



Indian Institute of Technology

Course Details Report

Course No: OE5010

Course Name: Oceanography

Course Type:

Theory

Description:

The objective of the course is to provide students with a basic knowledge of oceanic features and oceanographic flows which is essential for design and operation of marine vehicles and ocean engineering systems.

Course Content:

Introduction to Oceanography – Scientific concepts of its sub-disciplines namely physical, geological, chemical, biological, acoustical and optical oceanography; Understand the complexity of the sea as a natural system with the various physical, chemical, biological, and geological processes.

Physical Oceanography – scientific concepts, seawater and its properties – temperature, salinity, pressure, depth, and density; pressure effects on temperature and density; TS diagrams, water types and water masses; conservative and non-conservative properties; scales of motion; Ocean circulation – Conservation equations and transport processes, momentum balances, geostrophy, large scale circulation, wind-driven circulation, abyssal ocean circulation, boundary currents, friction and Ekman layers; Waves – Origin and evolution, characteristics, classification, Tsunami, Tides – Origin, characteristics, tidal generation forces, equilibrium tide, tidal analysis and prediction, Vorticity – characteristics and types of vortices and their applications; Methods and measurements, observational tools, data analysis and methods; Special topics of current interest (El-nino, global warming, sea-level rise, coastal development, and environmental issues (contamination, oil spills, exploitation) are presented.

Geological Oceanography – Origin of Earth, geodynamics, plate tectonics and Isostasy, continental drift and seafloor spreading, structure and evolution of ocean basins (continental margins, deep abyssal plains, ridges and trenches, sediments); Marine provinces, hypsography, technology; the geochemistry of seawater (salinity, dissolved and particulate matter, nutrient cycles, particulate fluxes and sedimentation); Marine sediments – Formation, types, distribution and classification; Deep-sea currents, processes and deposits; Mineral resources and exploration methods; Coastal morphodynamics and processes, coastal classification; Sea level changes and paleoceanography, important tools and techniques used by geological oceanographers.

Text Books:

1. J. Weisberg, and H. Parija, Introductory Oceanography, McGraw Hill, Tokyo, 1974.
2. J.M. McCormick, and J.V. Thiruvathukal, Elements of Oceanography, W.B. Saunders Company, 1976.
3. D.A. Ross, Introduction to Oceanography, Prentice-Hall, Inc., London, 1977.
4. R.H. Stewart, Introduction to Physical Oceanography, Orange Grove Texts Plus, 2009.

Reference Books:

1. J. Marshall and R. Alan Plumb, Atmosphere, Ocean, and Climate Dynamics, Elsevier, 2007.
2. S. Pond, and G.L. Pickard, Introductory Dynamical Oceanography, 2nd Edition, Butterworth-Heinemann, 1983.
3. H. Medwin, and C.S. Clay, Fundamentals of Acoustical Oceanography (Applications of Modern Acoustics), 1st edition, Academic Press Inc., 1997.