Syllabus

Course Description

Course Title	Hydrology and Hydraulics
Course Code	40196
Course Title Additional	
Scientific-Disciplinary Sector	AGRI-04/A
Language	Italian
Degree Course	Bachelor in Agricultural, Food and Mountain Environmental Sciences
Other Degree Courses (Loaned)	
Lecturers	Prof. Andrea Andreoli, Andrea.Andreoli@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/35911
Teaching Assistant	
Semester	First semester
Course Year/s	3
CP	9
Teaching Hours	60
Lab Hours	30
Individual Study Hours	135
Planned Office Hours	27
Contents Summary	The course is part of the group of topics characterizing the area skills in Agricultural Production and Forestry and Mountain Environment Management of the Agricultural, Food and Mountain Environmental Sciences degree. The "Hydrology and Hydraulics" course aims at giving the students the necessary knowledge to: determine a hydrological balance at a basin and stretch scale, calculate the flow rates in a small agricultural or mountain basin, design stable and efficient irrigation channels and drainages, design simple irrigation systems, design

	check dams for mountain environment. It is designed for acquiring professional skills and knowledge.
Course Topics	The course will cover the following topics: The hydrological cycle. Drainage basins and river networks. Precipitation: measurement, spatial analysis, and extreme-value analysis. Soil water: saturated and unsaturated conditions. Surface runoff: types and characteristics. Rainfall–runoff models: the Rational Method and the SCS method. Hydrographs and flow-duration curves. Principles of hydrostatics: Pascal's and Stevin's laws and their applications. Fundamental equations of fluid dynamics—continuity, conservation of energy, and conservation of momentum—and their application to orifices, weirs, and head losses. Uniform flow in open channels: Manning's equation, boundary shear stress, and stability assessment of hydraulic structures. Uniform flow in pressurized pipes: the Darcy–Weisbach equation, the Moody diagram, and local head losses. Principles of land drainage and channel design. Design of pressurized irrigation systems. Frost-protection irrigation. Erosion and sediment transport in rivers and streams. Watershed management and torrent-control works.
Keywords	Hydrology, hydraulics, irrigation, sediment transport, watershed management
Recommended Prerequisites	Basic concepts of mathematics, statistics, and physics will be applied.
Propaedeutic Courses	no
Teaching Format	The theoretical concepts covered in the course will be presented by the lecturer during classroom sessions, while the practical activities, including laboratory sessions and field trips, will be supervised by the lecturer in collaboration with the Teaching Assistant (TA). Students will be expected to work independently, both during laboratory activities—under the supervision of the lecturer and the

	TA—and at home, to complete exercises and prepare a report based on the laboratory activities and the field trip. The PowerPoint presentations used during the lectures will be made available through the course's Microsoft Teams platform, together with exercises and links to external resources.
Mandatory Attendance	no
Specific Educational Objectives and Learning Outcomes	Knowledge and understanding (1) of water dynamics in rural environments related to flood protection as well as agricultural production, (2) of the different technical solutions that can be used for the measurement, control, planning and management of torrent control works and irrigation system. Applying knowledge and understanding through the development of some skills concerning: (1) the analysis of water budget and flood discharge in small catchments, the design of stable channels (for drainage or irrigation) and irrigation systems, (2) the ability to obtain information from classwork-exercises on how integrating together the theoretical elements provided during the lessons. Making judgements concerning: (1) the choice of the most appropriate parameters for the hydrological analysis presented in a written report and in the written exercises. Communication skills to present the learned concepts (topics and issues related to agricultural and forest hydrology, hydraulic, irrigation systems and torrent control works) with a personal vocabulary that is precise, appropriate and adequate to the subject. Learning skills of increasing the personal knowledge acquired during the course by reading technical documents and scientific articles and/or attending specific courses.
Specific Educational Objectives and Learning Outcomes (additional info.)	
Assessment	Students will be assessed based on the following components: an individual report on the laboratory activities and field trip (20% of the final grade);

	an oral examination comprising questions covering the entire course syllabus and the solution of two exercises (80% of the final grade).
Evaluation Criteria	The correctness of the answers will constitute the general assessment criterion. For open-ended questions, the following aspects will also be evaluated: clarity of presentation; command of technical terminology; ability to synthesize information and establish connections between different topics; relevance of the content to the question asked.
Required Readings	Lecture notes and slides. • Ferro, V. (2013). *Elementi di idraulica e idrologia per le scienze agrarie, ambientali e forestali*. McGraw-Hill. • Ferro, V. (2019). *Opere di sistemazione idraulico-forestale*. McGraw-Hill. Recommended for the “Mountain Forest Environment Management” curriculum. • Capra, A. and Scicolone, B. (2016). *Progettazione e gestione degli impianti di irrigazione*. 2nd ed., Edagricole. Recommended for the “Agricultural Production” and “Food Science” curricula. • Benini, G. (2000). *Sistemazioni idraulico-forestali*. UTET, Turin. Recommended for the “Mountain Forest Environment Management” curriculum.
Supplementary Readings	• Dingman S.L., Physical hydrology, Waveland press, 2008 • Nalluri C., Featherston R.R., Civil Engineering Hydraulics, Blackwell Science, 2001 Any additional references and teaching materials will be communicated during the course.
Further Information	One or two field trips are planned. The open-source software QGIS will be used for the practical exercises. Students will receive step-by-step guidance on using the software to perform hydrological analyses; however, basic knowledge of Geographic Information Systems (GIS) is recommended.
Sustainable Development	No poverty, Zero hunger, Good health and well-being, Clean water

Goals (SDGs)	and sanitation, Affordable and clean energy, Life on land, Reduced inequalities, Sustainable cities and communities, Responsible consumption and production, Climate action, Industry, innovation and infrastructure