Syllabus

Course Description

Course Title	Transversal agricultural knowledge and skills
Course Code	47309
Course Title Additional	
Scientific-Disciplinary Sector	
Language	English
Degree Course	Master in Smart Sustainable Agriculture Systems in Mountain Areas
Other Degree Courses (Loaned)	
Lecturers	dr. Michele Torresani, Michele.Torresani@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/37414 Dr. Lorenzo Brusetti, Lorenzo.Brusetti@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/27178
Teaching Assistant	
Semester	Second semester
Course Year/s	1
CP	5
Teaching Hours	30
Lab Hours	20
Individual Study Hours	75
Planned Office Hours	15
Contents Summary	The course introduces the topic of Microbiology of farming systems and geomatics. Theoretical concepts as well as practical approaches are presented and discussed. Students will become familiar with the positive or negative role of microorganisms in the mountain farms, including animal health. By acquiring professional skills and knowledge about geomatics tools students become familiar with practical implementation of them.

	Module 1: Microbiology of farming systems (3 ECTS) This module will cover the following topics: (1) Revision of the main concept of microbial ecology in environments, including molecular-based knowledge; (2) Microbiology of grass, forages and silages; (3) Microbiology of rumen and livestock gut systems; (4) Basis on pathogenic microorganisms and animal health, including farm-related food spoilers; (5) Bee microbiology; (6) Antibiotic resistomes and the One Health approach, including agricultural soils, manure and irrigation waters; (7) PC-based laboratory including data analysis and survey of existing knowledge on the topic. Module 2: Geomatics (3 ECTS) The module will cover the following topics: (1) Introduction; (2) Definitions and concepts of geomatics; (3) geomatics for smart and sustainable agricultural systems in mountain areas; (4) Fundamentals of cartography and digital cartography; (5) Introduction to Geographic Information System (GIS), Global Positioning System (GPS), unmanned aerial vehicle (UAV) and remote sensing (RS); (6) spatial analysis and basics of geostatistics; (7) Laboratory (PC based) of GIS and RS; (8) Laboratory (external) of GPS and UAV; (9) Summary and conclusions.
Course Topics	The microbial cells: morphology, DNA dynamics, and basis of metabolism Brief introduction to the main concepts of microbial ecology Ecological factors affecting microbial growth Role of microorganisms in soil and symbiotic interactions; rhizobia, actinorhizal bacteria, and mycorrhizae Microbiology of grassland and pasture systems Microbiology of vegetable crops and fruit trees Microbiology in organic versus conventional agriculture Microbiology of silage and forage Microbiology of livestock

	Rumen microbiology Overview of pathogenic microorganisms in livestock Microbiology of bees Microbiology of manure Microbiology of irrigation water Antibiotic resistance and One Health concepts
Keywords	One Health; Gut microbiology; Soil microbiology; Microbiomes;
Recommended Prerequisites	Microbial Biology and Agricultural Microbiology
Propaedeutic Courses	No
Teaching Format	Lectures and laboratory activity
Mandatory Attendance	No
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding --> - use the most modern and intelligent technologies and information systems for practical application and for the management and creation of business processes - actively participate in research projects in the field of mountain agriculture - collaborate with other professionals in the fields of architecture, engineering and natural sciences - work in interdisciplinary, national and international teams Ability to apply knowledge and understanding --> Graduates of the Master SAM degree programme have a solid scientific and technical foundation that enables them to tackle and solve complex problems. Thanks to their scientific and technical training in the fields of agriculture, economics and management, graduates are able to develop analyses and plans for the development and management of farms in mountain regions, taking into account their specific characteristics and multifunctionality (ecosystem services). In these specialist areas, graduates are able to coordinate interdisciplinary teams in the agricultural sector. The ability to apply the specialist knowledge acquired is achieved through critical reflection on the teaching materials offered and classroom learning activities, supplemented by case study analysis and practical exercises by teachers. In addition, there are practical exercises in the laboratory, on the computer and in the field, excursions, bibliographic research, the development of individual

	and/or group projects and the preparation of the final thesis. The assessment of success (oral and written exams, seminar reports) and exercises are designed in such a way that graduates must demonstrate that they have mastered the tools of the trade, the methods learned and a critical and independent way of working. Autonomy of judgement --> - choosing the best production techniques, taking into account environmental protection; - analysing data and information to independently assess the quality and effectiveness of the results obtained in the design of strategies to control difficulties - making independent decisions on professional issues. These may relate in particular to the feasibility of projects in the field of agricultural activities - planning activities and strategies on the basis of predefined objectives, taking into account timescales and methods Communication skills --> Graduates will be able to work professionally in one or more foreign languages. Compulsory and elective courses are taught in English. In addition, some elective courses may be offered in Italian or German. In accordance with unibz's trilingual policy, the unibz Language Centre offers extracurricular courses (levels A1-C1) in Italian and German. Graduates will be able to communicate fluently with other professional groups with whom they work and will be able to participate in European projects with foreign partners thanks to the international orientation of the Master's programme. Written and oral communication skills are promoted in seminars, excursions, exercises and teaching activities, which include the preparation of reports and written documents and their oral presentation in English and, where applicable, in Italian and German in elective subjects. The acquisition and assessment/verification of the above communication skills also takes place through the writing of the final thesis and its discussion in English. The master's degree programme also promotes the acquisition of additional language skills in German and Italian. This should enable graduates to successfully enter the international job market (e.g. Austria-

	Switzerland-Italy-Germany). Learning skills --> Graduates will be able to manage complex projects thanks to the specialist knowledge acquired during their studies. They will be able to continuously expand the specialist knowledge acquired during their studies and keep it up to date. They will learn to use the most modern methods to be able to competently carry out analysis, project planning and management measures in their professional lives. Graduates will be able to use various IT systems to further their cultural and professional development. They will also be able to choose the methods and training paths best suited to their cultural and professional development. Graduates will be able to manage complex projects thanks to the specialist knowledge acquired during their studies. They will be able to continuously expand the specialist knowledge acquired during their studies and keep it up to date. They will learn to use the most modern methods to be able to competently carry out analysis, project planning and management measures in their professional lives. Graduates will be able to use various IT systems to further their cultural and professional development. They will also be able to choose the most suitable methods and training paths for their cultural and professional development. Learning skills are encouraged throughout the degree programme. Particular attention is paid to individual study, especially in the completion of group work on the proposed topics. These skills are enhanced during compulsory lessons, which include group work, and subsequently in the preparation of the final thesis. Learning progress is assessed regularly during the courses and during the writing of the final thesis. In particular, this practice-oriented training involves working in small groups (3-5 students) on a joint project (e.g., a plan for the development of farms in mountain areas) from the initial stages (development of objectives and measures, collection of available data) to cooperation with various stakeholders (e.g., public administration, mountain agriculture advisory centre, farmers' association), which also includes communication activities for agriculture and society. The projects are carried out under the supervision of two or more teachers, with an exchange between students and private companies and/or the public authorities concerned.

	Learning ability is assessed through continuous assessment during the learning units and in the preparation of the final thesis.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	Written exams (3 open questions)
Evaluation Criteria	Max 10 points for each question
Required Readings	Slide materials from the lecturer
Supplementary Readings	
Further Information	
Sustainable Development Goals (SDGs)	Clean water and sanitation, Life on land, Climate action, Responsible consumption and production

Course Module

Course Constituent Title	Microbiology of farming systems
Course Code	47309A
Scientific-Disciplinary Sector	AGRI-08/A
Language	English
Lecturers	Dr. Lorenzo Brusetti, Lorenzo.Brusetti@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/27178
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	Module 1: Microbiology of farming systems (3 ECTS) This module will cover the following topics: (1) Revision of the main concept of microbial ecology in

	environments, including molecular-based knowledge; (2) Microbiology of grass, forages and silages; (3) Microbiology of rumen and livestock gut systems; (4) Basis on pathogenic microorganisms and animal health, including farm-related food spoilers; (5) Bee microbiology; (6) Antibiotic resistomes and the One Health approach, including agricultural soils, manure and irrigation waters; (7) PC-based laboratory including data analysis and survey of existing knowledge on the topic.
Course Topics	The microbial cells: morphology, DNA dynamics, and basis of metabolism Brief introduction to the main concepts of microbial ecology Ecological factors affecting microbial growth Role of microorganisms in soil and symbiotic interactions; rhizobia, actinorhizal bacteria, and mycorrhizae Microbiology of grassland and pasture systems Microbiology of vegetable crops and fruit trees Microbiology in organic versus conventional agriculture Microbiology of silage and forage Microbiology of livestock Rumen microbiology Overview of pathogenic microorganisms in livestock Microbiology of bees Microbiology of manure Microbiology of irrigation water Antibiotic resistance and One Health concepts
Teaching Format	Lectures and laboratory activity
Required Readings	Slide materials from the lecturer
Supplementary Readings	-

Course Module

Course Constituent Title	Geomatics
Course Code	47309B
Scientific-Disciplinary Sector	AGRI-04/C
Language	English

Lecturers	dr. Michele Torresani, Michele.Torresani@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/37414
Teaching Assistant	
Semester	Second semester
CP	2
Responsible Lecturer	
Teaching Hours	12
Lab Hours	8
Individual Study Hours	30
Planned Office Hours	6
Contents Summary	Module 2: Geomatics (3 ECTS) The module will cover the following topics: (1) Introduction; (2) Definitions and concepts of geomatics; (3) geomatics for smart and sustainable agricultural systems in mountain areas; (4) Fundamentals of cartography and digital cartography; (5) Introduction to Geographic Information System (GIS), Global Positioning System (GPS), unmanned aerial vehicle (UAV) and remote sensing (RS); (6) spatial analysis and basics of geostatistics; (7) Laboratory (PC based) of GIS and RS; (8) Laboratory (external) of GPS and UAV; (9) Summary and conclusions.
Course Topics	The module introduces the fundamentals of environmental and agriculture geomatics and remote sensing, providing a solid foundation in the scientific principles necessary for the understanding and use of geospatial data.
Teaching Format	Frontal lectures, exercises, labs, projects.
Required Readings	NA
Supplementary Readings	NA