



# SLUkurs

## Syllabus

**PNG0060 Carbon cycling: from molecular to global processes, 3.0 credits**

## Syllabus approved

2015-05-27

## Subjects

Chemistry

## Education cycle

Third cycle

## Grading scale

Pass / Failed

The requirements for attaining different grades are described in the course assessment criteria which are contained in a supplement to the course syllabus. Current information on assessment criteria shall be made available at the start of the course.

## Language

English

## Prior knowledge

This course is primarily intended for PhD students in the Focus on Soils and Water graduate school and PhD students at Uppsala University, but it is also open to other PhD students working in related fields. Other researchers are also very welcome to participate in discussions whenever seats are available.

## Objective, including learning outcomes

The aim of the course is to give participants a deep understanding of the chemical, physical, and biological characteristics and processes influencing carbon. We will highlight the influence of these processes at the molecular level and move towards larger scales to reach the global cycling. Focus will be given to both terrestrial and aquatic systems.

## Content

The course consists of 2 mandatory parts + 1 optional part:

1) Individual literature studies during 30th September – 22nd October, where selected papers will be discussed during five group meetings. The course literature consists of research and review papers selected by the organizers and invited lecturers.

2) A workshop at Sunnersta Herrgård (Uppsala) the week 2nd – 6th November, based around lectures by leading researchers in the field, as well as student poster presentations.

Both the literature seminars and the workshop will be structured in 5 main blocks:

- Chemistry: Characterization of organic matter. Hydrolysis, oxidation, and humification processes.
- Physics: Sorption and spatial distribution of organic matter.
- Biology: Fungal and bacterial decomposers in terrestrial and aquatic systems.
- Ecosystem level: Regulation of carbon cycling at the ecosystem. Terrestrial-riparian-aquatic interfaces and carbon balance at the regional scale.
- Global perspective: Global carbon cycling. Land use change impacts and model uncertainty

3) An additional optional week (9th – 13th November) of modelling exercises led by Thomas Kätterer (SLU). The emphasis will be on modelling of carbon cycling in ecosystems with special focus on life cycle analysis.

## Requirements for examination

Constructive alignment

a) Course description and objectives – Learning outcomes

Course name: Carbon cycling: from molecular to global processes

The aim of the course is to give participants a deep understanding of the chemical, physical, and biological characteristics and processes influencing carbon. We will highlight the influence of these processes at the molecular level and move towards larger scales to reach the global cycling. Focus will be given to both terrestrial and aquatic systems.

Upon completion of this course students will be able to:

1. Summarize the most important carbon cycle concepts in relation to its chemistry, physics, biology, ecosystem, and global aspects.
2. Critically discuss the benchmark studies on the subject.
3. Interact with leading scientists on the subject.
4. Put their own research in context with the general content of the course.
5. Perform simple models that estimate carbon budgets in relation to life cycle analysis (optional).

b) Learning activities

The activities and teaching techniques in relation to the different learning outcomes will be:

1. Self-reading of selected studies by the course organizers and lectures on the five main subjects in which the course is divided.
2. 5 half-day literature discussion seminars.
3. One-week workshop with lectures/discussions guided by leading scientists.
4. Within the workshop, there will be two sessions for student poster presentations.
5. Additionally, an optional week of modelling exercises with focus on carbon in life cycle analysis is planned.

c) Grading system – Assessment

The students will be graded according to their participation and involvement in the different activities that relate to the learning outcomes. Attendance to all the literature seminars and the workshop is a mandatory requisite to pass the course. Alternatively, students that are not able to attend some or any of the literature seminars (e.g. students based outside the Uppsala-Stockholm area) will be asked to handle a summary of the papers and parallel group discussions. Ideally, this will be done in group of students based in the same university area.

## **Additional information**

### **Responsible department**

Department of Aquatic Sciences and Assessment