Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Forest planning and protection forestry
Course code	47031
Scientific sector	AGR/05 -AGR/09
Degree	Master in Environmental Management of Mountain Areas (EMMA)
Semester	II
Year	I
Academic year	2022/23
Credits	9
Modular	Yes

Total lecturing hours	18 + 18 + 18
Total lab hours	
Total exercise hours	12 + 12 + 12
Attendance	
Prerequisites	
Course page	Course Offering - enrolled from 2021 / Free University of Bozen-Bolzano (unibz.it)

Specific educational objectives	The course belongs to the class "characterizing" and specifically to the scientific disciplinary area of forestry and environmental disciplines. It is part of the *Environmental protection* curriculum. Three modules that are strongly interconnected compose the course. The educational objectives of the *protection forestry* module are to provide knowledge about the role of mountain forests in mitigating and preventing natural hazards without compromising the provision of other ecosystem services. The forest management specifically oriented to enhance the protective function of mountain forests is the main focus of this module. For each natural hazard and forest category of Alpine area the most suitable forest management approach will be discussed also referring to real case-studies. The educational aim of the "*Forest Inventories*" module is to provide knowledge about methods and techniques for measuring forest resources. During lectures, students will learn about the innovative ground and remote sensing approaches while during practical activities, students will have the opportunity to put at work the acquired knowledge with data and software. Participants will familiarize themselves with some of the newest technologies used to estimate forest cover, biomass,

	and eventually carbon stocks. The educational aim of the module *"Forest Harvesting and Logistics"* is to provide knowledge about: • the main features of the machines to be used for the forest harvesting in mountain areas; • the basic procedures for selecting and planning the use of machines related to ground and aerial logging operations; • technical, operational and economic performances of a given technology system; • analysis of weak- and strength-points of any mechanization solution, with emphasis to safety issues.

Module 1	Protection Forestry
Lecturer	***Giorgio Alberti****, K Building, Room 4.02, email: Giorgio.alberti@unibz.it, tel. 0471-017088*
Scientific sector of the lecturer	AGR/05
Teaching language	English
Office hours	12
Teaching assistant (if any)	Alessandro Andriolo
Office hours	Upon appointment
List of topics covered	• Definition of protection forests; definition of hazard and risk; principles of risk management; main natural hazards in the Alps; protection forestry and forest planning. • Recalls about main characteristics and organs of a tree; roots and soil properties; tree crown, forest cover and rain/snow interception; tree stem, stability and protection functions. • Extreme events and return period. • How to identify protection forests. • Definition of target profile (species composition, forest structure, regeneration); indicators plots; forest stand dynamics. • Protection forestry and landslides: recalls on landslides (susceptibility assessment, types); vegetation and landslides; dendro-geomorphology application to landslides; forest management and landslides. • Protection forestry and avalanches: definitions; avalanches and forests dynamics; forest and avalanches; forest management to enhance protective role against avalanches; case studies.

	• Protection forestry and rockfall: definitions; protective measures; target diameter and stand density; forest management; case studies.
Teaching format	This module is based on frontal lectures, exercises and fieldtrips. Practical parts and excursions will also involve local forest managers and stakeholders. Power Point presentations will be available in Team group.

Module 2	Forest Inventories
Lecturer	***Tomelleri Enrico*** *K Building, Room 3.04, email: enrico.tomelleri@unibz.it*
Scientific sector of the lecturer	AGR/05
Teaching language	English
Office hours	12
Teaching assistant (if any)	
Office hours	9 – by appointment
List of topics covered	Introduction to the topic of forest inventories including general definitions and an overview of the course objectives. Description of approaches for measuring forests like relascopy and terrestrial laser scanning. Introduction to remote sensing with relevant platforms and sensors. Use of remote sensing for mapping forests with some examples of applications. Applications of light detection and ranging. UAV-borne sensing forest applications with a focus on photogrammetry. National forest inventories – an overview of how forest inventories are conducted in different countries. Forests and carbon accounting.
Teaching format	The module is based on frontal lectures. Hands-on exercises and excursions will permit the students to test the acquired knowledge on real world problems.

Module 3	Forest Harvesting and Logistics
Lecturer	***Raffaele Cavalli****, raffaele.cavalli@unipd.it*
Scientific sector of the lecturer	AGR/09 – AGRICULTURAL MECHANICS
Teaching language	English
Office hours	9 - Upon arrangement by e-mail
Teaching assistant (if any)	-
Office hours	-
List of topics covered	FOREST OPERATIONS – Peculiarities of forest work and consideration of the limits related to forest operations; knowledge of the basics of work safety applied in forestry; consideration of the impact of the use of different equipment on the health of the operator

	HARVESTING SYSTEMS – Introduction to the main harvesting systems used in mountain areas and related machinery. General description of the different machinery used for logging activities according to the different levels of mechanization. OPERATIONAL MONITORING SYSTEMS – Estimations of work times, work organization and scheduling, concepts of work rate and workability. Economic performances: exercise costs of forestry processes.
Teaching format	This is a lecture-lab module in which topics are presented by the Professor. Practical activities (field excursions) are led by the Professor eventually assisted by an expert of the sector invited on demand. Slides pdf-presentations will be available in the course reserve collection database of the faculty. Additional materials related to both proposed and solved exercises and articles on specific topics will be provided by the teacher, directly.

Learning outcomes	**Knowledge and understanding** The course is aimed to provide knowledge and the scientific basis about the role of mountain forests in mitigating and preventing natural hazards, the different methods and techniques used to quantify forest resources and the forest machinery used in mountain areas, with related aspects on ergonomic, safety and work organizations. **Applying knowledge and understanding** By the end of the course, students should be able to: 1. Manage protective forests according to specific natural hazard and target to protect. 2. Select the best approach to properly quantify forest resource at plot and regional scale. 3. Plan logging and timber harvesting activities in mountain areas, in various environmental and production contexts. **Making judgments** Students will have the ability to integrate knowledge, formulate judgments and handle complexity of the management of protective forests, assessment of forest resources, and planning of logging and timber harvesting activities in mountain areas. **Communication skills** Students will be able to present the acquired skills with a correct technical language. **Learning skills** Students will be able to autonomously extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation.

Assessment	The assessment will be carried out either by written

	student assignment or oral exam as communicated by each lecturer during the course.
Assessment language	English
Evaluation criteria and criteria for awarding marks	The final grade for the entire course will be calculated as the average of the results obtained in the three modules. • The assessment criteria for the assignments include soundness of the proposed approach, critical thinking, clarity and originality in the presented solution, mastery of the technical language, quality of presentation. • Relevant for the oral exam assessment are correctness of the answers, mastery of the technical language, ability to produce critical judgment, capability to create connections between the topics of the course.

Required readings	Slides pdf-presentations
Supplementary readings	The supplementary material for the module "Protection Forestry" and the module "Forest Inventories" will be made available on Teams/OLE during the course. For the module Forest Harvesting and Logistics: • Dykstra D.P. and Heinrich R., *FAO Model code of forest harvesting practice*. Roma: FAO, 1996. http://www.fao.org/docrep/v6530e/v6530e00.htm • Bryce J. Stokes, Colin Ashrnore, Cynthia L. Rawlins, and Donald L. Sirois., Glossary of Terms Used in Timber Hawes ing and Forest Engineering. Gen. Tech. Rep. SO-73. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 33 p.. 1989 • Visser, R., Next Generation Timber Harvesting Systems: Opportunities for remote controlled and autonomous machinery. Forest & Wood Products Australia, 2018 • Frehner M. et. al., Sustainability and success monitoring in protection forests - *Guidelines for silvicultural interventions in forests with protective functions* Federal Office for the Environment FOEN Bern, 2007