UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Physics of The Sea

2223-1-F7401Q097

Aims

Provide basic knowledge of the physics of the oceans. Show the usefulness of mathematical and physical models for the description and the understanding of geophysical fluid dynamics.

Contents

In the first part of the course fundamental physical properties of the ocean will be introduced. The second part will be basic geophysical fluid dynamics, with the discussion of solutions to approximations relevant for the description of the ocean circulation and waves. In the laboratory sessions, hands on experiments will be presented to better visualise and understand the main topics of the course.

Detailed program

Ocean Physics: Light and sound propagation. Temperature and salinity. Equation of state. Mixed layer and stratification. Tracer distribution. Heat fluxes. Water masses. T-S diagrams.

Oceanic Dynamics: Navier-Stokes equation. Mass conservation. Hydrostatic approximation. Geostrophic flow. Ekman transport. Upwelling and downwelling. Vorticity. Large scale circulation and winds. Subtropical and subpolar gyres. Western boundary currents. Gravity waves. Rossby and Kelvin waves. Turbulent fluxes.

Labortatory sessions: Geophysical fluid dynamical experiments.

Prerequisites

None

Teaching form

Online frontal lecture

Lab

Textbook and teaching resource

Vallis “Essential of Atmospheric and Oceanic Dynamics”, Cambridge Univ. Press (2019)

Stewart, “Introduction to Physical Oceanography”, freely available on line.

Marshall and Plumb “Atmosphere, Ocean, and Climate Dynamics”, Academic Press (2008)

Semester

Second

Assessment method

Online oral exam: candidates will be asked questions regarding the topics discussed in class.

Office hours

Contact the instructor

Sustainable Development Goals

QUALITY EDUCATION