COURSE TITLE:

OCEANOGRAPHY (MARINE SCIENCES)

COURSE DESCRIPTION:

Modul 1. – Physical Oceanography

The thermohaline (deep water) circulation on present day Earth, density driven circulation. The definition of deep and surface water according to different principles of science. We track the movement of water masses along the great conveyor belt, with special emphasis on the Atlantic water masses. The concept of deep water formation is established. The impications of deep water circulation is considered for productivity, pH, TOC, CCD or ACD changes in the three large ocean basins, the Atlantic, the Indian Ocean and the Pacific. Residence time is introduced. Surface water circulation – the force of the wind, Coriolis force and the Ekman spiral and case study in the Arabian Sea.

Modul 2. – Chemical Oceanography

The major constituents of sea water and their constant ratio, the Dittmar's (Forschammer) principle with its implications for methods of measuring salinity from the old days until today: from Lavoisier, to Microwave Imaging of salinity from satellites through titration, and conductivity. The physical and chemical processes controlling the flow of dissolved elements in seawater. The non-salt constituents of sea water, the nutrients and their importance in geobiochemical cycles: the Redfield ratio, primary production, the application of Stoke's law on marine planktonic organisms. The marine snow.

Modul 3. – Marine Ecology

The major marine provinces concerning benthos and planktonic organisms. Basic terms in ecology with marine examples: niche, competition, habitat etc. Trophic chains in the marine system: the grazing and the decomposing chain. Energy and material transport in marine ecosystems Simple case studies Bergen Port in Sweden (foraminifera), Coral reefs, the Sargasso Sea. The binominal nomenclature and DNA based taxonomy versus the fossils.

The distribution of primary productivity in the present day oceans: higher in polar waters, due to weak picnocline, the western boundaries of continents upwelling at equatorial latitude. Sediments on the seafloor in present day ocean and explanation in the light of the great conveyor belt. Formation of marine varves

Modul 4. - Climate and ocean

The relation between thermohaline (deep water) circulation and global warming. The IPCC and the anthropogenic global warming. Predictions for the future. Definition of model in present day Earth System science. The carbonate and silica ocean and the net CO2 uptake.

Modul 5. - Paleoceanography and proxy

The past of the ocean and our climate is recorded in the marine sediments. This is the best to learn about changes before human history, and the only way to learn about climate through the history of Earth. Definition of proxy, proxies as input data, testing models, isotope thermometer and alkenons.

LITERATURE:

Stewart, R. H., 2008, Our Ocean Planet: Oceanography in the 21st Century. A New Oceanography Book for College Students. **http://oceanworld.tamu.edu/ocean401/**

Barnes, R. S. K., and Hughes, R. N., 1999, Marine Ecology: Blackwell Science, no. ISBN 0-86542-834-4, p. 1-286.

Paytan, A., 2006, Marine Chemistry. http://ocean.stanford.edu/courses/bomc/cnotes.html

TEACHER:

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