A GIAN Course on

Marine Energy and Blue Economy

IIT Madras, December 09 -20, 2024

Course Overview

The course Marine Energy and Blue Economy introduces fundamental concepts of floating bodies, different energy converters, system components, and design strategies. Lectures delve into wave dynamics, exploring wave motions and the properties of irregular waves. Students will learn about wave-structure interactions and single and multi-body wave energy converters in frequency and time domains.

The course includes simulation tools to study and understand wave energy converter (WEC) behavior. The curriculum covers Power Take-Off (PTO) design for WECs and various control challenges and methods to improve system efficiency. Students will also learn about WEC controller design, which is crucial for optimizing energy extraction and system performance. The course includes laboratory demonstrations. The course also emphasizes other marine energy sources, such as tidal and ocean current energy and ocean thermal energy systems.

The objectives of the course are:

- To impart the fundamental concepts of wave-structure interactions and hydrodynamics.
- To discuss various marine energy converters, such as WEC, tidal energy converters, and ocean current energy converters.
- To discuss details for marine system design strategy.
- To demonstrate marine energy systems through lab experiments

Course Information	**Dates – 09th to 20th December 2024** • Topics covered- Vibrations basics, introduction to WECs, wave motions, irregular waves, wave structure interactions, Single body WEC frequency and time domain, multibody WEC, WECsim simulations, Oscillating Water Column, WEC PTO design and control, WEC dimensional analysis, Power electronics, Tidal and Ocean Current energy, Marine energy environments. • Laboratory experiments
Who can attend	Students at all levels (BTech/MSc/MTech/PhD) or faculty from • IITs/NITs/Universities/ colleges/other institutes. • Engineers and industry professionals. • Faculty members/ postdocs/ scientists. Number of participants for the course will be limited to sixty. Registration will be based on a first-come, first-serve basis.
Fees	The participation fees for taking the course are as follows: • Students: INR 2000 • Faculty/ Scientists/ Postdocs: INR 10000 • Industry: INR 15000 • International participants: USD 500. The above fee covers the cost of course material and event management.
Accommodation	Classes will be held at IIT Madras, Chennai. Hostel accommodation for students may be available on a payment basis. Request for hostel accommodation may be submitted through the below link http://hosteldine.iitm.ac.in/iitmhostel/

Registration Procedure	Please follow the following steps for the registration: Enroll for the course: Marine Energy and Blue Economy in the below link and pay the fee https://code.iitm.ac.in/code-programs/gian-registration/

The Course Instructors

Prof. Lei Zuo, the Herbert C. Sadler Collegiate Professor of Engineering at the University of Michigan, is an expert in marine renewable energy, energy harvesting, and advanced manufacturing. He completed his PhD at MIT and has led over 90 funded projects. Dr. Zuo has authored 370 papers, won over 15 best paper awards, and holds over 10 US patents. He has supervised over 70 Ph.D. and master's students. His accolades include the 2017 ASME Leonardo da Vinci Award, the 2015 ASME Thar Energy Design Award, and two R&D 100 Awards. He also serves as an editor for several prestigious journals.

LinkedIn: https://www.linkedin.com/in/prof-lei-zuo-a3a54b16/

Prof. Abdus Samad, a professor in the Ocean Engineering department at IIT Madras, completed his bachelor's and master's at Aligarh Muslim University and his PhD in mechanical engineering at Inha University, South Korea. His research focuses on marine energy, particularly point absorbers and tidal/hydro turbines. He has led 38 projects funded by prestigious agencies, including the Australian Consulate General and the Indian government. Prof. Samad has received 20 awards, including the Sustainability Champion Award from IIT Madras and the DUO-India fellowship. He has published 115 research papers, 9 book chapters, and holds 6 patents. He has also supervised 57 postgraduate students.

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Dr. Vijay K G is an Assistant Professor in the Department of Ocean Engineering at IIT Madras since March 2021. Before joining, Dr Vijay worked in the subsea flexibles industry (Oceaneering and Technip) for 4.5 years. Dr Vijay primarily works on the numerical and experimental modeling of fluid-structure interaction problems. His research interests are coupled dynamics of risers, wave energy converters, floating offshore wind turbines, Subsea Umbilicals, Flowlines and Risers (SURF), etc. He obtained his M.Tech (Ocean Engineering) from IIT Madras and PhD (Ocean Engineering) from IIT Kharagpur. Dr. Vijay handles three sponsored projects as Principal Investigator in the DST-SERB Startup Research Grant, DRDO-Naval Research Board, and the MOES- National Institute of Ocean Technology. Dr. Vijay is guiding six PhD scholars in the spectrum of ocean engineering. He has published 30+ research papers.

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Course Co-ordinators

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