The course will describe the characteristics of water masses and the basic instrumentation and methods used for observing the oceans, basic concepts on energy and mass budgets (with a focus on marginal seas), processes involved in air sea interactions and how to describe them, basic dynamical balances in the oceans, waves and currents in the coastal zone, sea level variations, vertical structure of the water column. The concepts are applied to describe the circulation of the Mediterranean, Baltic and Black Seas. The course will also teach techniques for data visualization based on the Ocean Data View software.

The students are required a basic knowlede of algebra, calculus and Physics (dynamics and thermodynamics)

The students will acquire a basic knowledge of the processes leading to changes of temperature, salinity and producing currents and waves in the oceans. Description will focus on processes occurring in the coastal zone and on mass, energy and salinity balances in marginal seas and having important effects in the corresponding environments. The students will acquire capability of understanding the basic physical-mathematical language used in physical oceanography. Moreover, the students will learn about basic techniques for presenting (also graphically) oceanographic data.

teaching will be based on a sequence of lectures explaining the content of the course. It will be integrated with exercizes (solution of simple problems) and demonstrations of techniques to plot oceanigraphic variables
The exam consists in 2-3 questions, asking you to describe a figure, to comment a formula and its use, a measurement device and/or procedure, to describe how some given data are obtained (up to 30 points)
Alternatively, the students can pass two partial texts that will be carried out during the course (each of them corresponding to the content of 50% of the lessons). Each test consists in a combination of multiple-choice and open questions. The final score (up to 30 points) will be the average score of the single tests.
In order to increase the final score, or to reach the 18/30 threshold, the students may produce (on a voluntary basis):
• A short report based on the ODV software and the plot of oceanographic data (up to 5 points)
• A summary/report of a relevant scientific paper (up to 5 points)

detailed list of the subjects covered during the lectures:
Historical notes on the evolution of physical oceanography, generalities on observations (errors, accuracy, precision), morphology of ocean basins, propagation and attenuation of sound in sea water and echosounders, the sound channel, energy budgets, heat capacity of ocean basins, air-sea interaction (thermal radiation, sensible and latent heat flux), Bulk formulas, vertical and horizontal flux of heat in the ocean, winds and wind stress, salinity, density of sea water, vertical structure of the water column (Mixed layer and its variations, seasonal and permanent thermocline, abyss) , methods and instruments for observing temperature, salinity and currents, hydrostatic pressure, salinity and salt budget, exchanges of mass, heat and salt across straits, temperature and salinity in the Mediterranean Sea, circulation of the Mediterranean Sea, notes on Baltic, Red and Black Seas, waves in the ocean, forces in the oceans, geostrophic balance, Margules’ relation, comments on Gibraltar and Otranto straits, coastal currents, surface waves in shallow water and the surf zone, ekman transport, coastal downwelling and upwelling, storm surges and castal floods, sea level variations at regional scale.