Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Syllabus LM-69
Course description

Course title	Smart design and planning of mountain livestock and Grassland management Technologies
Course code	47307
Scientific sector	AGR/09 – Meccanica Agraria (Agricultural Machinery and Mechanization)
Degree	Smart Sustainable Agriculture Systems in Mountain Areas (SAM)
Semester	2nd
Year	1st
Credits	6
Modular	*No*

Total lecturing hours	36
Total lab hours	
Total exercise hours	24
Attendance	Compulsory
Prerequisites	Completion of the course "Smart Agricultural Technologies" in the first semester of the degree program "Smart Sustainable Agriculture Systems in Mountain Areas (SAM)" is strongly recommended.
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Specific educational objectives	This is a characterizing of the course "Smart design and planning of mountain livestock and Grassland management Technologies" of the Master's degree "Smart Sustainable Agricultural Systems in Mountain Areas 'SAM', which deals with those agricultural engineering topics that highlight various aspects of the use of technologies to carry out typical agricultural production processes in mountain areas. The focus is on fodder production and livestock farming processes. The main technologies of "Smart Farming" will be presented through a multidisciplinary approach that, in addition to describing the characteristics, physical, electronic and computational properties and functional design details of the technological systems, will also address the main aspects of the necessary resources (such as energy requirements) and management needs. The student is gradually introduced to this integrated approach, which ranges from understanding the technical principles within a technical process to their application within an electronic management system. At the end of the course, students should be able to - Know the main characteristics of the machinery required for agricultural process management in mountain areas; - The basic procedures for selecting and planning the use of machinery for forage production and livestock farming in mountain areas; - Evaluate the technical and operational performance of a given technology system; - Identify weakness and strengthen points of mechanization solutions. *Please indicate the educational objectives* 1. understanding the systematic of livestock farming systems. 2. Ability to implement environmental requirements to livestock farming technologies on grassland. 3. Ability to design concepts of farm buildings for livestock in mountain regions; 4. Basic knowledge of smart technologies for livestock farming to be able to plan mechanization concepts (grazing, fodder production, in the barn, livestock management systems, animal observation, animal welfare detection, production observation); 5. Knowledge of smart waste management systems and ability to calculate sustainable process technologies and machinery 6. Understanding the basics and ability to calculate renewable Energy supply systems for livestock farming. 7. Understanding the basics and ability to use LCA tools for system evaluation

Lecturer	*Gronauer, andreas.gronauer@unibz.it, https://www.unibz.it/de/faculties/agricultural-environmental-food-sciences/academic-staff/person/37756-andreas-gronauer*
Scientific sector of the lecturer	AGR/09 – Meccanica Agraria (Agricultural Machinery and Mechanization)
Teaching language	English
Office hours	by appointment
Teaching assistant *(if any)*	-
Office hours	-
List of topics covered	Part I: 1. systematic of livestock farming systems; 2. requirements to livestock farming technologies on grassland; 3. concepts of farm buildings for livestock in mountain regions; 4. smart technologies for livestock farming (grazing, fodder production, barn technologies, livestock management systems, 5. smart waste management systems 6. renewable Energy supply systems 7. LCA tools for system evaluation Part II: 1. definition, technology of grassland management, 2. complexity of an animal farm system - grazing and forage production 3. requirements for grassland management; 4. process steps and machinery of grassland management 5. tools/devices for smart farming technology (telemetry, telecommunication, sensors, data processing, GIS mapping, variable rate technology, evaluation); 6. farm management and information systems (FMIS); 7. Examples from Practice
Teaching format	Frontal lectures (36 hours), exercises (12 hours), labs (4 hours), office (18) by a written scientific report on a specific topic, oral presentation of the report

Learning outcomes	**Knowledge and understanding of:** (1) farm machinery use in mountain areas, with related aspects on smart farming technology, especially electronics, computer science, telecommunication, farm management and information systems, and energy impacts; (2) how integrating the use of smart farming technologies into machines and 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, waste management, energy generation, for 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 bette 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, ii) the written scientific report and iii) an oral ppt presentation about the report (see ii))
Assessment language	English
Evaluation criteria and criteria for awarding marks	The final mark will be assigned as follows: Ad i) oral exam 55% Ad ii) written report 20% Ad iii) oral presentation (25%) 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. Examples: • relevant for assessment i): clarity of answers, mastery of language (also with respect to teaching language), ability to summarize, evaluate, and establish relationships between topics. • relevant for assessment iii and iii): ability to work in a team, creativity, skills in critical thinking, ability to summarize in own words

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 (https://www.asabe.org/BEdetails) • Lazzari M., Mazzetto F., Meccanica e Meccanizzazione dei Processi Produttivi Agricoli. Reda Ed., 2016, ISBN 978-8883612558 (in Italian) • Jungbluth Th., Büscher W., Krause M., Technik Tierhaltung. Eugen Ulmer Verlag, utb, 2., vollst. überarb. Auflage 2017. 322 S., 154 Abb., 50 Tab., kart., 2017, ISBN 978-3-8252-4243-5., • Kuntke F., Resilient Smart Farming; Crisis-Capable Information and Communication Technologies for Agriculture; Springer Verlag; 2024, ISSN 3004-9318 ISSN 3004-9326 (electronic) ISBN 978-3-658-44156-2 ISBN 978-3-658-44157-9 (eBook) https://doi.org/10.1007/978-3-658-44157-9 • Dörr, J., Nachtmann, M., (Ed.) Handbook Digital Farming - Digital Transformation for Sustainable Agriculture, Springer-Verlag GmbH, part of Springer Nature. ISBN 978-3-662-64377-8 ISBN 978-3-662-64378-5 (eBook) https://doi.org/10.1007/978-3-662-64378-5