UNIVERSITY OF GOTHENBURG

DEPARTMENT OF MARINE SCIENCES

OCM100 Physical Oceanography I, 15 credits

Fysisk oceanografi I, 15 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Earth Sciences on 2013-02-20 and was last revised on 2022-08-18 by Department of Marine Sciences to be valid from 2022-08-19, autumn semester of 2022.

Field of education: Science 100%
Department: Department of Marine Sciences

Position in the educational system

The course is the first course within the Master's Programme in Physical Oceanography.

The course can be part of the following programmes: 1) Marine Science, Bachelor's Programme (N1MAV), 2) Master's Programme in Physical Oceanography (N2FOC) and 3) Marine Science, Master's Programme (N2MAV)

Main field of studies	*Specialization*
Physical Oceanography	A1N, Second cycle, has only first-cycle course/s as entry requirements
Marine Sciences	A1N, Second cycle, has only first-cycle course/s as entry requirements
Oceanography	A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

For admission to the course, 120 credits of completed courses within natural sciences are required, of which at least 15 credits in mathematics (analysis and linear algebra).

Learning outcomes

Upon completion of the course, the student is expected to be able to:

Knowledge and understanding

- Describe how the physical properties of seawater influence oceanic flows
- Define the different terms in the equations of fluid motions
- Define the most important space and time scales for the different types of flow
- Describe the basic physical balances of different idealized flow cases: Geostrophic flow and thermal wind, frictional boundary layers and the Sverdrup balance
- Describe the driving and controlling mechanisms of the large-scale circulation in the sea and be able to describe some idealized models for ocean circulation

Competence and skills

- Know the definition and relevance of the most important physical properties of seawater
- Know the equations of fluid motion for a rotating fluid
- Perform mathematical derivations and make calculations for some idealized flow cases
- Derive the main characteristics of wind-driven flows in the ocean

Judgement and approach

- Know how to apply fundamental principles of physics and mathematics to develop a quantitative understanding of ocean dynamics
- Understand standard simplifications and common limitations that are often associated to studies of ocean processes
- Apply and manipulate simple theories of the large-scale ocean circulation

Course content

The course provides a basic introduction to the principles that govern the flow in the sea at different scales from the smallest turbulent vortices to the large-scale circulation in the oceans. A major emphasis is on describing various physical phenomena using quantitative mathematical tools. The course deals with the following elements: Basic properties of a fluid including the driving equations for mass conservation, momentum and energy, coordinate systems and effects of Earth rotation, the derivation of simplified sets of equation describing large-scale oceanic flows, and the description of geostrophic flows, thermal wind, frictional effects, and basic theory of wind-driven ocean gyres.

Sub-courses

1. **Basic theory** *(Grundläggande teori),* 7.5 credits

Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
Seawater properties and the equations of motion for a rotating geophysical fluid

2. **Applied theory** *(Tillämpad teori),* 7.5 credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
   Frictional geostrophic balance, wind-driven gyres and mixing-driven overturning circulations

Form of teaching

Teaching is given mainly in the form of lectures, calculation exercises and lab report.

Language of instruction: English

Assessment

- Sub-course 1, 7.5 credits: Written exam, U / G / VG
- Sub-course 2, 7.5 credits: Written exam and Lab Report, U / G / VG

For students who have not been approved at regular examinations, additional examination opportunities are offered. The possibilities of retaking examinations are limited and decided in consultation with the course leader.

If a student who has failed twice at the same examination wishes to change the examiner before the next examination opportunity, he/she must submit a request to the department responsible for the course that should be approved if there are no special reasons on the other hand (HF 6 § 22).

In cases where a course has been discontinued or has undergone major changes, the student shall normally be guaranteed at least three examination occasions (including the ordinary examination) during a period of at least one year, but maximum two years from the last time the course was given.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).
For grades G on sub-course 1, 55% is required for the exam. For grades VG on sub-course 1, 75% is required for the exam.

For grades G on sub-course 2, 55% is required for the exam and approved lab report. For grades VG on sub-course 2, 75% is required for the exam and approved lab report.

For grade G on the entire course, both sub-courses must be approved. For grades VG on the full course, both sub-courses must have the grade VG.

Regarding the application of the ECTS scale for grades, see Rector's decision 2007-05-28, ref. G 8 1976/07 and 2011-02-28, dnr O 2009/5545.

Course evaluation

A written evaluation is done at the end of the course. In the written evaluation, the student is anonymous. The results and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.