Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus
Course description

Course title	**TECHNOLOGIES FOR LOW INPUT AGRICULTURAL SYSTEMS**
Course code	47043
Scientific sector	AGR/09 – Meccanica Agraria (Agricultural Machinery and Mechanization)
Degree	Environmental Management of Mountain Areas (EMMA)
Semester	2
Year	I
Academic year	2024/2025
Credits	6
Modular	No

Total lecturing hours	36
Total lab hours	-
Total exercise hours	24
Attendance	Not compulsory
Prerequisites	The completion of a university course in *Basic Physics* is strongly recommended.
Course page	https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/master-environmental-management-mountain-areas/course-offering/

Specific educational objectives	This is a characterizing course ("*corso caratterizzante*") of the Master's Degree in "Environmental Management of Mountain Areas" dealing with those **Agricultural Engineering topics** that consider various aspects of the use of technologies for performing typical production processes in mountain environments. The most relevant technologies are here introduced through a multi-disciplinary approach that, besides the description of the features, the physical properties and construction details of the technological systems, analyses their main implications and impacts on energy performances and management. The student is gradually introduced to this integrated approach starting from the comprehension of the physical behaviour of a technology within a process, up to its management practice through an enterprise information system. By the end of the course, students are expected to be able to: • know the main features of the machines to be used for the agricultural process management in

	mountain areas; • carry out the basic procedures to select and plan the use of machines related to arable and livestock systems in mountain areas; • evaluate the technical and operational performances of a given technology system; • identify both weak- and strength-points of any mechanization solution, with emphasis to safety issues.

Scientific sector of the lecturer	AGR/09 – Meccanica Agraria (Agricultural Machinery and Mechanization)
Teaching language	English
Office hours	
Teaching assistant (if any)	-
Office hours	-
List of topics covered	**MOUNTAIN ENERGY SYSTEMS** – Introduction to Energy: sources, requirements, consumption, degree of use. Energy sources FOR and FROM agro-environmental enterprises. Types of energy. Energy conversions and generators. Endothermic engines: performances and fuel consumption. Thermal and electric generators, co-generators. The "tractor" concept: a mobile power-conversion unit. Farm tractors: types, dynamic power balance and related performances. Main technologies for exploiting renewable energy sources in agricultural farms: sun, water, wind, biomasses; principles and technologies for the production and the use of liquid and gaseous biofuels. Examples of technical systems for the pollutants control: cyclones for dust removal, SCR systems for NO_x reduction. **MOUNTAIN TECHNOLOGY SYSTEMS** – Enterprise ontology: resources, materials and actions. Mountain farming systems. Standard processes and scheduling. Planned and executed activities. Arable, grassland and livestock farming systems. Agricultural tasks: soil tillage, fertilization and phytosanitary treatments with environmental related problems. Grassland and livestock tasks: haymaking, forage harvesting and conservation, milking in dairy cow/goat livestock systems. Precision farming and conservative agriculture. Systems for animal wastes treatment at farms. Transport tasks: logistic and energy consumption, overview on mountain transport systems. Ergonomics and safety in mountain production systems.
Teaching format	This is a lecture-lab course in which topics are presented by the Lecturer. Slides presentations in pdf format will be made available in the Teams web space for this course

	made available by the Faculty. Possible additional materials related to both proposed and solved exercises and scientific articles on specific topics will be directly provided by the Lecturer and put at the students' disposal.

Learning outcomes	**Knowledge and understanding** of: (1) farm machinery use in mountain areas, with related aspects on safety, work organization and energy impacts; (2) how integrating the use of machines within an enterprise information systems to support mountain farmers in their operational, management and strategic decisions, (3) the different technical solutions that can be used for saving resources and limiting the environmental load in field operations, energy generation, production processes in agricultural systems. **Applying knowledge and understanding** in the planning, selection and use of farm machinery in mountain areas, technologies and sensors for a better energy use in a rural context; capability of performing autonomous evaluations on selection/use of farm machines, technologies and sensors in various environmental and production contexts. **Making judgments** through the choice of the most appropriate parameters for appreciating the most relevant aspects of the performance of a rural technology system. Capability of presenting such an evaluation in a written report. **Communication skills** to present topics and issues relative to any rural technology system for mountain areas with pertinent and adequate technical terminology **Learning skills** to deepen and update the knowledge acquired during the course seeking relevant information on scientific and technical literature

Assessment	The assessment of students' outcomes will be carried out through: i) the explanation, in front of the exam commission, and the subsequent discussion of a final report (suggested in the form of a ppt presentation) dealing with practical management/strategic/technical problems in a rural technology system, to be proposed and prepared autonomously by the student; ii) an oral discussion on the theoretical topics covered during the course.
Assessment language	English

Evaluation criteria and criteria for awarding marks	The final mark will be assigned as follows: discussion of the report (40%), final oral discussion (60%). It will not be possible to pass the exam if one of the above assessments is insufficient. Marks will be assigned based on correctness and clarity of answers, mastery of the technical language, capability to establish relationships between different topics.

Required readings	Didactic material made available by the lecturer.
Supplementary readings	For consultation purposes; in alphabetical order on the title: • Chen G., ***Advances in Agricultural Machinery and Technologies***. CRC Press, 2018, ISBN 978-1498754125 • Megh R. Goyal, ***Emerging Technologies in Agricultural Engineering***, 1st Edition, Apple Academic Press, 2017, ISBN 978-1771883405 • Holden, N. M., Wolfe, M. L., Ogejo, J. A., and E. J. Cummins, ***Introduction to Biosystems Engineering***, ASABE in association with Virginia Tech Publishing, 2021, ISBN 9781949373974 pdf - 9781949373936 print (free downloadable as pdf at https://www.asabe.org/BEdetails) • Lazzari M., Mazzetto F., ***Meccanica e Meccanizzazione dei Processi Produttivi Agricoli***. Reda Ed., 2016, ISBN 978-8883612558 (in Italian)