General course information:

Course title:	**Management of Extreme Hydrological Phenomena**	**Course code:**	CE09-H09
Credits:	6	**Work load (hours):**	120

Course level:	Undergraduate ☑	Graduate ☐	
Course type:	Mandatory ☐	Selective ☑	
Course category:	Basic ☐	Orientation ☑	
Semester:	10th	**Hours per week:**	4

Course objectives (capabilities pursued and learning results):

Scope of the course is the introduction to hydrology of floods and droughts and natural and human-induced causes of floods and droughts, methods and models of flood and drought analysis and flood and drought management. The outline of the course includes: Introduction to droughts (Definitions, types, characteristics). Climatological and human-induced causes and predictability. Types of droughts (meteorological, hydrological (low flow river and groundwater drought), agricultural and water resources drought). Methods and models of analysis. Drought Indices. Drought modeling using meteorological, agrohydrological and hydrological models. Stochastic modeling of droughts. Probabilistic modeling of droughts. Introduction on hydrology of floods (flood types, characteristics and causes of flooding). Statistical Frequency Analysis of Hydrologic Data. Regional Frequency analysis. Flood Mapping and Flood Zoning. Flash Floods. Urban Floods. Climate Change and Floods. Drought and flood management (adaptation and mitigation, preparedness plans).

This course strengthens students' technical and intellectual competency, preparing them for engineering employment or advanced study. The course exposes students to computational techniques of flood risk estimation and drought identification, modelling, monitoring and assessment used in modern professional and engineering practice. Upon completion of the course, students should be able to demonstrate:

- Understanding of drought types and their characteristics
- Understanding drought causes and impacts of drought
- Understanding the benefits and limitations of different approaches used in drought modelling (statistical, stochastic-probabilistic methods etc.)
- To employ various drought techniques (meteorological and hydrological) for drought modelling and monitoring
- Understanding of the natural processes of flood generation
- Understanding and practical familiarity with current modelling and statistical approaches to flood risk estimation and modelling
- Understanding the range of different approaches used in flood modelling
- Ability to estimate the design flood of a watershed with statistical analysis of

flow data or application of empirical methods and hydrological models ➢ Ability to apply current methods for flood risk estimation in basic cases
Prerequisites:
Hydrology Hydrological Modeling and Forecasting Probability - Statistics

Instructor's data:

Name:	Athanasios Loukas
Level:	Professor
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Other tutors:	Dr. Lampros Vasiliades/Dr. Marios Spiliotopoulos

Specific course information:

Week No.	**Course contents**	**Hours**	
		Course attendance	**Preparation**
1	➢ **Introduction to droughts (Definitions, types, characteristics).** ➢ **Climatological and human-induced causes and predictability.**	**4**	**2**
2	➢ **Types of droughts (meteorological, hydrological (low flow river and groundwater drought), agricultural and water resources drought.**	**4**	**4**
3	➢ **Methods and models of analysis.** ➢ **Meteorological and agricultural drought. Drought Indices.**	**4**	**5**
4	➢ **Methods and models of analysis.** ➢ **Hydrological (low flow river and groundwater drought) and water resources drought. Drought Indices.**	**4**	**5**
5	➢ **Drought modeling using meteorological, agrohydrological and hydrological models.**	**4**	**6**
6	➢ **Stochastic and probabilistic modeling of droughts.**	**4**	**5**

7	➢ **Drought management (adaptation and mitigation, preparedness plans).**	**4**	**4**
8	➢ **Introduction on hydrology of floods (flood types, characteristics and causes of flooding).**	**4**	**2**
9	➢ **Statistical Frequency Analysis of Hydrologic Data.**	**4**	**6**
10	➢ **Regional Frequency analysis.**	**4**	**5**
11	➢ **Hydrological models and Simulation (Rainfall-runoff modeling, Continuous hydrologic modelling, Snowmelt-runoff modeling).**	**4**	**5**
12	➢ **Flood routing (Hydrologic and Hydraulic methods of flood routing, Channel and Reservoir-Lake Routing).** ➢ **Flood Mapping and Flood Zoning.**	**4**	**4**
13	➢ **Flash Floods.** ➢ **Climate Change and Floods.**	**4**	**6**
14	➢ **Flood Management**	**4**	**5**

Additional hours for:			
Class project	**Examinations**	**Preparation for examinations**	**Educational visit**
64			

Suggested literature:
➢ M. A. Mimikou «Water Resources Technology», Papasotiriou, 1994 (in Greek) ➢ G. Tsakiris «Water Resources I. Engineering Hydrology», Symetria, 1995 (in Greek)

Teaching method *(select and describe if necessary* - **weight***):*		
Teaching	☑	80%
Seminars	☐	…….%
Demonstrations	☐	…….%
Laboratory	☐	…….%

Exercises	☑	20%
Visits at facilities	☐	…….%
Other *(describe):* …….	☐	…….%
Total		100%

Evaluation method *(select)*- **weight:**				
	written	*%*	*Oral*	*%*
Homework	☐		☐	
Class project	☑	80	☑	20
Interim examination	☐		☐	
Final examinations	☐		☐	
Other *(describe):* ……	☐		☐	