Syllabus

Course Description

Course Title	Forest ecophysiology and soil ecology
Course Code	47070
Course Title Additional	
Scientific-Disciplinary Sector	
Language	English
Degree Course	Master in Environmental Management of Mountain Areas
Other Degree Courses (Loaned)	
Lecturers	Prof. Luigimaria Vittorio Borruso, luigimaria.borruso@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/30124 Prof. Roberto Tognetti, Roberto.Tognetti@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/47243
Teaching Assistant	
Semester	First semester
Course Year/s	1
CP	6
Teaching Hours	36
Lab Hours	24
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	- Introduction to soil ecology - Soil quality and soil health - Climate change - Soil biodiversity - Soil formation - Biological, chemical, and physical properties of soils - Rhizosphere ecology

	- Mycorrhizal symbioses in relation to plant nutrition - Permafrost ecosystems - Plant microclimate - Leaf energy balance and evaporation - Plant water relations - Xylem architecture and water transport - Stomata and gas exchange - Root structure and nutrient acquisition - Environmental factors and tree growth - Stable isotope discrimination. - Climate change and atmospheric pollution
Course Topics	1. Describe, measure, and quantify the key processes involved in photosynthesis and analyse how they respond to varying environmental conditions. 2. Describe the mechanisms driving water movement in plants and explain the environmental conditions that influence water transport. 3. Describe the major processes involved in nutrient uptake and discuss the various forms of nutrients utilized by plants. 4. Describe and classify soil processes and profiles, and understand the interactions between biological, chemical, and physical characteristics 5. Describe and quantify soil micro-diversity and understand the role of soil fauna in the context of soil health. 6. Describe and use modern techniques for monitoring soil diversity evaluating species-species interactions through in the rhizosphere.
Keywords	Soil quality, Environmental changes, Gas exchange, Soil biodiversity, Water relations
Recommended Prerequisites	
Propaedeutic Courses	No
Teaching Format	Lectures shall introduce fundamental concepts in soil ecology and tree physiology, with particular emphasis on the scientific foundations of climate change adaptation. Field excursions shall provide direct experience in observing and understanding forest ecophysiological and soil processes. Laboratory exercises shall enable students to apply theoretical concepts through the analysis of empirical data.

	Supporting materials, including PowerPoint presentations, shall be made available on Teams.
Mandatory Attendance	No
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding --> - collaborate with other professionals in the fields of architecture, engineering and natural sciences Ability to apply knowledge and understanding -->
Knowledge and learning abilities are achieved through course attendance, practical activities both in the field and in the laboratory and through personal study. The achievement of the learning objectives will be tested through oral and/or written examinations, as well as through the guided preparation of seminars on topics specific to the Master's degree.
The tests (written and oral examinations, reports) and exercises involve the performance of specific tasks in which the student demonstrates mastery of tools, methodologies and critical autonomy. Autonomy of judgement -->
Autonomy of judgement is developed by means of training aimed at stimulating students' critical analysis. This includes the use of case studies, simulations using spreadsheets and videos, the critical reading and discussion of scientific articles, as well as specialised seminars conducted by experts from the forestry and environmental sector.
The assessment of the autonomy of judgement acquired by the students is entrusted to the individual lecturers responsible for the training activities, who will assess it through oral and/or written reports on specific topics and/or through the examination. Communication skills -->
Graduates will be able to work professionally and scientifically in one or more foreign languages, since in addition to English (the official language of the course) in which all compulsory and part of the optional courses are offered, they will be able to follow optional courses offered in Italian or German. The Language Centre of the Free University of Bozen/Bolzano also offers students, in accordance with the policy for trilingualism that characterises the

	profile of the Free University of Bozen/Bolzano, the possibility of taking extracurricular courses at level (A1-C1) in Italian and German. Finally, the graduate will be able to effectively communicate what he or she has learnt to the different professional categories with which he or she works and has the ability, given the international nature of the degree course, to share projects with foreign interlocutors. Written and oral communication skills are developed in seminars, tutorials and training activities, which also include the preparation of written reports and documents and the oral presentation of these, compulsorily in English and possibly in Italian and German for optional courses. The acquisition and assessment/verification of the achievement of communication skills is also envisaged through the writing of the final dissertation and its discussion in English. The Master's degree course promotes the acquisition of additional language skills (Italian/German), which are also aimed at increasing the ability of graduates to effectively market themselves on the labour market in part of the Alpine region (Austria-Switzerland-Italy-Germany). Learning capacity --> The graduate will have the ability to learn by synthesising the notions learnt in the course of studies, in order to address complex design issues, by expanding and updating the knowledge and technical skills acquired by using analysis, design and management tools appropriate to the situations in which the graduate operates. The graduate will be able to manage the different information networks in order to be able to continue to learn and thus to update himself/herself for his/her own cultural improvement and professional advancement. In addition, the graduate will be able to identify the appropriate training tools and paths for the development of their own cultural and specialist knowledge. Learning skills are attained during all phases of the course of study. The Master's degree course enables students to consolidate their self-study skills, especially when they carry out group work on proposed topics; again, this ability is enhanced during a compulsory course, which involves group work, and subsequently in the preparation of the final thesis of an experimental nature. In particular, this practical course requires students to work in small

	groups (3-5) on a project (e.g., rural development plan for a mountainous area, rehabilitation project for a degraded terrestrial or river ecosystem) from its initial stages (identification of objectives, conceptual development of actions, collection of available data) through to interaction with the various stakeholders and communication activities towards society. The projects will take place under the supervision of two or more professors from the two universities involved, but also by having the students interact with professional firms and/or public technical offices that have already expressed interest and willingness to do so. Learning ability is assessed through continuous forms of verification during the training activities and during the conduct of the activity related to the final examination.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	The final grade shall be determined on the basis of course activities, including field exercises and written essays, and shall be complemented by a final oral examination.
Evaluation Criteria	Evaluation shall focus on the student's capacity to undertake research activities both independently and in collaboration with peers. The final assessment shall place particular emphasis on the ability to synthesize, critically evaluate, and establish connections among the topics addressed in the course.
Required Readings	Recent scientific literature shall be provided throughout the course to support lectures, field activities, and group exercises.
Supplementary Readings	Landsberg J.J., Sands P.J. (2011). Physiological ecology of forest production. Academic Press. Jones H.G. (2013). Plants and microclimate. Cambridge University Press.
Further Information	
Sustainable Development Goals (SDGs)	Life on land, Climate action

Course Module

Course Constituent Title	Soil ecology

Course Code	47070A
Scientific-Disciplinary Sector	AGRI-06/B
Language	English
Lecturers	Prof. Luigimaria Vittorio Borruso, luigimaria.borruso@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/30124
Teaching Assistant	
Semester	First semester
CP	3
Responsible Lecturer	
Teaching Hours	18
Lab Hours	12
Individual Study Hours	45
Planned Office Hours	9
Contents Summary	- Introduction to soil ecology - Soil formation and classification - Biological, chemical, and physical aspects of soil - Soil micro-diversity and soil fauna - Methods to study the past climate and soil - Biodiversity - Next-generation biomonitoring of soil biodiversity - Biological soil crusts - Rhizosphere ecology - Permafrost ecosystems
Course Topics	
Teaching Format	Lectures shall introduce fundamental concepts in soil ecology, with particular emphasis on the scientific foundations of soil biodiversity. Field excursions shall provide direct experience in observing and understanding forest soil processes. Laboratory exercises shall enable students to apply theoretical concepts through the analysis of empirical data. Supporting materials, including PowerPoint presentations, shall be made available on Teams.

Required Readings	Recent scientific literature shall be provided throughout the course to support lectures, field activities, and group exercises.
Supplementary Readings	

Course Module

Course Constituent Title	Tree physiology and climate change
Course Code	47070B
Scientific-Disciplinary Sector	AGRI-03/B
Language	English
Lecturers	Prof. Roberto Tognetti, Roberto.Tognetti@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/47243
Teaching Assistant	
Semester	First semester
CP	3
Responsible Lecturer	
Teaching Hours	18
Lab Hours	12
Individual Study Hours	45
Planned Office Hours	9
Contents Summary	- Plant microclimate - Leaf energy balance and evaporation - Plant water relations - Xylem architecture and water transport - Stomata and gas exchange - Root structure and nutrient acquisition - Environmental factors and tree growth - Stable isotope discrimination. - Climate change and atmospheric pollution
Course Topics	
Teaching Format	Lectures shall introduce fundamental concepts in tree physiology, with particular emphasis on the scientific foundations of climate change adaptation. Field excursions shall provide direct experience in observing and

	understanding forest ecophysiological processes. Laboratory exercises shall enable students to apply theoretical concepts through the analysis of empirical data. Supporting materials, including PowerPoint presentations, shall be made available on Teams.
Required Readings	Recent scientific literature shall be provided throughout the course to support lectures, field activities, and group exercises.
Supplementary Readings	Landsberg J.J., Sands P.J. (2011). Physiological ecology of forest production. Academic Press. Jones H.G. (2013). Plants and microclimate. Cambridge University Press.