Syllabus

Course Description

Course Title	Forest planning and harvesting
Course Code	47072
Course Title Additional	
Scientific-Disciplinary Sector	
Language	English
Degree Course	Master in Environmental Management of Mountain Areas
Other Degree Courses (Loaned)	
Lecturers	dr. Giovanni Carabin, Giovanni.Carabin@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/35346 Prof. Enrico Tomelleri, Enrico.Tomelleri@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/38848
Teaching Assistant	
Semester	Second 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 forest inventories - Approaches for measuring forests - Remote sensing applications - Applications of light detection and ranging - UAV-borne sensing forest applications - National forest inventories - Forest and carbon accounting

	- Forest operations: peculiarities, basics of work safety, impact of the use of different equipment on the health of operators - Harvesting systems: main harvesting systems, machinery used for logging activities - Operational monitoring systems: work organisation and economic performance
Course Topics	Part I – Forest Inventories Introduction to forest inventories: objectives and definitions. Ground-based measurement techniques (e.g., relascopy, terrestrial laser scanning). Remote sensing platforms and sensors for forest assessment. UAV-borne photogrammetry and LiDAR applications. National forest inventories: approaches and case studies. Forest biomass and carbon accounting. Data handling and software applications for forest resource analysis. Part II – Forest Harvesting and Logistics Fundamentals of forest operations: work conditions, safety, ergonomics, and environmental impacts. Harvesting systems in mountain and lowland areas: ground-based and cable/aerial logging. Machinery for forest harvesting: main types, functions, and performance. Work organization, time studies, and operational monitoring systems. Economic evaluation of harvesting operations (costs, productivity, workability). Logistics of timber extraction and transport, including road infrastructure and supply chains. Innovative and emerging technologies: automation, remote-controlled and autonomous machinery.
Keywords	Forest inventories, remote sensing, UAV applications, biomass and carbon assessment, harvesting systems, forest machinery, work safety, productivity and cost analysis, timber logistics, sustainable forest management.
Recommended Prerequisites	
Propaedeutic Courses	No
Teaching Format	Lectures with slides and examples.

	Practical exercises in data analysis and use of forestry software. Field excursions for measurement methods, harvesting demonstrations, and logistics case studies. Group assignments and discussions.
Mandatory Attendance	No
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding --> - apply spatial information systems for land management and planning 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. In addition to having acquired a solid scientific-technological basis, the graduate of the Master's degree in "Environmental Management of Mountain Areas" acquires the ability to tackle and solve new problems. Thanks to a technical-scientific education, integrated with technological-managerial subjects, he or she is able to analyse, design, plan and manage the mountain territory and its specificities, vulnerabilities and characteristics. The graduate must also be able to coordinate interdisciplinary teams in the fields of ecology, restoration and functional maintenance of mountain ecosystems, agro-forestry management and socio-economic development. 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. The final thesis will play a central role in assessing the students' ability to design, plan, and manage forest ecosystems, with particular reference to the mountain environment. Autonomy of judgement --> For this purpose, the didactic approach envisages that theoretical training in courses is accompanied by individual and group work that encourages active participation, a proactive attitude and the

	capacity for autonomous elaboration. Another fundamental means of developing independence and critical awareness is through the drafting of the final thesis, in which the student must demonstrate that he or she has acquired autonomy of choice and design skills. Other key training moments for the development of independent judgement include educational visits and internships in companies and public or private institutions. 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	Written/oral exam and/or project work.
Evaluation Criteria	Assessment will focus on the ability to apply methods, critical thinking, clarity of technical communication. Written exam (focused answers, problem-solving, data interpretation).

	Oral exam (discussion of methods, case studies, integration of topics). Assignments/projects (field data analysis, harvesting/logistics planning, reports).
Required Readings	Provided via Open Learning Environment or MS Teams.
Supplementary Readings	Provided via Open Learning Environment or MS Teams.
Further Information	Provided via Open Learning Environment or MS Teams.
Sustainable Development Goals (SDGs)	Good health and well-being, Life on land, Climate action, Responsible consumption and production

Course Module

Course Constituent Title	Forest inventory
Course Code	47072A
Scientific-Disciplinary Sector	AGRI-03/B
Language	English
Lecturers	Prof. Enrico Tomelleri, Enrico.Tomelleri@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/38848
Teaching Assistant	
Semester	Second semester
CP	3
Responsible Lecturer	
Teaching Hours	18
Lab Hours	12
Individual Study Hours	45
Planned Office Hours	9
Contents Summary	- Introduction to forest inventories - Approaches for measuring forests - Remote sensing applications - Applications of light detection and ranging - UAV-borne sensing forest applications - National forest inventories

	- Forest and carbon accounting
Course Topics	Introduction to forest inventories: objectives and definitions. Ground-based measurement techniques (e.g., relascopy, terrestrial laser scanning). Remote sensing platforms and sensors for forest assessment. UAV-borne photogrammetry and LiDAR applications. National forest inventories: approaches and case studies. Forest biomass and carbon accounting. Data handling and software applications for forest resource analysis.
Teaching Format	Lectures with slides and examples. Practical exercises in data analysis and use of dedicated software. Field excursions for measurement methods, harvesting demonstrations, and logistics case studies. Group assignments and discussions.
Required Readings	Provided via Open Learning Environment or MS Teams.
Supplementary Readings	Provided via Open Learning Environment or MS Teams.

Course Module

Course Constituent Title	Forest harvesting and logistics
Course Code	47072B
Scientific-Disciplinary Sector	AGRI-04/B
Language	English
Lecturers	dr. Giovanni Carabin, Giovanni.Carabin@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/35346
Teaching Assistant	
Semester	Second semester
CP	3
Responsible Lecturer	
Teaching Hours	18
Lab Hours	12
Individual Study Hours	45

Planned Office Hours	9
Contents Summary	- Forest operations: peculiarities, basics of work safety, impact of the use of different equipment on the health of operators - Harvesting systems: main harvesting systems, machinery used for logging activities - Operational monitoring systems: work organisation and economic performance
Course Topics	Fundamentals of forest operations: work conditions, safety, ergonomics, and environmental impacts. Harvesting systems in mountain and lowland areas: ground-based and cable/aerial logging. Machinery for forest harvesting: main types, functions, and performance. Work organization, time studies, and operational monitoring systems. Economic evaluation of harvesting operations (costs, productivity, workability). Logistics of timber extraction and transport, including road infrastructure and supply chains. Innovative and emerging technologies: automation, remote-controlled and autonomous machinery.
Teaching Format	Lectures with slides and examples. Laboratory experiences and exercises. Field excursions for harvesting demonstrations and logistics case studies.
Required Readings	Provided via Open Learning Environment or MS Teams.
Supplementary Readings	Provided via Open Learning Environment or MS Teams.