UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2016/2017
MASTER'S DEGREE (MSC)	CIVIL ENGINEERING
SUBJECT	HYDRAULIC PROTECTION OF LAND
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50353-Ingegneria civile
CODE	05909
SCIENTIFIC SECTOR(S)	ICAR/02
HEAD PROFESSOR(S)	CANDELA ANGELA Professore Associato Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	HYDRAULIC PROTECTION OF LAND - Corso: INGEGNERIA PER L'AMBIENTE E IL TERRITORIO HYDRAULIC PROTECTION OF LAND - Corso: ENVIRONMENT ENGINEERING
YEAR	2
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**CANDELA ANGELA** Monday 11:00 13:00 presso Sezione idraulica DICAM piano 2° Thursday 11:00 13:00 presso Sezione idraulica DICAM piano 2°

DOCENTE: Prof.ssa ANGELA CANDELA

PREREQUISITES	Knowledge of hydraulics and hydrology
LEARNING OUTCOMES	Knowledge and understanding At the end of the course, the student will have acquired knowledge and methods to address and resolve questions related to the management and soil conservation. In particular, the student will be able to analyze the local context concerned, to reconstruct the meteorological input through a hydrological study in order to assess their impact on the territory and properly design their defenses. Applying knowledge and understanding The student will have acquired knowledge and methodologies to analyze and solve typical problems of soil management protection with particular attention to the problem of sediment transport in the river bed and the flood risk. He will be able to formulate hypotheses about the interventions for the erosion defense and for risk mitigation, modelling the effect of such works on the territory, and assess its consequences in relation to flood exposure. Making judgments The student will have acquired a methodology for its analysis of the soil management and conservation that will allows himself to make appropriate design and planning decisions rearding risk erosion and flood risk. Communication The student will be able to address complex land management and conservation issues. Lifelong learning skills The student will be able to cope independently in any matters related to river basin management. He will be able to investigate complex issues such as the conception, design and maintenance of protection works and soil conservation.
ASSESSMENT METHODS	Oral examination on the arguments developed in the lectures. The oral test consists of an interview in order to ensure the acquisition by the student of skills and subject knowledge provided by the course. The questions are,specifically, designed to test the learning outcomes in order to verify the acquired knowledge and ability computing. Actually, ability to establish connections between the object of the course content is request. Finally, it will be checked that adequate skill exhibition. The examination is evaluated in thirtieths. The sufficiency threshold is reached when the student shows general knowledge and understanding of the subjects and he has acquired minimum application skills in order to address concrete cases under different points of view (design, management, etc ...). Below this threshold the examination is insufficient.The maximum score is obtained where the student has an autonomous capacity judgment on the topics and a good capacity to find appropriate solutions in the reference professional context.
EDUCATIONAL OBJECTIVES	The course of River Basin Management aims to provide the scientific foundations, procedures and regulations for soil protection in order to assess flood risks planning and management. In detail, the course aims to give the methodology for defining monitoring plans and the key scenarios aimed at the characterization of flood risk. The course aims, also, to provide the knowledge and tools needed to analyze the interaction of infrastructure and antrophic activities with the environment in order to define interventions for the territory protection and safeguarding in order to valorize natural resources with particular reference to water and soil.
TEACHING METHODS	Lectures, Classroom exercises
SUGGESTED BIBLIOGRAPHY	V. Ferro: La sistemazione dei bacini idrografici. Mc Graw Hill, Milano, 2002. R. Rosso: Manuale di Protezione Idraulica del Territorio. CUSL, Milano, 2002. APAT, Atlante delle opere di sistemazione fluviale, 2003 APAT, Atlante delle opere di sistemazione dei versanti, 2003 PODIS, La valutazione di impatto ambientale nella difesa del suolo, 2004 CIRF, Manuale di riqualificazione fluviale, 2006 Dispense relative a particolari contenuti del Corso

SYLLABUS

Hrs	Frontal teaching
1	Introduction to the course - the hydrograph catchment and the river environment. Rivers and streams. River basin management framework
5	The flood risk. The concept of risk. The environmental impact assessment for the of hydraulic defences. Flood-prone areas mapping. 1D and 2D flood propagation methods: Hydrologic unsteady flow models. Hydraulic unsteady flow models: De Saint Venant hypotheses and equations; the HEC-RAS model, hydraulic models.
1	Torrent control. River basin management framework. The Flood Directive 2007/60/EC. Flood risk management plans

SYLLABUS

Hrs	Frontal teaching
9	The sediment transport. Sediment grain size and properties. Torrent control. Aggradation and degradation in natural streams. Equilibrium slope. The kinematic and dynamic formulations: Shield's diagram and Thiery method. Bed load estimation formulas. Crossing structures: check dams. Design and verification of structures. Types of check dams. Selective check dams: classification and types. Sills, coatings and block ramps. Outline of bioengineering techniques for river restoration
4	The solid mass transport - The debris flows, mud flows and landslides: generality and phenomenology. Elements of rheology of debris flows. Solid flow discharge assessment. The speed and volume of debris flows. Debris Flow Preventive Measures: passive measures (Definitionof hazard zones, Warning systems), active measures (Reforestation, Stabilization of debris sources using check dams and erosion sills Channel improvements, diversion, Open debris basins, Debris sheds)
7	Slope protection. Water erosion phenomena. The erosion risk. Mathematical models for estimating soil loss: The Wischmeier and Smith formula. Foster and Meyer conceptual approach. Outlines of stochastic methods, empirical and conceptual and physically based models. Sediments yield and water erosion: the modified universal soil loss equation (Musle), distributed models for sediment yield estimation. The sediment delivery ratio SDR coefficient. The sediment yield in a river basin. Structural interventions for the erosion protection: surface drainage channels. Environmental engineering interventions for the defense from erosion on the slopes.
16	The hydraulic protection from flood and river erosion. Distinctive morphological characters of valley watercourse. Riverbank protection purpose: measures to strengthen the banks other than using riprap. Different types of riverbank protection: Vegetation, Windrows and Trenches, Sacks and Blocks, Gabions and Mattresses, articulated concrete mattresses, Soil-Cement, Retaining Walls, brushes or repellents. Flood risk mitigation. Structural measures: river embankments, stream corrections, canal spillways, diversions, reservoirs, flood control reservoirs. Background of Non-structural measures,
6	Flood control and river flood management in urbanized areas - Flood events in the urban environment: types, causes. Effect of urbanization on hydrological response of river networks. Flood risk in urban areas: hazard, vulnerability and exposure. Flood control measures in urbanized areas: storage areas, diversions, centralised and distributed storm management practices.