COURSE OUTLINE Flood risk analysis and Hydroinformatics

EDUCATION LEVEL	7		
CODE	WBCC-521we	SEMESTER	2nd
TITLE	Flood risk analysis and Hydroinformatics		
TEACHING ACTIVITIES	HOURS/WEEK	ECTS	
Lectures, Practice exersices, Field work	3	6	
TYPE OF COURSE	Main course in the specialization «Water in conditions of excess»		
PREREQUISITE KNOWLEDGE	-		
LANGUAGE OF INSTRUCTION AND ASSESSMENT	Greek		
AVAILABILITY TO ERASMUS STUDENTS	-		
WEBSITE (URL)	https://eclass.uoa.gr/courses/GEOL577/		

LEARNING OUTCOMES

Learning Outcomes/Subject Specific Competences
The course is a modern scientific field that combines hydrology with informatics. The aim of the course is to familiarize the students with the basic concepts of hydroinformatics and its applications for flood risk protection. The course is divided into four main parts: Basic concepts of hydroinformatics Main categories of hydroinformatics problems Decision making, optimal control and forecasting systems Artificial Intelligence (AI) Technologies In the first part of the course, students will study the basic concepts of hydroinformatics, such as its fields of application, hardware and software products, as well as basic models and techniques. In the second part of the course, students will get to know the main categories of hydroinformatics problems, such as decision-making, control and forecasting. They will also study typical applications in each problem category. In the third part of the course, students will familiarize themselves with the issues related to decision-making, optimal control and forecasting systems. They will also study uncertainty and its analysis, including Monte Carlo simulation. In the fourth part of the course, students will be introduced to artificial intelligence (AI) technologies used in the field of hydroinformatics, such as virtual (VR) and augmented (AR) reality. They will also study neural networks, surrogate models, cellular automata, fuzzy logic, data mining, modern measurement-telemetry technologies and the Internet of Things. The last part of the course is practical in nature. Students will be introduced to MATLAB and will practice modeling and analysis of a flood risk management system. The students who attend the course will acquire the necessary knowledge and skills to deal with hydroinformatics, a modern and dynamically developing scientific field. Upon successful completion of the course, students will have acquired the following knowledge, skills and abilities: Knowledge They will understand the basic concepts of hydroinformatics, such as its fields of application, hardware and software products, and basic models and techniques. They will know the main categories of hydroinformatics problems, such as decision making, control and forecasting. They will have knowledge of the basic principles of uncertainty and its analysis, including Monte Carlo simulation. They will have knowledge of key artificial intelligence (AI) technologies used in hydroinformatics, such as virtual (VR) and augmented (AR) reality. Skills They will be able to apply basic hydroinformatics techniques, such as the collection, management, analysis and evaluation of hydrological data. They will be able to model hydrological systems using various models, such as physically based models, conceptual models, stochastic-statistical models and black box models. They will be able to make flood risk management decisions based on the analysis of hydrological data and models. Abilities They will be able to effectively communicate their knowledge and skills in hydroinformatics.

They will be able to collaborate effectively with other hydroinformatics professionals.
• They will be able to learn and adapt to new technologies and information in the field of hydroinformatics.

Generic Competences
Search, analysis and synthesis of data and information, using the necessary technologies Literature review Decision making Individual work Teamwork Project Planning and Management Adaptation to new situations Cultivating respect for the natural environment • Work in an interdisciplinary environment

COURSE CONTENT

Over the recent decades, reported losses caused by natural hazards have increased sharply. The purpose of the course is to familiarize with methodological tools to better prevent the loss of property and life from floods. The course focuses on aspects of flood risk management, forecasting and protection measures. In addition, practices and techniques related to the protection of people from floods are being studied, with special emphasis on those areas that show increased flood risk. In the same lesson, the appropriate prevention, protection and preparation measures are presented. This course also introduces the fundamental concepts related to hydrologic modeling, primarily flood modeling and control of floodplain points.
Educational objects:
Understanding floods, their different types and the mechanism of their generation,
Understanding the application of the EU Flood Risk Management Directive,
Evaluation of flood hazard maps and flood risk using stochastic models,
Understanding how flood magnitudes and risks work and calculate with the help of models such as SWAT and HEC-RAS,
Understanding how innovative IT methods and tools (AR, VR, AI) contribute to predicting and preventing flood risks.
Upon completion of the course, students will be able to:
Understand and be able to explain the flood cycle and its effects on human lives and property and cultural works,
Develop sustainable management plans taking into account floods,
Implement management and protection plans with the help of innovative methods (hydrological models and geo-informatics tools).

LEARNING ACTIVITIES - TEACHING and ASSESSMENTS METHODS

MODE OF DELIVERY	Distance learning
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Learning process support through the course's online learning platform, including: Course presentations Teaching notes Announcements related to the course d) Communication with students via e-mail
PLANNED LEARNING ACTIVITIES	Activity: Semester Workload Lectures: 3 h x 13 weeks Practice Exercises: 10 h Project: 50 h Self Study: 40 h Total: 139 h
ASSESSMENT METHODS AND CRITERIA	Assignments (projects, reports, presentations): 100%

TEXTBOOKS - BIBLIOGRAPHY

T. Eshtawi, F.A. Abdulla. Using hydrological models in the management of a semi arid watershed: Under the Umbrella of GIS. LAP LAMBERT Academic Publishing pp. 124 (2011)

2. S.B. Simonović. Floods in a Changing Climate: Risk Management. Cambridge University Press pp. 197 (2012)