LUND UNIVERSITY

Faculty of Science

BERN03, Computational Science: Introduction to Modelling of Climate System, 7.5 credits

Beräkningsvetenskap: Introduktion till modellering av klimatsystem, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2022-12-12 to be valid from 2022-12-12, autumn semester 2023.

General Information

The course is an elective course in the second cycle for a degree of Master of Science in Computational Science and for a degree of Master of Science in Applied Computational Science. The course is compulsory for a degree in these programs with a specialisation towards geoscience, geology and physical geography.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Applied Computational Science	A1F, Second cycle, has second-cycle course/s as entry requirements
Computational Science	A1F, Second cycle, has second-cycle course/s as entry requirements

Learning outcomes

The aim of the course is that the student on completion of the course should have acquired in depth knowledge about computational methods in geoscience with a specific focus on climate systems. The student will acquire skills to apply this knowledge to study climate change on geological and historical time scales and link these to future climate predictions.

Knowledge and understanding

On completion of the course, the student shall be able to:

- account for the fundamental principles and methods that contemporary climate

models are based on
- explain how data generated from climate models can be used together with observational data to reconstruct palaeoclimate
- describe methods to assess uncertainties in climate predictions.

Competence and skills

On completion of the course, the student shall be able to:

- analyse and present multi-dimensional (spatial and temporal) results from climate models
- independently implement and utilize a computer program to solve a given problem in geoscience
- motivate the choice of method to solve a given problem in geoscience and discuss the conclusions drawn, both written and orally.

Judgement and approach

On completion of the course, the student shall be able to:

- identify and assess how climate models can be utilized, as well as their limitations
- reflect on resource consumption in connection with climate modeling from a sustainability perspective
- critically review and evaluate climate model output and their associated uncertainties.

Course content

The course will give in-depth knowledge about climate systems and how climate models are constructed. In the first half of the course different components of contemporary climate models (ocean/land/atmosphere) and interactions between them are introduced and discussed. This includes handling of typical data formats associated with climate models and the analysis of model output with varying resolution and/or complexity. The second half of the course focuses on applications in palaeoclimate reconstructions and impact models and the use of ensembles to assess model uncertainties. This includes projects where students independently and in groups solve tasks using programming. Exercise in the use of simplified climate models and analysis tools as well as information retrieval and oral and written presentation techniques are included as a part of certain learning activities.

Course design

The teaching consists of lectures, seminars, group work and project work. Oral presentation is included as a part of certain exercises and project work. Participation in project work and thereby integrated other teaching is compulsory.

Assessment

The examination consists of grading of individual oral and written reports on project work during the course.

For students who have not passed the regular exam, an additional exam opportunity is offered in close connection with this.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
For passing grade on the entire course passing grades on written project reports and the oral project presentations are required.

The grading scale for oral project presentations is Fail, Pass, while written project reports are graded according to the grading scale Fail, Pass, Pass with distinction.

The final grade will be determined through a weighted average of the results on the written project reports.

Entry requirements

For admission to the course 90 credits in natural science or engineering, including knowledge equivalent to BERN01, Modelling in Computational Science, 7.5 credits and English 6/B are required.

Subcourses in BERN03, Computational Science: Introduction to Modelling of Climate System

Applies from H23

2301 Oral project presentations, 2,5 hp
Grading scale: Fail, Pass

2302 Written project reports, 5,0 hp
Grading scale: Fail, Pass, Pass with distinction