Syllabus

Course Description

Course Title	Forestry and Forest Ecology
Course Code	40201
Course Title Additional	
Scientific-Disciplinary Sector	AGRI-03/B
Language	English
Degree Course	Bachelor in Agricultural, Food and Mountain Environmental Sciences
Other Degree Courses (Loaned)	
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	Second semester
Course Year/s	3
CP	12
Teaching Hours	72
Lab Hours	48
Individual Study Hours	180
Planned Office Hours	36
Contents Summary	Understanding the concepts of ecology is fundamental in the context of either conservation of natural resources or sustainable forest management, especially in the fate of climate change and anthropogenic pressures. Thus, the course will introduce the students to ecological theory and terminology, factors affecting forest structure and composition, on the effects of environmental gradients on plant species distribution, the dynamics of forest communities over time and key ecosystem-level processes such as nutrient and carbon cycling. Students will also learn how natural and human-induced perturbations affect

	forest dynamics and ecosystem services and how appropriate forest management could increase resilience to perturbations. In this context, they will be introduced to silvicultural techniques and their applications to meet a variety of landowner or stakeholder objectives in forested stands and multiple ecosystem services. Students will learn how to analyse and interpret the growth of individual trees and the dynamics of forest stands to develop decision tools and design silvicultural prescriptions for sustainable forest management.
Course Topics	Silviculture: definition of wood, tree, forest and silviculture; concept of forest ecosystem services; definition of afforestation, reforestation, and deforestation; forests in the world, in Italy and Sud Tyrol; forest dynamics and successional processes; principle of dendrochronology and dendroecology; site description; forest stand description (i.e., composition, density, vertical and horizontal structure, development stage); management of coppices; management of even-aged forests; thinning; management of uneven-aged forests; examples on the management of the most important forest categories in South Tyrol. Forest mensuration: fundamentals of biometrics and statistics; fundamentals of measuring tree growth and volume; methods for assessing forest biomass; principles of relascopy; sampling techniques and data analyses; measuring timber products. Forest ecology: Understanding forest functioning in the context of the changing climate and human pressure. The concept of ecosystem. Resources and conditions. The ecological role of solar radiation and temperature. The transfer and storage of energy in ecosystems. Biogeochemical cycles - the carbon, water, and nutrients cycle in forest ecosystems. Forest productivity - gross and net primary productivity, net ecosystem productivity, and net ecosystem carbon balance. Interaction among species in forest ecosystems - symbiosis, competition, predation, parasitism, commensalism, mutualism, amensalism. Forest and disturbances - fire, pests, and wind effects. Forests and climate change - mitigation and adaptation. Ecological successions. Models and their role in resource management.
Keywords	Sustainable forest management, Mountain silviculture, Climate change, Biogeochemical cycles, Environmental disturbances.
Recommended Prerequisites	Botany, Soil chemistry

Propaedeutic Courses	no
Teaching Format	Lectures shall provide an overview of fundamental forest ecology and management concepts, with particular emphasis on the scientific basis of ecological processes and silvicultural practices. Field excursions shall offer real-world experiences, enabling students to visualize key ecological and silvicultural principles. Group exercises shall support the application of these concepts through the analysis of collected data. Supporting materials, including PowerPoint presentations, shall be made available in the course reserve collection on Teams.
Mandatory Attendance	no
Specific Educational Objectives and Learning Outcomes	Knowledge of the theoretical basis of ecology applied to the study of forest ecosystems. The capacity of learning and synthesizing scientific literature. The capacity of conceiving field experiments and analysing experimental data. Communication skills: through active participation in lessons, students will learn how to present the acquired knowledge in an appropriate way. Practical experience with measured data and scientific literature will also develop the ability to summarize and communicate the results of their analysis.
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 will be provided during the course.
Supplementary Readings	Ashton M., Kelty M. (2018). The Practice of Silviculture (10th ed.). Wiley.

	Palik B.J., D'Amato A.W., Franklin J.F., K. Johnson N. (2020). Ecological Silviculture: Foundations and Applications. Waveland Press, Inc. Kimmins J.P. (2005). Forest ecology: a foundation for sustainable forest management and environmental ethics in forestry. London: Macmillan Publishing. 3rd ed. Chapin III F.S., Matson P.A., Vitousek (2011). Principles of Terrestrial Ecosystem Ecology. Springer.
Further Information	
Sustainable Development Goals (SDGs)	Responsible consumption and production, Life on land, Climate action

Course Module

Course Constituent Title	Forestry
Course Code	40201A
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	Second semester
CP	6
Responsible Lecturer	
Teaching Hours	36
Lab Hours	24
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	Silviculture: definition of wood, tree, forest and silviculture; concept of forest ecosystem services; definition of afforestation, reforestation, and deforestation; forest dynamics and successional processes; principle of dendrochronology and dendroecology; site description; forest stand description management of coppices; management of even-aged forests; thinning; management of

	uneven-aged forests; Forest mensuration: fundamentals of biometrics and statistics; fundamentals of measuring tree growth and volume; methods for assessing forest biomass; principles of relascopy; sampling techniques and data analyses; measuring timber products.
Course Topics	
Teaching Format	Lectures shall provide an overview of fundamental forest management concepts, with particular emphasis on the scientific basis of silvicultural practices. Field excursions shall offer real-world experiences, enabling students to visualize key ecological and silvicultural principles. Group exercises shall support the application of these concepts through the analysis of collected data. Supporting materials, including PowerPoint presentations, shall be made available in the course reserve collection on Teams.
Required Readings	Recent scientific literature shall be provided throughout the course to support lectures, field activities, and group exercises.
Supplementary Readings	Ashton M., Kelty M. (2018). The Practice of Silviculture (10th ed.). Wiley. Palik B.J., D'Amato A.W., Franklin J.F., K. Johnson N. (2020). Ecological Silviculture: Foundations and Applications. Waveland Press, Inc.

Course Module

Course Constituent Title	Forest Ecology
Course Code	40201B
Scientific-Disciplinary Sector	AGRI-03/B
Language	English
Lecturers	Prof. Leonardo Montagnani, leonardo.montagnani@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/24975
Teaching Assistant	
Semester	Second semester
CP	6

Responsible Lecturer	
Teaching Hours	36
Lab Hours	24
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	Understanding forest functioning in the context of the changing climate and human pressure. The concept of ecosystem Biogeochemical cycles Forest productivity Interaction among species in forest ecosystems: Forest and disturbances Forests and climate change Ecological successions Models and their role in resource management.
Course Topics	Cycles of carbon, water and nitrogen. The energy flow and the food web. The human impact on forest ecosystems' function The fire cycle.
Teaching Format	Lectures shall provide an overview of fundamental forest ecology, with particular emphasis on the scientific basis of ecological processes. Field excursions shall offer real-world experiences, enabling students to visualize key ecological and silvicultural principles. Individual and group exercises shall support the application of these concepts through the analysis of collected data. Supporting materials, including PowerPoint presentations, shall be made available in the course reserve collection on Teams.
Required Readings	Recent scientific literature shall be provided throughout the course to support lectures, field activities, and group exercises.
Supplementary Readings	Kimmins J.P. (2005). Forest ecology: a foundation for sustainable forest management and environmental ethics in forestry. London: Macmillan Publishing. 3rd ed. Chapin III F.S., Matson P.A., Vitousek (2011). Principles of Terrestrial Ecosystem Ecology. Springer.