Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	Sustainable soil management
Course code	47302
Scientific sector	AGRI-06/B
Degree	Smart Sustainable Agriculture Systems in Mountain Areas (SAM)
Semester	1st
Year	1st
Credits	6
Modular	*Yes*

Total lecturing hours	18 (Soil Protection) + 18 (Molecular Agroecology & Biochemistry)
Total lab hours	12 (Soil Protection) + 12 (Molecular Agroecology & Biochemistry)
Total exercise hours	-
Attendance	Strongly recommended
Prerequisites	
Course page	

Specific educational objectives	Provide students with the tools to assess soil health, manage conservation strategies, and understand environmental policies related to soil management. Additionally, provide advanced knowledge of molecular interactions within agroecosystems, alongside practical experience for monitoring and enhancing soil biodiversity nutrient cycles, and overall sustainability. This includes applying soil molecular ecology and biochemistry approach to monitor soil health.

Module 1	Soil Protection
Lecturer	
Scientific sector of the lecturer	AGRI-06/B
Teaching language	English
Office hours	Monday to Friday, upon appointment to be agreed through email
Teaching assistant *(if any)*	-
List of topics covered	- Soil and Ecosystem Function - Soil Health Descriptors and Methods - Threats to Soil Health - Soil Conservation Techniques - Soil Remediation Techniques - Soil Legislation
Teaching format	The class comprises lectures during which the professor presents the topics. Excursions and laboratory activities

	are also foreseen. The assessment of the student preparation is through an oral exam. The exam includes questions to verify the understanding of the course topics. In addition, questions on possible practical implications of the topics taught in the course will be evaluated

Module 2	Molecular Agroecology & Biochemistry
Lecturer	
Scientific sector of the lecturer	AGRI-06/B
Teaching language	English
Office hours	Monday to Friday, upon appointment to be agreed through email
Teaching assistant (if any)	-
Office hours	
List of topics covered	- Soil Biochemisty in Agroecosystems - Enzymatic Activities in Soils Linked to Biogeochemical Cycles - Soil Biomass and Respiration - Soil Biodiversity Monitoring in Agroecosystems Using Environmental DNA - Data Analysis of Environmental DNA and Biochemical Data - Application of Molecular and Biochemical Knowledge in Agroecosystems
Teaching format	The class comprises lectures during which the professor presents the topics. Excursions and laboratory activities are also foreseen. The assessment of the student preparation is through an oral exam. The exam includes questions to verify the understanding of the course topics. In addition, questions on possible practical implications of the topics taught in the course will be evaluated

Learning outcomes	**Knowledge and Understanding** Students will gain in-depth knowledge of soil health. Also, they will be introduced to advanced concepts of soil molecular ecology, biochemistry, and molecular interactions within agroecosystems, and environmental policies related to soil management. **Applying Knowledge and Understanding** Students will develop practical skills to apply in monitoring and soil sustainability practices. They will learn to use molecular ecology and biochemistry approaches to monitor soil health. **Making Judgements** Students will be trained to analyze and interpret data on soil health and agroecosystem interactions. They will be able to critically evaluate policies and soil management

	strategies, proposing innovative solutions for sustainability. **Communication Skills** Students will develop the ability to communicate complex concepts effectively, presenting findings and recommendations on soil health, biodiversity, and sustainability to specialized and non-specialized audiences. **Learning Skills** Students will improve their critical thinking skills, allowing them to remain informed about advancements in soil monitoring and molecular (agro)ecology, and agro ecosysytem management. Additionally, they will refine their ability to translate theoretical knowledge into practical applications, effectively addressing real-world challenges.

Assessment	The course exam consists of an oral exam divided between the two modules, with questions aimed at assessing the knowledge and understanding of the topics covered
Assessment language	*English*
Evaluation criteria and criteria for awarding marks	Ability to present clearly the topics studied within the course using appropriate technical terminology. In addition, the capability to establish relationships between different topics will be evaluated.

Required and/or suggesting reading material	Lecture notes are strongly recommended as a study material. - Blume, H. P., Brümmer, G. W., Fleige, H., Horn, R., Kandeler, E., Kögel-Knabner, I., Kretzschmar, R., Stahr, K., & Wilke, B. M. (2015). Scheffer/schachtschabel soil science. Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-30942-7 -Blume, H.-P., Brümmer, G. W., Horn, R., Kandeler, E., Kögel-Knabner, I., Kretzschmar, R., Kücke, M., Stahr, K., Wilke, B.-M., & Thiele-Bruhn, S. (2016). *Essentials of soil science: Soil formation, functions, use, and classification (2nd ed.).* Schweizerbart Science Publishers. - Donald L. Sparks, Balwant Singh, Matthew G. Siebecker, Environmental Soil Chemistry - David C. Coleman, Mac A. Callaham, D. A. Crossley Jr., Fundamentals of Soil Ecology