UNIVERSITY OF GOTHENBURG

DEPARTMENT OF MARINE SCIENCES

OC6310 Ocean Models, 15 credits

Oceanografiska modeller, 15 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Earth Sciences on 2014-02-20 and was last revised on 2017-09-05 by Department of Marine Sciences to be valid from 2017-11-01, autumn semester of 2017.

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

Position in the educational system

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

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

Entry requirements

120 credits in the field of Science where at least 60 credits must be in the fields of Mathematics, Physics, Physical Oceanography, Meteorology or equivalent knowledge.

Alternatively; Bachelor's Degree (180 credits) in Marine Sciences, including 15 credits within Physical Oceanography or equivalent knowledge.

Learning outcomes

Introduction

Numerical methods is a standard tool for studying and evaluation various oceanographic processes and dynamical features. In this course the focus is on practical usage of

1. Solving simple relevant equations using numerical method
2. Use a state-of-the-art Ocean General Circulation Model (i.e. the MITgcm)
3. Formulate analytical tools to evaluate processes in model output
4. Considering a project based work (5 HEC) aiming at setting up model scenario, evaluate model dynamics, and present results.

After the course the student is expected to have learned to:

Knowledge and understanding

- Basic understanding of numerical methods in oceanography
- Provide good understanding about how analytical and numerical model can be applied in marine science
- Analyze model results from theoretical frameworks

Competence and skills

- Organize and run numerical models for different marine applications
- Being able to use one Ocean General Circulation model (GCM)
- Using and compiling large FORTRAN codes and use programs for analyzing results
- Present result from numerical models in oral and written form
- Display critical thinking about model limitations

Judgement and approach

- Evaluate and judge results from numerical models
- Formulate and solve simple oceanographic problem using numerical ocean models
- Judge the models ability to adequately describe important processes

Course content

The main aim of the present course is to provide good understanding about how analytical and numerical models can be applied in different aquatic problems including lakes and coastal seas.The course will provide the student with scientific understanding and well-tested ocean model codes for a number of applications. By starting from simple scenarios the student will learn how to build up a more advanced understanding and getting confidence in numerical/ocean modelling.

Sub-courses

1. **Oceanographic Models, Part 1** *(Oceanografiska modeller, del 1),* 10 higher education credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
   Part 1 will include introduction to numerical methods in oceanography, as well as an introduction to using large model codes written in FORTRAN and learning to compile and handle the system on linux. The course will focus on using the MITgcm. The dynamics of large scale ocean dynamics will also be discussed. The theoretical framework will disuss shallow water dynamics and includes Rossby adjustment, Kelvin waves, Rossby and topographic waves, equatorial waves, wind forced circulation such as wind driven upwelling, Sverdrup, Stommel and Munk type of of circulation, etc. The lectures will include seminars and numerical exercises.

2. **Oceanographic Models, Part 2** *(Oceanografiska modeller, del 2),* 5 higher education credits
   Grading scale: Pass with Distinction (VG), Pass (G) and Fail (U)
   Part 2 will be devoted to a small project choosen by the students. The lectures will mainly be in the form of disussion seminars and help sessions.

Form of teaching

The teaching takes place mainly in the form of: Lectures, exercises / calculations, seminars, oral presentations and written reports.

Language of instruction: English

Assessment

Examination through:

- Participation during seminars
- Oral presentations
- Solved exercises as written reports

For students who have not passed, additional examination sessions are offered. The possibilities to supplement not completed practical components can be limited and are determined in consultation with the course responsible teacher.

If a student, who has failed the same examined component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

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 from the last time the course was given.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).
The grade Pass (G) for the whole course requires the grade G on both the sub-courses.
Pass with Distinction (VG) for the whole course will be given according to a weighted average mark on both sub-courses.

Concerning application of the ECTS grading scale please see 28/05/2007, D No. G 8 197/07 as well as 28/02/2011, D No. O 2009/05545.

Course evaluation

A written course evaluation will be done after the end of the course. The evaluation will be used to improve the course next year.