**III.2.4 OCEAN DYNAMIC**

**A. Course description**

**1. Credit points: 2 ECTS**

**2. Time commitment**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Items | Lecture | Tutorial/Exercise | Practice/Assignment | Lab-work | Total |
| No. of hours | 16 | 4 |  |  | 20 |

**3. Prerequisites** : Introduction to physical oceanography

**4. Recommended background knowledge**

None.

**5. Subject description**

A course designed to provide the basic dynamic of waves and tides

The course gives a basic introduction to the ocean dynamics. The starting point is conservation of mass and momentum and the corresponding equations, formulated in non-rotating and rotation coordinate systems. Physical interpretation of these equations is given and simplified expressions are used to explain, derive and quantify characteristics properties of, in particular, large scale and free motion ocean.

**6. Objectives & Outcome**

Aftercompleted course the students should be able to:

- derive the basic equations for the motion in ocean

- use several versions of non-rotating and rotation coordinate systems for quantifying ocean dynamics

- derive the geostrophic and thermal wind equations, and apply various versions of these expressions on large scale systems in ocean

- derive how friction influences, to lowest order, ocean dynamics

- apply first physical principles to describe the large scale, global circulation in ocean

- derive and apply the basic expressions for Ekman and Sverdrup dynamics in the ocean

**7. Assessment/ Evaluation**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Component | Attendance | Assignment | Practical | Participation | Midterm | Final |
| Percentage % | 10 |  |  |  | 30 | 60 |

**8. Prescribed Textbook(s)**

[1]Stephen Pond, George L. Pickard – **Introduction Dynamical Oceanography** – 2nd Edition (2009)

[2]Robert H. Stewart–**Introduction to Physical Oceanography** – online book – September 2008 Edition

[3]Matthias Tomczak – **An Introduction to Physical Oceanography** – online book – April 2002 Edition

[4] H. U. Sverdrup et al.,PrenticeHall - **The Oceans: their physics, chemistry and general biology** - first edition, 1942

[5]. R. L. Weigel, Prentice-Hall - **Oceanographical Engineering** - 1964

[6]. J. Proudman, Methuen - **Dynamical Oceanography** - 1953

**B. Course content**

1.Theories of wind-driven circulation. 2.Sverdrup solution, frictional and inertial boundaryregimes;

3. Instabilities, meanders and meso-scale features.

4.Role of stratification, topography and time dependence;

5. Thermohaline circulation- Conveyor belt- Formation and distribution of water

masses-subduction and ventilation- Abyssal circulation- mixing – Isopycnal and diapycnal

mixing -Topographic steering, thermodynamic and salinity circulation, equations for salt and

temperature conservation, Reynold’s fluxes and eddy diffusivity, thermocline and thermohaline circulation, mixed layer of the ocean.

**C. Reference Literature**