Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Syllabus

MV0115.1 Introd. in soil sciences, physical chemistry and environm. physics, 15.0 credits

Introd. i markvetenskap, fysikalisk kemi och biogeofysik

The course is given as course independent of study programme

Syllabus discontinued 16 April 2009

Version 1 in Slukurs. Corresponds to version 1 in Ladok

Syllabus approved

26 May 2004

The version applies to students admitted from spring 2005 to spring 2008

The version is not a module version

Subjects

Soil science/Chemistry

Education cycle

First cycle

Modules

Title	Code	Credits
Single module	0101	15.0

Advanced study in the main field

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

Swedish

Prior knowledge

The equivalent of 10 Swedish University Credits (SUC) of basic courses in General and Organic Chemistry, and 5 SUC in Mathematics.

Objectives

The overall objective is to get basic knowledge of physical, chemical and biological processes within the soil-plant-atmosphere system. After completion of the course the student should:
- have general knowledge of the soil as a system and its properties related to plant growth from physical, chemical and biological perspectives
- have good knowledge of basic thermodynamics
- have knowledge of absorption of light and the prerequisites for photosynthesis
- have knowledge of complex formation reactions in water solution and its importance in e.g. weathering reactions
- have good knowledge of reactions in the soil solution/particle interface
- have understanding of the interaction between the physical and biological mechanisms determining the energy and water balance of the soil-plant-atmosphere system, in for instance forest and agricultural systems
- have a good understanding of the role of the plant in regulating the transport of water and energy between soil and atmosphere, and knowledge of the processes regulating the exchange of momentum, water vapour and heat, of plant communities
- have knowledge of the use of simulation models to calculate flows of water and energy within the soil-plant-atmosphere system
- be able to interpret the temporal dynamics of processes like transpiration and heat exchange, in relation to climate.

Content

The first part, introduction in soil sciences (ca 2 weeks), contains a perspicuous view over the properties of the soil, their influence on plant growth, and how man influences soil properties. The second part, physical chemistry (ca 3 weeks), provides basic knowledge in thermodynamics, the chemical prerequisites for photosynthesis, complex formation in aqueous solution, principal structures of minerals and clays, and reactions in the soil solution/particle interface. In the third part, environmental physics (ca 5 weeks),

the physical and biological processes which regulate transport and states within the soil-plant-atmosphere system are described and analyzed; emphasis is put on flow and storage of water and energy. The contents of the course are:
- The soil as a system and its components (minerals, pores and particles, humus and organisms, air and water), and its impact on plant growth
- The influence of soil composition and structure on other soil properties
- Perspicuous view over occurrence, retention and movement of air, water and essential elements in the soil profile
- Basic thermodynamics (classical mechanics, thermodynamics)
- Liquids: structure and characteristics (retention types, surface tension, the unique properties of water)
- Solutions: (solvation, coordination geometries, hydrophobic and hydrophilic interactions)
- Solid soil partcles: structure and characteristics (the principal structures of minerals and clays, physisorption, chemisorption, ion exchange, colloidal system)
- The soil solution/particle interface (descriptive)
- Climate at global, regional and local scale
- Mechanisms regulating the exchange of water, heat and momentum between soil, vegetation and atmosphere
- The role of vegetation for regulating water and energy transport
- Evaporation from different vegetation covers and land use
- Water balance in different climatic regions
- Models calculating flow of water and heat within the soil-plant-atmosphere system (local scale)
- Radiation balance of the earth, and vegetation
- Temperature and heat flows in soil (including frost)
- The importance of abiotic factors (for instance soil humidity and temperature) for flows and storages of carbon and nitrogen within the soil-plant-atmosphere system
- Perspective of the relationship between processes on the local scale and global phenomena, like effects of climate change.

Implementation

Lectures ca 90 h
Computer exercises ca 20 h (compulsory)
Exercises and laboratories ca 40 h (compulsory)
Project ca 6 % of course time, ca 20 h (compulsory)
Project presentation ca 4 h (compulsory)

Examination

Requirements for examination

Written and/or oral examinations.

Approved examinations and completed compulsory parts of the course, i.e. exercises, laboratories and project work.

- If the student fails a test, the examiner may give the student a supplementary assignment, provided this is possible and there is reason to do so.
- If the student has been granted special educational support because of a disability, the examiner has the right to offer the student an adapted test, or provide an alternative assessment.
- If changes are made to this course syllabus, or if the course is closed, SLU shall decide on transitional rules for examination of students admitted under this syllabus but who have not yet passed the course.
- For the examination of a degree project (independent project), the examiner may also allow the student to add supplemental information after the deadline. For more information on this, please refer to the regulations for education at Bachelor's and Master's level.

Additional information

5 SUC in Geology/Hydrology and 5 SUC in Plant Anatomy/ Plant Physiology is recommended.

- The right to take part in teaching and/or supervision only applies to the course date to which the student has been admitted and registered on.
- If there are special reasons, the student may take part in course components that require compulsory attendance at a later date. For more information on this, please refer to the regulations for education at Bachelor's and Master's level.

Responsible department

Department of Soil and Environment

Supplementary Information

Finalized by: Programnämnden för naturresursprogrammet
Replacement course: MV0106 och MV0107