Exchange programme Vrije Universiteit Amsterdam

Vrije Universiteit Amsterdam - Exchange programme Vrije Universiteit Amsterdam - 2024-2025

Exchange

Vrije Universiteit Amsterdam offers many English-taught courses in a variety of subjects, ranging from arts & culture and social sciences, neurosciences and computer science, to economics and business administration.

The International Office is responsible for course approval and course registration for exchange students. For details about course registration, requirements, credits, semesters and so on, please visit the exchange programmes webpages.

Ecosystem Modelling

Course Code	AB_1218
Credits	6
Period	P1
Course Level	300
Language Of Tuition	English
Faculty	Faculty of Science
Course Coordinator	dr. ir. S. Luyssaert
Examiner	dr. ir. S. Luyssaert
Teaching Staff	dr. ir. S. Luyssaert
Teaching method(s)	Lecture, Computer lab

Course Objective

The aim of the Ecosystem Modelling course is to introduce the students to the world of numerical biology in which computer code is used to study ecosystems. Following successful completion of the course, students will be able to use a numerical model to study the response in plant growth to environmental changes. To this aim students will:

- Use light, temperature, CO2 and soil moisture sensors mounted on a microprocessor;
- Send sensor readings to a microprocessor;
- Program the microprocessor to simulate photosynthesis, carbon allocation, and transpiration.

Course Content

Where science unravels more and more physiological, physical and ecological processes, models can help to synthesize this knowledge in a consistent mathematical framework. Also, when field experiments are impossible, unethical or excessively expensive, simulation experiments can be used to forecast the outcome of different treatments or climate scenarios.

In this course we will program a microprocessor connected to light, temperature, CO2 and soil moisture sensors to behave as close as possible to a plant. The program we will write could be considered as the plant DNA. We will then inject the DNA into a robot plant that we called plantroid. Thanks to its “DNA” the plantroid will become alive. Finally, we will use the plantroid to demonstrate some of the possibilities and limitations of ecosystem modelling.

The basic tools of the trade will be introduced and implemented during supervised computer-based exercises. The course builds on BSc level ecological knowledge, BSc level scientific skills, and high school level physical and mathematical knowledge to obtain new skills: basic computer programming, numerical modelling and critical thinking in the context of numerical models.

Additional Information Teaching Methods

The course consists of 7 hours of lectures and 53 hours of supervised computer-based exercise classes. An additional 50-100 hours of unsupervised study is required to complete the exercises. The course Ecological Modelling accounts for 6ECTS. The lectures address:

- Introduction to modelling and in-silico biology
- Introduction to MU editor and introduction to python
- Introduction to coding in python
- Introduction to the photosynthesis model and its environmental drivers.
- Introduction to carbon allocation
- Introduction to transpiration
- Introduction to the plantroid, connect PC to plantroid, transfer code, and monitor the plantroid
- Conduct and report experiments with the plantroid.

Method of Assessment

The course consists of six milestones. At the end of each milestone, the tutorial contains a set of questions. Students can use these question to self-monitor their progress . The course is completed by a written exam.

Literature

Students are strongly recommended to bring their own computer for the exercises. During the exercises the MU editor which is a free open-source initiative will be used. Any other software that can run python3.5.1 and circuit python could be used.

Additional Information Target Audience

- BSc students in the Minor Evolutionary Biology and Ecology
- Third year BSc students in Biology or Earth Sciences
- BSc and MSc students with an interest in quantitative macroecology

Explanation Canvas

Course material is available on Canvas.

Recommended background knowledge

- BSc level ecological knowledge
- BSc level scientific skills
- High school level physical and mathematical knowledge