Syllabus

Course Description

Course Title	Landscape ecology and ecosystem restoration
Course Code	47071
Course Title Additional	
Scientific-Disciplinary Sector	BIOS-01/C
Language	English
Degree Course	Master in Environmental Management of Mountain Areas
Other Degree Courses (Loaned)	
Lecturers	Dr. Lukas Egarter Vigl, Lukas.EgarterVigl1@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/35013
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	- Basic terms and concepts in ecology, and systematics and taxonomy - Introduction to the discipline and history of Landscape Ecology - Multifunctional and traditional landscapes - Patterns and processes in landscapes, and methodologies - Ecosystems and land-use types in mountain areas - Vegetation and its differentiation in landscapes - Ecosystem and landscape services, and urban landscapes - Interdisciplinary aspects in Landscape Ecology - Introduction to Restoration Ecology with history and concepts - Ecological concepts for ecosystem restoration and practical

	measures - References for ecosystem restoration, and monitoring control - Examples of ecosystems and land-use types and their restoration - Re-introduction of animals and plants
Course Topics	Unit 1 – Landscape & Restoration Ecology Foundations This unit introduces the fundamental concepts and frameworks of landscape and restoration ecology, setting the ecological and theoretical groundwork for the course: - Introduction to Landscape Ecology – Overview of the discipline, its history, principles, and key concepts such as spatial heterogeneity, scale, and landscape function. - Drivers of Landscape Pattern and Change – Examination of natural and anthropogenic processes shaping landscapes, including climate, land use, disturbance, and fragmentation. - Restoration Ecology – Introduction to the theory and principles of restoring degraded ecosystems and landscapes, and their relationship with conservation and sustainable land management. Unit 2 – Land System Modelling This unit provides tools and analytical methods to assess and model spatial patterns and dynamics within landscapes: - Landscape Modelling & GIS – Use of Geographic Information Systems (GIS) for spatial data analysis, mapping, and modelling landscape structure and function. - Landscape Metrics – Quantitative approaches to describe and analyze landscape composition, configuration, and connectivity using spatial indices. - Remote Sensing – Application of remote sensing technologies (satellite imagery, drones) to monitor land-use change, vegetation, and ecological processes Unit 3 – Landscape and Society Focusing on the human dimension, this unit explores how people perceive, value, and govern landscapes: - Landscape Perception – Understanding how individuals and societies perceive, experience, and attach meaning to landscapes; cultural and aesthetic dimensions. - Ecosystem Services and Valuation – Identification and assessment of ecosystem and landscape services, and methods for their ecological, social, and economic valuation.

	- Governance, Policy and Planning – Frameworks and instruments guiding landscape and restoration management; participatory planning, policy integration, and sustainability governance. Unit 4 – Restoration Ecology This unit deepens the understanding of ecosystem restoration, emphasizing applied methods, case studies, and evaluation: - Introduction to Ecosystem Restoration – Historical development, ecological concepts, and guiding principles for restoring structure, function, and biodiversity. - Examples of Ecosystems and Land-Use Types and Their Restoration – Case studies illustrating restoration approaches in forests, grasslands, wetlands, rivers, and agricultural landscapes. - Monitoring and Control – Techniques for evaluating restoration success, adaptive management, and long-term ecological monitoring.
Keywords	Landscape and Restoration Ecology, Ecosystem Services, Land-Use Change, GIS and Remote Sensing, Environmental Governance, Sustainable Land Management, Interdisciplinary Landscape Research.
Recommended Prerequisites	
Propaedeutic Courses	No
Teaching Format	The course consists of a combination of lectures, exercises, and an excursion designed to integrate theoretical and practical aspects of landscape and restoration ecology. Lectures: introduction to key concepts, theories, research papers and case studies in landscape and restoration ecology. Exercises: practical sessions and group work focusing on GIS and remote sensing, landscape metrics, and applied restoration planning. Excursion: field visit to explore landscape patterns, restoration sites, and management practices in mountain and rural environments.
Mandatory Attendance	No
Specific Educational	Knowledge and understanding -->

Objectives and Learning Outcomes	- apply knowledge of landscape ecology, spatial planning and environmental rehabilitation in the sustainable management of mountain environments Ability to apply knowledge and understanding --> 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. 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	Student performance will be evaluated through a combination of individual and group-based components designed to assess both theoretical understanding and practical application. Group Work (Exercises): Evaluation of group assignments and practical exercises focusing on spatial analysis, landscape modelling, and restoration planning. In-Class Presentation: Individual or group presentation of a case study or short research paper related to landscape or restoration ecology. Final Written Exam: Multiple-choice examination assessing comprehension of key concepts, theories, and methods covered in lectures and exercises. The final grade will be based on the combined results of these components.
Evaluation Criteria	1. Group Work (Exercises) - Assessed through reports, spatial analyses, or project outputs: - Accuracy and quality of data analysis (e.g., GIS, remote sensing, or modelling results) - Application of landscape and restoration ecology concepts - Clarity and structure of documentation or report - Creativity and problem-solving in addressing real-world landscape challenges - Collaboration and equitable participation within the group 2. In-Class Case Study / Research Paper Presentation - Assessed through presentation and discussion performance: - Relevance and scientific quality of the chosen case or research topic - Depth of analysis and ability to link theory with practice - Clarity, structure, and effectiveness of presentation

	- Use of visuals or maps to support arguments - Engagement in discussion and response to questions 3. Final Written Exam (Multiple Choice) - Assessed through individual understanding of key knowledge areas: - Understanding of fundamental concepts in landscape and restoration ecology - Knowledge of key processes, patterns, and ecological principles - Familiarity with methodologies (GIS, metrics, monitoring) - Ability to apply theoretical knowledge to example-based questions
Required Readings	**Turner, M.G., Gardner, R.H., & O'Neill, R.V. (2015).** *Landscape Ecology in Theory and Practice: Pattern and Process.* 2nd Edition. Springer, New York. – Foundational text introducing the principles, methods, and applications of landscape ecology. **Gergel, S.E. & Turner, M.G. (2017).** *Learning Landscape Ecology: A Practical Guide to Concepts and Techniques.* 2nd Edition. Springer, New York. – Practical guide with case studies and applied examples linking landscape analysis to real-world ecological management. Selection of research papers provided by the lecturer.
Supplementary Readings	
Further Information	
Sustainable Development Goals (SDGs)	Sustainable cities and communities, Life on land, Climate action, Responsible consumption and production