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	2019/20
Credits	9
Modular	Yes

Total lecturing hours	18 + 18 + 18
Total lab hours	
Total exercise hours	12 + 12 + 12
Attendance	
Prerequisites	
Course page	https://www.unibz.it/en/faculties/sciencetechnology/master-environmental-management-mountain-areas/

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 typology 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. Furthermore, 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 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 management and timber harvesting in mountain areas; • the basic procedures for selecting and planning the use of machines related to terrestrial and aerial logging operations related to working context; • 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	***Giustino Tonon**, K Building, Room 2.04, email: giustino.tonon@unibz.it, tel. 0471-017190*
Scientific sector of the lecturer	AGR/05
Teaching language	English
Office hours	12
Teaching assistant (if any)	Panzacchi Pietro
Office hours	
List of topics covered	• Protection against natural hazards (direct versus indirect protection); • Concept of target profile; • Efficacy of forest management of protection forests; • Sustainable management of protection forest; • concepts of "need for action" • Target profile of protection forests against avalanches • Target profile of protection forests against rock-fall • Target profile of protection forests against landslides • Target profile of protection forests against debris flow and runoff • Concept of minimum diameter in rock-fall protection forests • Forest management nearby the channel slope • Importance of modelling in protection forestry (describe the main results of the case-study) • Site-related target profile (Swiss stone pine and larch forests) • Site-related target profile (Norway spruce forests) • Site-related target profile (Scotch pine forests)

	• Site-related target profile (Silver fir forests) • Site-related target profile (Beech forests) • Site-related target profile (Oak forests) • Definition, aims and functions of soil bioengineering • Main criteria of soil bioengineering • Examples of soil bioengineering works • Dendrogeomorphology and its main applications
Teaching format	This module is based on frontal lectures, exercises and field-trip in which topics are presented by the professor. Practical parts and excursions are explained by the professor with the support of local forest managers and stakeholders. Power Point presentations will be available in the course reserve collection database of the faculty.

Module 2	Forest Inventories
Lecturer	***Tomelleri Enrico**, Building K, Office K4.05, 0471/017…, enrico.tomelleri@unibz.it*
Scientific sector of the lecturer	AGR/05
Teaching language	English
Office hours	12
Teaching assistant (if any)	-
Office hours	
List of topics covered	Introduction to forest inventories – Introduction to the topic including general definitions and an overview of the course objectives. Forest mensuration – Description of approaches for measuring forests like relascopy and terrestrial laser scanning. Remote sensing principles – introduction to active and passive remote sensing with relevant platforms and sensors. Remote sensing forest applications – use of remote sensing for mapping forests with some examples of applications. UAV-borne sensing forest applications – use of UAVs for forest inventories. Advantages and disadvantages compared to other approaches. National forest inventories – an overview of how forest inventories are conducted in different countries. Forests and carbon cycling – the role of forests in climate change.
Teaching format	The module is based on frontal lectures. Hands-on exercises will permit the students to test the acquired knowledge on real world problems.

Module 3	Forest Harvesting and Logistics
Lecturer	***Raimondo Gallo**, Building K, Office K4.02,0471/ 017623, raimondo.gallo@unibz.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	HARVESTING SYSTEMS – Introduction to the main harvesting systems used in mountain areas. General description of the different machinery used for logging activities according to the different levels of mechanization. POWER UNITS AND IMPLEMENTS – Description of the characteristic and functioning of the common and specialized machines employable for logging and transports tasks in mountain areas. Description on how the operational, economic and environmental constraints can influence on the choosing of the different solutions. During this topic will be analyzed: - portable machines (chainsaw); - terrestrial logging machines (forest tractor coupled with winch, forest tractor with forest trailer, harvester, forward hardwarder); - aerial logging machine (fix and mobile yarding machines); - transports (tractors or trucks). - Special machines (debarker and chipper) MOUNTAIN TECHNOLOGY SYSTEMS – Description of the main WMSD and injuries that can occur in forest activities. Explanation of the most important ergonomics and safety precaution to assume in according to the main logging activities. OPERATIONAL MONITORING SYSTEMS – estimations of work times, work organization and scheduling, concepts of workrate 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	All modules Oral exam that includes questions to assess the knowledge and understanding of the course topics and questions designed to assess the ability to transfer these skills to study cases. Space will also be dedicated to the evaluation of the ability to produce critical judgment about the topics of the course, and to the evaluation of the communication skills.
Assessment language	English
Evaluation criteria and criteria for awarding marks	Clarity of answers, mastery of language (also with respect to teaching language), ability to summarize, evaluate, and establish relationships between topics. The final mark will be the average of the marks of the 3 modules.

Required readings	Slides pdf-presentations
Supplementary readings	• Hippoliti G. Appunti di meccanizzazione forestale. Studio Editoriale Fiorentino, 1997. • Hippoliti G., Piegai F., Tecniche e sistemi di lavoro per la raccolta del legno. Compagnia delle Foreste, Arezzo, 2000 • Samset I. Winch and Cable System. Forestry

	Sciences, 1985. • 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