Syllabus

Course Description

Course Title	Fundamentals of Agricultural and Forest Engineering
Course Code	40214
Course Title Additional	
Scientific-Disciplinary Sector	NN
Language	Italian
Degree Course	Bachelor in Sustainable Agriculture and Forestry in Mountain Environments
Other Degree Courses (Loaned)	
Lecturers	Prof. Michele Larcher, Michele.Larcher@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/33885 dr. Michele Torresani, Michele.Torresani@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/37414 dr. Riccardo Zamboni, Riccardo.Zamboni@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/51510
Teaching Assistant	
Semester	Second semester
Course Year/s	1
CP	9
Teaching Hours	54
Lab Hours	36
Individual Study Hours	135
Planned Office Hours	27
Contents Summary	Fundamentals of Physics and Engineering: Kinematics, dynamics, Newton laws, equilibrium, work

	Mechanical energy, power, linear and angular momentum Fluid statics and dynamics Equation of state, ideal and real gases, 1st and 2nd law of thermodynamics Electromagnetism Topography and Digital Cartography: GIS (Geographic Information Systems) Vectors and platforms for remote sensing Global positioning systems Optical data for environmental analysis LiDAR for 3D terrain modeling Photogrammetry for estimating ecological variables
Course Topics	The course, devoted to the fundamentals of agricultural and forestry engineering, is organized into two modules: (i) Fundamentals of Physics and Engineering; (ii) Topography and Digital Cartography. The first module introduces the basic concepts of physics and engineering that are essential for understanding and managing technical applications in agricultural and forestry contexts. The second module introduces the fundamentals of environmental geomatics and remote sensing, providing a solid foundation in the scientific principles necessary for the understanding and use of geospatial data.
Keywords	Physics, Engineering, topography, cartography, fundamental knowledge.
Recommended Prerequisites	Students are expected to have a basic knowledge of mathematics.
Propaedeutic Courses	no
Teaching Format	Frontal lectures, exercises, labs, projects.
Mandatory Attendance	no
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding: The degree course provides advanced knowledge for the training of professionals capable of carrying out management and coordination activities in mountain and forestry agriculture, as well as effectively preparing students for possible further studies. The knowledge and skills acquired provide graduates with

	planning, management, control, coordination and training skills in agriculture and forestry. All these skills will be transmitted to the graduates by means of face-to-face lecturing, technical and practical laboratory exercises, field exercises and educational-scientific excursions. The elaboration of the experimental thesis may be carried out both in the faculty's laboratories and in companies and local authorities At the end of their studies, the three-year graduate at Sustainable agriculture and forest management in mountain environment possesses basic knowledge of mathematics, physics, chemistry, statistics, and the biology of plant and animal organisms and microorganisms. The expected learning outcomes can therefore be summarised as: - understanding of the principles and laws of physics with particular reference to the statics and movement of fluids and gases - being able to read and understand advanced texts relating to the various aspects characterising the agrarian and agro-forestry environment in mountainous areas - being able to communicate and discuss issues relating to the training course in an appropriate manner in the three languages (Italian, English, German). The knowledge and comprehension skills listed above are achieved through participation in lectures, practical exercises, seminars, and through guided personal and individual study as envisaged by the training activities offered. Some courses in the syllabus may be offered in a dual mode (lectures face-to-face and in video-recorded form and made available on the university intranet platform) The assessment of the achievement of learning outcomes takes place mainly by means of exams and possible in -progress tests. The tests may be written and/or oral, and may also consist of reports and oral presentations of projects or seminars. Ability to apply knowledge and understanding: The ability to apply knowledge is achieved through critical reflection on the texts proposed for individual study stimulated by classroom activities, the study of research and application cases shown by the lecturers, the performance of practical laboratory and field exercises, bibliographical research, individual and/or group projects

	as part of the fundamental and optional courses included in the teaching plan, as well as during the internship and preparation for the final examination. The tests carried out by means of written and/or oral examinations, reports and exercises include the performance of specific tasks in which the student demonstrates mastery of tools, methodologies and critical autonomy. In the internship activities, the verification takes place through the presentation of a report by the student to the teacher of reference. Making judgements: Autonomy of judgement is developed and verified through the exercise activities, the organised seminars, the preparation of papers as part of the teaching, as well as during the internship activity and the activity assigned by the lecturer for the preparation of the final examination. Communication skills: The graduate has the ability to use the most modern and effective means of communication to disseminate the research carried out and the analyses relating to the problems of agro-forestry and forest management; he/she is able to deal with the production realities in the agro-forestry sector and to interact with figures from the sector and related sectors. Communication skills are particularly developed during exercises, the organised seminars, as well as during training activities that also involve the preparation of reports and written documents and the oral presentation of the same. Since the course is trilingual, graduates are able to communicate correctly, in written and oral form, in Italian and in two other languages (German and English). In tutorial activities and seminars, students are encouraged to speak publicly in order to improve their ability to describe clearly and comprehensibly any doubts and/or requests for clarification on specific topics. The acquisition and evaluation/verification of the achievement of communication skills are also provided for during the internship and the final report, as well as when writing and discussing the final paper. Learning skills: The degree course provides the basic cognitive tools indispensable

	for the continuous updating of knowledge, also with tools that make use of new communication and information technologies. The graduate is able to apply the developed learning methods and tools to update and deepen the studied contents, also in professional contexts and to undertake further studies.
Specific Educational Objectives and Learning Outcomes (additional info.)	Knowledge and understanding: Knowledge and understanding of physical laws and engineering applications of: - Mechanics - Thermodynamics - Electrodynamics - Fundamental of engineering - Geomatics - Remote sensing Applying knowledge and understanding: - Ability to analyze and solve problems on the specific topics mentioned above. Making judgements: - Students are expected to develop the ability to judge the plausibility of results. Communication skills: - Further development of a quantitative, technical, and scientific terminology to express ideas and opinions about physical phenomena. Ability to learn: - Development of an analytic attitude enabling the student to divide a problem into sub-tasks which can be solved using previously-acquired knowledge.
Assessment	The assessment will be performed independently for the two modules, but a single final grade will be assigned. For the first module, Fundamentals of Physics and Engineering, the assessment of students' outcomes will be carried out through a written exam consisting of two parts: a first part (problem 1) with a series of qualitative questions based on the understanding of the

	covered topics, as well as a second part (problems 2-6) consisting of several numerical problems to be solved, which cover aspects of the various topics covered. The student can have access to the exam with a pen, pencil, dictionary, and a non-programmable calculator. Constants are provided to the students along with the text of the exam. All students are also allowed to bring a double A4 sheet with handwritten notes to the exam. For the second module, Topography and Digital Cartography, the assessment of students' outcomes will be carried out through an oral exam on the topics covered during the course, including the evaluation of a project presented by the student related to the laboratory activities.
Evaluation Criteria	The evaluation criteria will be independent for the two modules. For the first module, Fundamentals of Physics and Engineering, the following evaluation criteria will be adopted: - the correctness of the approach and the mathematical steps of the solution, the calculation of numerical results and the correct use of physical quantities and units; - the correctness of the provided answers and of their presentation, as well as the terminology used. The final score is the sum of the scores associated to each exercise, with a total of 33. To pass the exam the final score must be larger or equal to 18. For scores above 30, a "with honors" is awarded. After specific request from the student, a voluntarily-based oral exam can be performed. It consists of two questions, covering both qualitative questions and numerical exercises. The mark can range from 0 to +3 and it is summed up to the score of the written exam. For the second module, Topography and Digital Cartography, the following evaluation criteria will be adopted: Both the oral exam and the project presentation must be positively assessed. For the grading of the oral exam, the clarity of the answers and the appropriateness of language (also with regard to the language of the course), the ability to summarize, and the relevance of the

	arguments will be evaluated. Additionally, the student's creative ability, critical analysis skills, and problem-solving capacity related to the presented project will be assessed.
Required Readings	Teaching resources and supplementary materials will be made available by the professor through Microsoft Teams.
Supplementary Readings	• Physics for Scientists and Engineers with Modern Physics, Douglas C. Giancoli, Pearson, 4th edition, 2008. • Physics for Scientists and Engineers , Paul A. Tippler, Macmillan, 6th edition, 2007. Wegmann, M., Leutner, B., & Dech, S. (Eds.). (2016). • Remote sensing and GIS for ecologists: using open source software. Pelagic Publishing Ltd.
Further Information	
Sustainable Development Goals (SDGs)	Quality education, Life on land, Sustainable cities and communities, Industry, innovation and infrastructure

Course Module

Course Constituent Title	Fundamentals of Physics and Engineering
Course Code	40214A
Scientific-Disciplinary Sector	ICAR/01
Language	Italian
Lecturers	Prof. Michele Larcher, Michele.Larcher@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/33885 dr. Riccardo Zamboni, Riccardo.Zamboni@unibz.it https://www.unibz.it/en/faculties/engineering/academic-staff/person/51510
Teaching Assistant	
Semester	
CP	6

Responsible Lecturer	
Teaching Hours	36
Lab Hours	24
Individual Study Hours	90
Planned Office Hours	18
Contents Summary	Kinematics, dynamics, Newton laws, equilibrium, work Mechanical energy, power, linear and angular momentum Fluid statics and dynamics Equation of state, ideal and real gases, 1st and 2nd law of thermodynamics Electromagnetism
Course Topics	The module introduces the basic concepts of physics and engineering that are essential for understanding and managing technical applications in agricultural and forestry contexts: - Kinematics, dynamics, Newton laws, equilibrium, work - Mechanical energy, power, linear and angular momentum - Fluid statics and dynamics - Equation of state, ideal and real gases, 1st and 2nd law of thermodynamics - Electromagnetism
Teaching Format	Frontal lectures and exercises.
Required Readings	Teaching resources and supplementary materials will be made available by the professor through Microsoft Teams.
Supplementary Readings	• Physics for Scientists and Engineers with Modern Physics, Douglas C. Giancoli, Pearson, 4th edition, 2008. • Physics for Scientists and Engineers , Paul A. Tippler, Macmillan, 6th edition, 2007.

Course Module

Course Constituent Title	Topography and Digital Cartography
Course Code	40214B
Scientific-Disciplinary Sector	AGR/10
Language	Italian
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	
CP	3
Responsible Lecturer	
Teaching Hours	18
Lab Hours	12
Individual Study Hours	9
Planned Office Hours	45
Contents Summary	GIS (Geographic Information Systems) Vectors and platforms for remote sensing Global positioning systems Optical data for environmental analysis LiDAR for 3D terrain modeling Photogrammetry for estimating ecological variables
Course Topics	The introduces the fundamentals of environmental geomatics and remote sensing, providing a solid foundation in the scientific principles necessary for the understanding and use of geospatial data: • GIS (Geographic Information Systems) • Vectors and platforms for remote sensing • Global positioning systems • Optical data for environmental analysis • LiDAR for 3D terrain modeling • Photogrammetry for estimating ecological variables
Teaching Format	Frontal lectures, exercises with specialized software open source (QGIS and R), project implementation.
Required Readings	Teaching resources and supplementary materials will be made available by the professor through Microsoft Teams.
Supplementary Readings	• Remote sensing and GIS for ecologists: using open source software. Pelagic Publishing Ltd.