Swedish University of Agricultural Sciences

P000121, Remote sensing methods to uncover vegetation structure, 3.0 Hp

Syllabus

Finalized by: Finalized by: Maksym Matsala, 2025-01-10, 2025-01-10

Level within study regulation:

Third cycle

Grading scale:

Pass / Failed

Course language:

Swedish

Entry requirements:

Admitted as PhD student at SLU or other high education institution. Basic knowledge of R coding language.

Objectives:

The aim of this course is to master technical skills and uncover practical aspects of studying vegetation structure in tree-dominated ecosystems. Students will elaborate into theoretical concepts and applied aspects of vegetation structure at non-spatial, horizontal, and vertical dimensions. This will be achieved by applying a variety of R data analysis instruments and using open access information and data collected during field sessions.

After completing the course, student should be able to:

• understand the theory of vegetation structure

• describe stand structural diversity using non-spatial data

• apply tree location data to uncover stand spatial patterns

• harness raster data on tree structure at landscape level

• deliver structural characteristics from spaceborne lidar data

• plan and carry out drone lidar acquisitions over forests

• describe vertical stand structure using 3D point clouds.

Content:

The course emphasizes the pivotal role of vegetation structure in silviculture, forest and landscape ecology, biodiversity science, and other disciplines. This course introduces a broad range of possible digital and remote sensing methods to study vegetation forest structure. The latter will be considered from different dimensions: horizontal and vertical, but also using conventional non-spatial data. This course focuses on analysing the data from traditional forest experiments or inventories; open-source remote sensing data like satellite imagery and spaceborne lidar footprints; manually collected 3D points clouds using drone equipped with lidar.

The course is organized in two modules. First module introduces the theory of vegetation forest structure and applied implications of it in different disciplines. Students will elaborate into traditional forest inventory data and describe structural heterogeneity in forests. Students will collect tree location data to study spatial patterns in forest stand. This module also focuses on spaceborne optical and lidar data for investigating forest structure at landscape level. Second module will focus on 3D point clouds acquired by airborne remote sensing and how these data can be used to describe forest structure at horizontal and vertical levels. Students will collect their own data in forest and make individual project analysing it.

The course has two field trips and preparation session for pair assignment as mandatory elements. The individual project (module I) and pair assignment (module II) are the base for grades. For pair assignment, students will share study area and jointly discuss workflow, but will use different methods and will be evaluated separately.

The course will use different R packages as main analysing tools for both modules. Students will use GPS-recording tools during the first field trip and drone with mounted lidar during the second trip. Course leader will assist students with primary lidar data processing.

Modes of assessment:

The progress in the course will be examined in two written assignment. In first assignment student will work on tree location data and will individually couple it with freely available

remote sensing data. In second assignment, students will work in pairs on lidar data for shared study area, but using two different approaches. They will be evaluated separately. Assignments will be graded with only ‘pass’ or ‘fail’. - If a student has failed an examination, the examiner has the right to issue supplementary assignments. This applies if it is possible and there are grounds to do so.

- The examiner can provide an adapted assessment to students entitled to study support for students with disabilities following a decision by the university. Examiners may also issue an adapted examination or provide an alternative way for the students to take the exam.
- If this syllabus is withdrawn, SLU may introduce transitional provisions for examining students admitted based on this syllabus and who have not yet passed the course.
- For the assessment of an independent project (degree project), the examiner may also allow a student to add supplemental information after the deadline for submission. Read more in the Education Planning and Administration Handbook.

Organisation:

Department of Southern Swedish Forest Research Centre

Supplementary information

Other information:

- The right to participate in teaching and/or supervision only applies for the course instance the student was admitted to and registered on.
- If there are special reasons, students are entitled to participate in components with compulsory attendance when the course is given again. Read more in the Education Planning and Administration Handbook.