Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Studium Generale

Syllabus
Course description

Course title	Introduction to Smart Agriculture Technologies for Mountain Ecosystems
Course code	Tbd
Scientific sector	AGR/09-Meccanica Agraria
Semester	Winter
Academic Year	2023-2024
Credits	3 ECTS
Day and time of the lectures	To be decided (please, refer to the course timetable) • ca. 8 hrs front and online lectures; • 6 hrs excursions (field practical lab) • 4 hrs exercise (computer applications at unibz)
Place or/and online	Bozen / Bolzano online / hybrid with TEAMS exercises/excursions at AFILab, NOI Techpark
Total lecturing hours	ca. 18 hrs
Attendance	Highly recommended, but not compulsory (highly recommended for practical applications)
Prerequisites	No formal requirements exist, but a previous background in agricultural sciences is helpful.

Specific educational objectives	This introductory course invites interested people to enter to the world of **Smart Agriculture (SA)** with a special focus on **Mountain Innovation Ecosystems.** The general definition refers to interconnected and automated technologies to be applied at agri-environmental enterprises (farms, forestry, livestock farming systems) to enable advanced forms of data-driven management decisions. The course will give a general understanding of the SA domain by presenting central concepts, definitions and technologies. Practical applications and needs will even regard **mountain contexts**, with a focus on extensive farming systems and the needs to identify new full production chains based on niche crops to be entirely carried at mountain farms. Lectures will start with background knowledge on farm mechanization, as well as technologic, economic and site-specific requirements. Common and well-known smart farming applications in crop production, livestock farming, fruit production and agro-forestry will be presented and discussed.

	Further on, basic components of every SA system will be considered more in detail, with a focus on the following components: sensors, identification systems, positioning systems (GNSS), actuators, hardware and software elements enabling advance decisional application at the enterprises. The way by which all the components will be integrated into a Farm Information Systems (FIS)/ Farm Management Information System (FMIS) will be finally discussed, together with the "decision-oriented" approach (=infologic) to be adopted when designing a new FIS/FMIS. The practical part of the course will focus in detail on the use of the above components (e.g., positioning systems to map entities and land shapes; GIS for managing digital maps importing specific field data; computation strategies for geo-data interpretation to be used in farm management decisions). The course is planned as hybrid course, that means only some lectures will be in presence. About 50% of the course will consist of online lectures or seminars. A significant part of the course will consist of self-study and independent study using digital sources.

Lecturer	Andreas Mandler (coordinator) & Fabrizio Mazzetto, CC-Mountecos (B5-AFIlab), Guests + other lab staff. mailto: andreas.mandler@unibz.it
Scientific sector of the lecturer	The course is organized by the Competence Centre Mountecos, as it deals with topics close to the project iNEST-PNRR https://www.unibz.it/en/home/research/competence-centre-mountain-innovation-ecosystems/ AGR/09 – Meccanica Agraria
Teaching language	English
List of topics covered	Smart Agriculture, agricultural engineering, data vs. information, farm information systems and related technological component, automation in mountain systems, certification and traceability, new full-chain production models in mountain systems
Teaching format	Lectures, guest lectures, discussions, hybrid seminars (synchrony/asynchrony), independent study (asynchrony). Excursion with field trips, assisted computer lab applications.

Learning outcomes	**Knowledge**: The course offers a first approach to the concept of SA. Students will learn about the different dimensions the term entails in the various realms of agriculture. Students will understand how data is

	collected, processed, evaluated and used in order to support farm management decisions, as well as to produce valuable reports for certification purposes (such as traceability tasks). Students will be introduced to the problems of agricultural management in mountainous contexts, together with the need to identify here new ICT-supported production models. **Applying knowledge and understanding**: students will learn how smart farming features can be applied to monitor and document farm processes and answer questions related to farm management, thus helping to produce more efficiently. At the same time, they will learn how to interpret and critically evaluate the collected data and subsequent offers made by smart farming solutions, even located in mountain contexts. **Making judgments**: ability to critically evaluate existing research results/applications in the field; ability to formulate an appropriate need analysis. **Communication skills**: learn key terminology of smart farming, FIS components (eg. IoT, GNSS, LAN etc.) and wider digital technologies; such terminology is necessary to communicate with representatives from the industry, academia and general users. **Learning skills**: ability to link agricultural knowledge with the digital world. Creating interfaces to collect und process data and make it available to support farm management decisions. Learning how to make further use of existing data. Ability to extend the knowledge acquired during the course autonomously by reading and understanding scientific texts and general analysis.

Assessment	Written test with 30 questions with multiple answers to test knowledge application and skills; possible oral discussion to review wrong answers.
Assessment language	English
Evaluation criteria and criteria for awarding marks	All students enrolled in the course are admitted to the written test. If necessary, an oral exam will be arranged. Relevant criteria are the clarity of answers, mastery of articulation i.e., definitions and technical terminology (also with respect to teaching language), ability to summarize, evaluate, and establish relationships between topics covered in the lecture. Standard assessment is based on a total scale of 100 points. At least 60% (60 points) are needed to pass the course.

Required readings	Tbc
Supplementary readings	Tbc