

**INSPIRE  
INNOVATE  
SUSTAIN**

UN Endorses Oceans 2022



2021 United Nations Decade  
of Ocean Science  
for Sustainable Development

IEEE  
Oceanic  
Engineering Society



marine technology  
SOCIETY  
Opportunity runs deep™



**OCEANS**  
CONFERENCE & EXPOSITION

**February 21-24, 2022 | IIT Madras Research Park, Chennai**

## TUTORIALS

(February 21, 2022 | IC&SR Building, IIT Madras)

As part of the pre-conference activity, eight tutorial sessions were conducted on February 21, 2022. The sessions were held online on a virtual conference platform created exclusively for OCEANS 2022.

Six half day and two full day tutorials were scheduled over the day, considering the time zone of the instructors being from different parts of the world.

The first tutorial on Study of Oceanographic Flows by Prof. P. Ananthkrishnan from IIT Madras kick started the tutorials session at 0800 hrs IST followed by Design in Nature and its Applications in Ocean Engineering by Dr S.B Pranesh and Mr. Rahul Bharti, scientists from NIOT. These were half day sessions.

The tutorial on study of Oceanographic flows started from basic principles of Physics, the modeling of ocean flows such as wind-driven currents and pressure-driven geostrophic flows, and shed light to better understanding of the physical ocean. Fundamentally, it covered, different features of oceanographic flows in contrast to small-scale engineering flows, and also commonality with large-scale atmospheric flows and planetary flows. Dr Ananthkrishnan discussed several subtle aspects of ocean-flow analysis that may not be easily trackable in the texts on the subject. Fascinating features of oceanographic observations such as westward intensification and topographic steering of currents were discussed based on the concept of potential vorticity and its conservation.

Dr S.B Pranesh presented about how we can inspire and learn from nature—the science of studying nature's models and taking inspiration from them to solve engineering problems. He presented about how application of biological growth method in both viewport and spherical shell results in a considerable reduction of stress. It is found from the studies that hydrophobic surfaces (Lotus effect) allow noticeable slip in the range of nanometres to microns and thus achieve drag reduction. Tuna-based oscillating propulsion mechanism is a bio-inspired propulsion system imitating how aquatic animals adapt to propel them forward. Murray's law in manifolds and hydraulic circuits is originally obtained from a study of mammalian cardiovascular systems; it provides the bio-mimetic design rule for micro-fluidic systems composed of arbitrary cross-sections. Towards the end they discussed about the design tools and its applications in Ocean Engineering.

**Conference Secretariat:**

OCEANS Conference & Exposition 2022

Department of Ocean Engineering, IIT Madras, Chennai - 600036.

Email: [info@chennai22.oceansconference.com](mailto:info@chennai22.oceansconference.com) | Website: [www.chennai22.oceansconference.org](http://www.chennai22.oceansconference.org)

Patrons



**INSPIRE  
INNOVATE  
SUSTAIN**

UN Endorses Oceans 2022



IEEE

Oceanic  
Engineering Society



marine technology  
SOCIETY  
Opportunity runs deep™



**OCEANS**  
CONFERENCE & EXPOSITION

**February 21-24, 2022 | IIT Madras Research Park, Chennai**

The full days tutorials were given by Prof. Karl von Ellsessions, Libera Università di Bolzano, Italy on the topic Fundamentals of Marine Vehicle Control and by Prof R Sundaravadivelu, IIT Madras on the topic Deepening of ports in India.

The lecture on topic "Fundamentals on Marine Vehicle Control" was handled by Prof. Karl Von Ellenrieder. The lecture had started with a exciting introduction on basic marine control system like open, closed loop system and also discussed the basic components in a control system and their characteristics behavior. The presenter touched upon the linear and nonlinear dynamics control method and stability analysis of marine vehicle. The maximum focus of the session is on the mathematical importance on the overall control of marine vehicle in its course at sea. Finally, based on these the control of under actuated vehicle and its mechanism were discussed in depth. The session was very interactive and lively with healthy conversation between the presenter and the audience with related questions about the topic.

Prof. Sundaravadivelu presented a wonderful lecture on deepening of ports in particular to dredging and blasting. He presented deepening of channel and extension of berths by pile driving close to the old berth at Tuticorin. The design and construction methodology, while the existing berth is in operation and demotion of old structures by controlled blasting with monitoring of vibration of nearby structures were highlighted for Visakhapatnam port. The lock gate free Haldia dock complex and the various studies carried out for opening a new entrance so that the vessels can be berthed were also presented. He explained the modifications required in the existing structures for deepening of ports. These sessions not limited to academic research but also includes most of the field cases like Vizag port, Tuticorin port with an active participation from industrial attendees.

Dr. Pushp Bajaj and V.Adm. Pradeep Chauhan, National Maritime Foundation in New Delhi, India discussed about Collapsing Marine Biodiversity and its Implications for the Blue Economy - How You Can Help Reverse This. This tutorial aimed to highlight the many ways in which accelerating climate change, overexploitation and mismanagement, and ever-growing marine pollution are transforming the chemical and physical characteristics of the world's ocean basins and how this ongoing chemical and physical transformation of the oceans will have profound implications for marine life, Earth's climate, coastal human populations, and ocean-based economies around the world. The tutorial discussed the wide-ranging adverse impacts of the ongoing changes in the marine food-web on the Blue Economy of India and other coastal and island nations around the world, and how the young citizens, entrepreneurs, conservationists, academics, policy makers and shapers, can affect change and contribute towards building a sustainable Blue Economy that protects and preserves our planet's incredibly rich ocean biodiversity.

**Conference Secretariat:**

OCEANS Conference & Exposition 2022

Department of Ocean Engineering, IIT Madras, Chennai - 600036.

Email: [info@chennai22.oceansconference.com](mailto:info@chennai22.oceansconference.com) | Website: [www.chennai22.oceansconference.org](http://www.chennai22.oceansconference.org)

Patrons



**INSPIRE  
INNOVATE  
SUSTAIN**

UN Endorses Oceans 2022



2021 United Nations Decade  
of Ocean Science  
for Sustainable Development

IEEE

Oceanic  
Engineering Society



marine technology  
SOCIETY

Opportunity runs deep™



**OCEANS**  
CONFERENCE & EXPOSITION

**February 21-24, 2022 | IIT Madras Research Park, Chennai**

Another half day tutorial was taken by Prof. Francisco Presuel-Moreno, Florida Atlantic University on Corrosion Control and Mitigation for Materials Used in the Ocean. Prof Francisco gave detailed introduction to corrosion, forms of corrosion, factors that affect corrosion in the ocean and mitigation techniques for corrosion control. He discussed basic concepts of corrosion for alloys and how the ocean environment affect corrosion. He touched upon the main techniques used for corrosion control. material selection, coatings, and cathodic protection.

Dr. Anders Tengberg, University of Gothenburg/Chalmers University of Technology, Sweden discussed about Oxygen Measurements in Ocean. This tutorial presented recent findings on oxygen dynamics and how sensors can be handled in the field to improve the data quality. The challenges of measuring in low oxygen environments and the shortcomings of the reference method, Winkler titration, were discussed. Pressure effects on the sensing foils in deep water was presented and results from new developments like trace O<sub>2</sub> detection and more stable foils with better deep sea pressure behaviour was presented

Lastly Prof. Nikolas Xiros, University of New Orleans USA discussed about Dynamical Systems for Harnessing Water Wave Power. The tutorial discussed about the control theory of nonlinear systems. He discussed about how for a wide class of nonlinear systems; the non-linearity appears as coupling between spectrally decoupled parts of the system. This nonlinear coupling between parts of the system requires specific treatment, using advanced mathematical tools like Hilbert Transform which was discussed in detail.

These tutorials were attended by around 70 delegates.

**Conference Secretariat:**

OCEANS Conference & Exposition 2022

Department of Ocean Engineering, IIT Madras, Chennai - 600036.

Email: [info@chennai22.oceansconference.com](mailto:info@chennai22.oceansconference.com) | Website: [www.chennai22.oceansconference.org](http://www.chennai22.oceansconference.org)

Patrons

