wave-structure interaction is shown.

Finally, the long-term statistics will be described by applying the theory of Equivalent Power Storms (including Equivalent Triangular Storms). It is shown as this approach enables to determine solutions for return period of extreme waves, which are useful for the design of ocean structures.

Each topic will be described giving a general overview of the detailed proofs. Then, possible applications are shown either to describe wave groups in an undisturbed field and for diffraction problems, or to determine design waves for structural applications.

Course participants will learn these topics through lectures and case studies. Assignments/ tutorials will stimulate the participants interest in the understanding of the subject.

<b>Dates for the Course</b>	<b>21<sup>st</sup> March 2016 to 1<sup>st</sup> April 2016</b>
<b>Host Institute</b>	<b>IIT Madras</b>
<b>No. of Credits</b>	<b>2</b>
<b>Maximum No. of Participants</b>	<b>25</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>▪ You are a Civil/Mechanical/ Marine engineer or Naval architect interested in understanding ocean waves.</li><li>▪ You are an Oceanographer or Physics background interested to learn theoretical basics of extreme ocean waves.</li><li>▪ You are a student or faculty from academic institution interested in learning how to initiate a course or to obtain a research theme in Extreme Ocean Waves.</li></ul>
<b>Course Registration Fees</b>	<p>The participation fees for taking the course is as follows: <b>Student Participants:</b> Rs.2000 <b>Faculty Participants:</b> Rs.6000 <b>Government Research Organization Participants:</b> Rs.10000 <b>Industry Participants:</b> Rs.20000</p> <p>The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges.</p> <p><b>Mode of payment: Demand draft in favour of "Registrar, IIT Madras" payable at Chennai</b></p>
<b>Accommodation</b>	<p>The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: <a href="http://hosteldine.iitm.ac.in/iitmhostel">http://hosteldine.iitm.ac.in/iitmhostel</a></p>

## Course Faculty



**Felice Arena** is Professor in Ocean Engineering and Director of the Natural Ocean Engineering Laboratory (NOEL - [www.noel.unirc.it](http://www.noel.unirc.it)) at Mediterranean University of Reggio Calabria (Italy). His fields of interest for the research activity

include: nonlinear sea waves; short-term and long-term statistics of ocean waves; random forces of sea waves on either coastal or offshore structures; new devices for absorption of wave energy, either to protect a coast or to produce electrical power. He has published more than 200 papers in international journals, books and conference proceedings. He mentored 14 graduated PhD students in Ocean Engineering. He also mentored 8 Post-Doc students. He has served in the scientific committees of many national and international conferences. He is Senior Member, in the PIANC, of the Working Group "Renewable Energy for Maritime Ports" (since 2012).



**Prof. S.A. Sannasiraj** is a faculty of Department of Ocean Engineering, Indian Institute of Technology Madras. His research interest includes wave modeling, wave energy, data assimilation, dynamics of wave breaking & impact on offshore

structures and Nonlinear free surface wave simulation using FEM and particle methods to simulate wave impact on vertical wall and piles. He is currently coordinating a research project on the Development a new method of regime characteristics assessment for wind and extreme wave along the Indian coast.

## Course Coordinator

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