UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Agrarie, Alimentari e Forestali
ACADEMIC YEAR	2023/2024
MASTER'S DEGREE (MSC)	AGROENGINEERING AND FORESTRY SCIENCES AND TECHNOLOGIES
INTEGRATED COURSE	WATERSHED HYDRAULIC PROTECTION
CODE	21733
MODULES	Yes
NUMBER OF MODULES	2
SCIENTIFIC SECTOR(S)	AGR/08
HEAD PROFESSOR(S)	CAROLLO FRANCESCO GIUSEPPE Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	PAMPALONE VINCENZO Professore Associato Univ. di PALERMO CAROLLO FRANCESCO GIUSEPPE Professore Associato Univ. di PALERMO
CREDITS	9
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**CAROLLO FRANCESCO GIUSEPPE** Tuesday 15:00 17:00 stanza n. 127 Edificio 4 Wednesday 14:00 16:00 stanza n. 127 Edificio 4 Friday 09:00 11:00 stanza n. 127 Edificio 4 **PAMPALONE VINCENZO** Tuesday 09:00 11:00 Studio docente, identificativo 13, Edificio 4, ingresso E-Dipartimento SAAF e Piattaforma Teams Wednesday 09:00 11:00 Studio docente, identificativo 13, Edificio 4, ingresso E-Dipartimento SAAF e Piattaforma Teams Friday 11:00 13:00 Sede del corso di Studi in Viticoltura ed Enologia e Piattaforma Teams.

DOCENTE: Prof. FRANCESCO GIUSEPPE CAROLLO

PREREQUISITES	Basics of open-channel flows, stream restoration works, soil erosion phenomenon, prediction of mean annual plot soil loss by the Universal Soil Loss Equation (USLE), soil conservation measures.
LEARNING OUTCOMES	Knowledge and understanding Acquisition of advanced tools for designing hydraulic-forestry works. Acquisition of the conceptual tools to develop investigations on soil erosion processes and to plan soil conservation measures. Ability to understand and use the specialized language of these branches of learning. Applying knowledge and understanding Ability to recognize, interpret, explain and analyze the processes of land hydraulic deterioration. Ability to autonomously organize the necessary surveys and analyses to design hydraulic-forestry works and soil conservation measures. Ability to use the developed analyses for mitigating the hydraulic risk and soil erosion risk. Making judgments Ability to understand the information contained in stream restoration studies and soil erosion investigations. Ability to critically analyze the project proposals related to stream works and the planned soil conservation measures. Ability to make planning decisions with awareness. Communicative skills Ability to expose the results of the studies even to an unskilled audience. Ability to support the importance and highlight the environmental impacts of hydraulic-forestry interventions, studying soil erosion processes, and planning soil conservation measures. Lifelong learning skills Update ability through consultation of scientific publications related to hydrology, soil science, and hydraulic-forestry restoration. Ability to use the knowledge acquired during the course for attending second-level masters, advanced courses, and specialized seminars in the fields of hydrology and hydraulic-forestry restoration.
ASSESSMENT METHODS	Oral examination. The candidate has to answer not less than five oral questions concerning the entire syllabus, enclosed the practical activities developed during the course. The final check aims to establish if the candidate has knowledge and comprehension of the treated topics and she/he can interpret and autonomously evaluate specific case studies. Grades range from 18 to 30. The minimum mark (18) is reached when the student shows a general knowledge and understanding of course subjects and can deal with very simple practical cases. Below this threshold, the exam is not passed. The more the student will show knowledge and understanding of the subjects and autonomy in applying them to practical cases related to the professional context, the higher the mark will be.
TEACHING METHODS	Lectures, classroom exercises

MODULE
SOIL EROSION AND CONSERVATION

Prof. FRANCESCO GIUSEPPE CAROLLO

SUGGESTED BIBLIOGRAPHY

Bagarello V., Ferro V. (2006). Erosione e conservazione del suolo. McGraw-Hill, Milano, 539 pp., ISBN 88-386-6311-4
Appunti delle lezioni.

AMBIT	50562-Discipline della difesa e del riassetto del territorio
INDIVIDUAL STUDY (Hrs)	43
COURSE ACTIVITY (Hrs)	32

EDUCATIONAL OBJECTIVES OF THE MODULE

The course aims to allow the student to (i) interpret and mathematically simulate the soil erosion phenomena occurring at the watershed scale, and (ii) plan and realize soil conservation measures, even to control silting of reservoirs and restoring fire-affected areas.

SYLLABUS

Hrs	Frontal teaching
1	Objectives and organization of the course
3	Mention to the soil water erosion processes at both the plot and the watershed scale: Sediment yield and sediment delivery ratio of the watershed.
3	Mention to the Universal Soil Loss Equation (USLE)
5	Empirical methods for estimating soil loss and sediment yield at the watershed scale. Modified universal equation (MUSLE). Estimating the sediment delivery ratio. Distributed models for estimating sediment yield. The SEDD model.
2	Soil erosion tolerance
1	Fire impacts on soil erosion. Mathematical simulation of soil erosion phenomena in fire-affected areas.
1	Silting of reservoirs
4	Soil conservation measures. Mathematical simulation of the antierosive effects of soil conservation measures

Hrs	Practice
12	Development of a soil conservation project for a particular case

MODULE
STREAM RESTORATION

Prof. VINCENZO PAMPALONE

SUGGESTED BIBLIOGRAPHY

FERRO V. (2006). La sistemazione dei bacini idrografici – seconda edizione. Ed. McGraw-Hill, Milano, 848 pp. ISBN 8838663270
FERRO V; DALLA FONTANA G; PAGLIARA S; PUGLISI S; SCOTTON P (2004). Opere di sistemazione idraulico-forestale a basso impatto ambientale. Ed. McGraw-Hill, Milano, 413 pp. ISBN 8838661456

AMBIT	50562-Discipline della difesa e del riassetto del territorio
INDIVIDUAL STUDY (Hrs)	86
COURSE ACTIVITY (Hrs)	64

EDUCATIONAL OBJECTIVES OF THE MODULE

The course aims to (i) allow the student to deepen some issues related to open channel flows and (ii) provide the student with knowledge on unconventional works for river restoration characterized by low environmental impact. The insights of open channel flow concern uniform and steady flow conditions and channels with complex geometry. The insights of hydraulic works concern the characterization of the hydraulic jump on a rough bed of a stilling basin, open check-dams, rock chute channels, boulder check-dams and bed-sills, and block ramps, which are increasingly widespread as grade control structures in mountain streams. Another treated topic concerns conventional hydraulic works having a recognized environmental value, such as gabions check dams and the wooden and stone ones.

SYLLABUS

Hrs	Frontal teaching
1	Objectives and contents of the course
4	Uniform open channel flow for streams having cross-sections with varying roughness along the wetted perimeter. Channels of compound sections. Computation of uniform flow. Applicative examples.
4	Velocity distribution and flow resistance law in mountain streams. Velocity distribution and flow resistance law in vegetated channels.
5	Steady open channel flows. Plotting of the flow profiles. Application of the direct step method
2	Hydraulic jump on smooth and rough beds. Length of the hydraulic jump. Applicative examples.
4	Classification of the hydraulic-forestry works. Conventional check dams as grade control structures. Gabion check-dams.
2	Wooden check-dams and wooden and stone check-dams: materials, construction typologies, calculation criteria, examples.
2	Boulder check-dams and bed-sills: calculation criteria, examples, scour on the bed downstream of grade control structures.
6	Block ramps: hydraulic behavior of the open channel flow on a block ramp, the energy dissipation process, hydraulic design, stability criteria, examples.
4	Open check-dams. Hydraulic functioning of open check-dams and design criteria. Examples.
3	Rock chute channels. Channel protection by gabions. Riverbank protection by boulders. Applicative examples.
3	Gabion check-dams: analysis of the forces acting on the structure and stability tests. Applicative examples.

Hrs	Practice
3	Computation of uniform flow for a stream and a channel of compound section
2	Computation of critical streamflow
4	Plotting of the steady flow profiles by the application of the direct step method
8	Reconversion design (draft) of a check-dam into a block ramp
4	Stability tests for a gabion check-dam
3	Design of riverbank protection by boulders. Channel protection by gabions.