

| TITOLO DEL CORSO | | | |
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| Oceanography (U1331) | | | |
| Settore Scientifico - Disciplinare: GEO/12 | | CFU: 6 (6 LF) | Ore: 48 |
| Ore di studio per attività: | Lezioni frontali: 48 | Laboratorio: 0 | Attività di campo: 0 |
| Tipologia di attività formativa: a scelta libera | | | |
| SYLLABUS | | | |
| Prerequisiti: Conoscenze di base di Fisica, Matematica, Chimica e Geografia. | | | |
| Lezioni frontali | | | |
| Numero ore | <u>Argomento:</u> | | |
| 4 | Introduction to Oceanography: The Earth's Oceans and Seas. History of Oceanography: Orientation; Ancient explorations; Pacific Navigators; The Kon-Tiki Expedition; European Navigators; The Sextant and Harrison's Watch; Cook's Voyages. | | |
| 2 | The Planet "Earth": Formation of the Earth; Earth's Internal Structure; Continental vs. Oceanic Crust; Lithosphere, Sthenosphere and Isostatic Adjustment; Origin and Development of Earth's Atmosphere and Oceans. | | |
| 2 | Plate Tectonics and the Ocean Floor: Alfred Wegener; Breakup of Pangaea; Continental Drift; The Theory of Plate Tectonics; Magnetic Polarity Reversals; Sea Floor Spreading; Age of Ocean Floor; Plate Boundaries; Rift Valley; Hotspots and their location; The evolution of the Atlantic and Pacific; New sea from East Africa rift valleys; Further Himalaya uplift; Separation of North and South America; Part of California in Alaska. | | |
| 2 | Marine Provinces and Bathymetry: Measuring Bathymetry; Echo Sounding Record; Modern Bathymetry Measuring; Sea Floor Mapping from Space; Seismic Reflection Profile; Passive and Active Continental Margins. | | |
| 2 | Marine Sediments: Classification and collection of Marine Sediments; Lithogenous Sediments; Sediment Transport; Grain Size; Sediment Distribution; Neritic, Lithogenous, Pelagic and Biogenous Sediments; Silica, Calcium Carbonate, Carbonate, Calcareous Ooze deposits; Manganese Nodules, Phosphates and Carbonates, Metal Sulfides, Evaporites; Cosmogenous Marine Sediments; Marine Sediment Mixtures; Worldwide Marine Sediment Thickness; Offshore Drilling Platform. | | |
| 2 | Water: Physical and Chemical Propensities of Water; Heat, Temperature, and Changes of State; Water's Heat Capacity and Specific Heat; Latent Heat; Global Thermostatic Effects; Day and Night Temperature Differences; Earth's Hydrologic Cycle; Water Density and Temperature. | | |
| 2 | Seawater: Salinity; Processes Affecting Salinity; Acidity and Alkalinity; pH Scale; Ocean pH; Carbonate Buffering System; Surface Salinity Variation by Latitude; Salinity Variation with Depth; Seawater Density; Temperature and Density Variations With Depth; Layered Ocean; Desalinization. | | |
| 2 | Air-Sea Interaction: Earth's Seasons; Distribution of Solar Energy; Oceanic Heat Flow; Physical Properties of the Atmosphere; Water Vapor in Air; Global Atmospheric Circulation; Idealized Three-Cell Model and the Global Wind Belts. | | |

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| 2 | Winds: Sea and Land Breezes; Storms and Air Masses; Fronts; Tropical Cyclones, Hurricane and Typhoon; Saffir-Simpson Scale of Hurricane Intensity; Storm Destruction; Historic Hurricane Destructions; Specific Hurricane destructive events (Irene, Katrina, Rita, Wilma, ecc.); Future Hurricane Threats; Wind Power; Global Ocean Wind Energy. |
| 2 | Ocean's Climate Patterns; Ocean's Climate Zones; Sea Ice Formation; Iceberg Formation; Shelf Ice; |
| 4 | Ocean Circulation and Temperature: Ocean Currents; Measuring Surface Currents; Surface and Deep Currents; Subtropical Gyres; Ekman Spiral and Ekman Transport; Geostrophic Currents; Western and Eastern Boundary Currents; Ocean Currents and Climate; World Ocean Sea Surface Temperatures; Water Upwelling and Downwelling; Diverging and Converging Surface Water; Coastal Upwelling and Downwelling; Antarctic and Atlantic Ocean Circulation; Gulf Stream; Climate Effects of North Atlantic Currents; Indian Ocean Circulation; Indian Ocean Monsoon; Australian Currents; Other currents; Equatorial Currents and Counter-Current; Walker Circulation; El Niño – Southern Oscillation (ENSO); Deep-Ocean Currents; Thermohaline Circulation; T–S Diagram; Conveyor Belt Circulation; Power from Currents. |
| 4 | Waves and Water Dynamics: Wave Generation and Types; Internal Waves; Progressive, Longitudinal, Transverse and Orbital; Deep and Shallow Water Waves; Wind-Generated Wave Development; Factors Affecting Wave Energy; Beaufort Wind Scale; Various Kinds of Waves; Waves Approaching Shore; Breakers; Surfing; Wave Refraction and Reflection; Effects of Wave Interferences; Properties and Geography of Tsunami; Global Wave Energy Resources. |
| 4 | Tides: Gravitational Origin of Tides; Idealized Tidal Bulges; Tides Generated by the Sun and the Moon; Earth's Rotation and Tides; Monthly Tidal Cycle; Complicating and Additional Factors; Cotidal Map; Tidal Patterns; Monthly Tidal Curves; Tides in Coastal Waters; Tides and Marine Life; Tide-Generated Power. |
| 2 | Beaches and Shoreline Processes: Coastal Regions; Cliffs and Beaches; Sand Movement Along Beach; Seasonal Effects; Longshore Current and Drift; Erosional and Depositional Shorelines; Bay Barrier; Tombolo; Barrier Islands; Deltas; Emerging and Submerging Shorelines; Breakwaters; Seawall Damage; Beach Replenishment. |
| 2 | Sea Level: Sea Levels During the Glacial Periods; Historical Evolution of the Sea Level during the Holocene; Contemporary Global and Local Sea Level changes; Climate Change and Sea Level Hazards. |
| 2 | The Coastal Ocean: United Nations Law of Sea; Characteristics of Coastal Waters; Salinity and Temperature Variation in Coastal Ocean; Coastal Geostrophic Currents; Estuaries; Lagoons; Coastal Wetlands; Mediterranean Sea. |
| 2 | Marine Pollution: Waste Disposal in Ocean; Petroleum and Cleaning Oil Spills; Sewage Sludge; DDT and PCBs in Environment; Mercury and Minamata Disease; Effects of Plastic Marine Trash; Biological Pollution Due to Non-Native Species. |
| 2 | Marine Life and the Marine Environment; Marine Species; Nekton and Benthos; Hydrothermal Vent Communities; Reproduction; Osmosis; Marine vs. Freshwater Fish; Plancton and Phytoplankton; Biological Productivity and Energy Transfer; Red Tides; Polar Ocean Productivity; Nutrient Flow in Marine Ecosystems; |

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| | Biomass Pyramid; Marine Fisheries. |
| 2 | Animals of the Pelagic Environment; Animals of the Benthic Environment; Zooplankton; Cold-Blooded vs. Warm-Blooded; Marine Mammals (Orders of Carnivora, Sirenia, Cetacea); Whaling; Distribution of Benthic Organisms; High, Middle, Low Tide Zones; Coral Reef Distribution; Coral Reef Distribution; Deep-Ocean Floor Communities; Chemosynthesis and the Hydrothermal Vent Communities. |
| 2 | The Oceans and Climate Change: Earth's Climate System; Natural vs. Human Caused Climate Change; Proxy Data – Ice Cores; Earth's Heat Budget; Climate Changes in the Oceans; Organisms Threatened by Increased Marine Acidity; Rising Sea Level. |

Risultati di apprendimento attesi

Conoscenza e capacità di comprensione:

Lo studente deve dimostrare di conoscere e sapere comprendere gli aspetti fisici e le problematiche relative ai processi che presiedono i fenomeni dei mari e degli oceani.

Conoscenza e capacità di comprensione applicate:

Lo studente deve dimostrare di essere in grado di interpretare varie dati oceanografici e comprendere il funzionamento e l'uso degli strumenti di misura comuni usati in oceanografia. Inoltre, deve risolvere semplici problemi di meteorologia.

Autonomia di giudizio:

Lo studente deve essere in grado di valutare in maniera autonoma vari processi oceanografici.

Abilità comunicative:

Lo studente deve saper spiegare a persone non esperte le nozioni di base relative ai processi oceanografici e la relativa fisica. Riguardo ai cambiamenti climatici, lo studente deve anche comprenderne le problematiche attuali, ad esempio, legate ai cambiamenti climatici.

Capacità di apprendimento:

Lo studente deve essere in grado di aggiornarsi o ampliare le proprie conoscenze attingendo in maniera autonoma a libri di testo. Il corso fornisce allo studente indicazioni e suggerimenti necessari per consentirgli di affrontare altri argomenti affini a quelli in programma.

Modalità di verifica dell'apprendimento

Esame Finale:

L'esame è orale.