UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2017/2018
MASTER'S DEGREE (MSC)	ENGINEERING AND INNOVATIVE TECHNOLOGIES FOR THE ENVIRONMENT
SUBJECT	PREVISION AND PREVENTION OF HYDRO-GEOLOGICAL RISK
TYPE OF EDUCATIONAL ACTIVITY	B
AMBIT	50372-Ingegneria per l'ambiente e territorio
CODE	15541
SCIENTIFIC SECTOR(S)	ICAR/02
HEAD PROFESSOR(S)	NOTO LEONARDO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**NOTO LEONARDO** Tuesday 10:30 13:00 DICAM - Area Idraulico-Ambientale II° piano Thursday 10:30 13:00 DICAM - Area Idraulico-Ambientale II° piano

DOCENTE: Prof. LEONARDO NOTO

PREREQUISITES	Skills concerning hydrology, statistics applied to hydrology and GIS spatial analysis techniques are required.
LEARNING OUTCOMES	Knowledge and understanding At the end of the course, the students will know the problems concerning the hydrological/geomorphological risk. In particular, they will be able to understand and analyze the processes leading to the risk and its dynamics. Applying knowledge and understanding The students will be able to use mathematical, physical and computer based tools to evaluate the different types of hydrological/geomorphological risk; moreover they will be able to design and plan different methods aimed to prevent the hydrological/geomorphological risk. Making judgements The students will be able to understand the phenomena associated with risk and its formation; they will be also able to manage hydraulic and hydrological models for evaluating and handling different risks (e.g. hydrological, geomorphological, etc.). Communication The students will be able to communicate and discuss about issues concerning the main topics of the course. They will be capable to argue about issues related to the hydrological/geomorphological risk, to highlight problems inherent the forecasting and the prevention systems and to propose different solutions to the policymakers. Lifelong learning skills At the end of the course, the students will have learned the importance of all of the physical processes reliable for the hydrological/geomorphological risk prevention: this will allow them to deal with the design and the verification of principal systems for the forecast of the hydrological/geomorphological risk together with those aimed to its prevention.
ASSESSMENT METHODS	The final exam consists of an oral exam with mark expressed in thirties (xx/30). The exam will focus on course topics and the candidate will have to answer at least three questions. Moreover, a question about the programming skills developed during the course could be asked. The final exam aims to evaluate students' knowledges of the course topics and their capability in applying them to real cases. The exam will be passed if the student shows at least a basic knowledge of the main topics of the course, the technical language, and the ability to independently apply the knowledges gained.
EDUCATIONAL OBJECTIVES	The course aims to provide the students with tools for the understanding, forecasting and prevention of the hydrological/geomorphological risk, with particular reference to hydrological extremes (floods and droughts). The course will deal with the hydrological knowledges in the field of the climatology and the meteorology. Particular attention will be paid to the probabilistic framework for the development of floods and droughts forecasting models. Students will learn to develop and implement stochastic models for the rainfall forecast and generation. With regard to the forecast phase, a number of methods, direct and indirect, designed to reduce the hydrogeological risk, will be mentioned and developed.
TEACHING METHODS	Lectures, Exercises, Field survey
SUGGESTED BIBLIOGRAPHY	Renzo Rosso: Manuale di protezione idraulica del territorio – CUSL – 2002 Noto L. – Appunti del corso di Previsione e Prevenzione del Rischio Idrogeologico Noto L. – Dispense del corso di Idrologia Becciu Paoletti – Fondamenti di costruzioni idrauliche, UTET, 2010 Chow V.T., Maidment D.R., Mays L.W. - Applied Hydrology – McGraw-Hill, 1988. Dispense varie distribuite ai ragazzi durante il corso

SYLLABUS

Hrs	Frontal teaching
3	Recall hydrology. Hydrological model calibration.
4	Definitions of risk and emergency. Risk classification according Italian law. Italian laws concerning risk and hazard. National Civil Protection Department. Hydraulic and geomorphological risk: definition and classification. PAI
4	Forecast of hydraulic and geomorphological risk. Structural and non structural actions for the prevention of hydraulic and geomorphological risk.
5	Meteorology. Weather models: forecasting and nowcasting.
5	Weather radar

SYLLABUS

Hrs	Frontal teaching
4	Time series. Generation of synthetic rainfall series.
4	Flood and drought risk mitigation using artificial reservoirs. Dam: definition and classification - Design of different dam structures. Flood lamination.
3	Flood wave propagation (De Saint Venant equations)
2	Rainfall thresholds for flood hazard/risk
5	Geomorphological risk. Landslide classification. Statistical methods for the derivation of susceptibility maps. Rainfall thresholds for the landslide triggering. Landslides survey.
3	Drought: definition, analysis and forecast.

Hrs	Practice
2	Generation of synthetic rainfall series.
2	Thunderstorm cell model
2	2-D Flood wave propagation (HEC-RAS 2D)
2	Rainfall thresholds for flood hazard/risk
2	Drought indices (SPI)
2	Creation of a landslide susceptibility map