COURSE OUTLINE

(1) General information

FACULTY/SCHOOL	TECHNOLOGY			
DEPARTMENT	ENVIRONMENTAL SCIENCES			
LEVEL OF STUDY	*Undergraduate*			
COURSE UNIT CODE	NEW **COURSE**	**SEMESTER**	3rd	
COURSE TITLE	HYDROLOGY			
INDEPENDENT TEACHING ACTIVITIES in case credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the entire course, give the weekly teaching hours and the total credits			**WEEKLY TEACHNG HOURS**	**CREDITS**
THEORETICAL BACKGROUND			4	5
LABORATORY PRACTICE			-	-
TOTAL			4	5
COURSE TYPE Background knowledge, Scientific expertise, General Knowledge, Skills Development	Background knowledge			
PREREQUISITE COURSES:	No			
LANGUAGE OF INSTRUCTION &EXAMINATION/ASSESSMENT:	Greek			
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes			
COURSE WEBSITE (URL)				

(2) LEARNING OUTCOMES

Learning Outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail.
It is necessary to consult:

APPENDIX A

- *Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.*
- *Descriptive indicators for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and*

APPENDIX B

- *Guidelines for writing Learning Outcomes*

Scope of the course is the introduction to the phenomena and natural processes of surface hydrology and hydrologic cycle, the understanding of the phenomena and the analysis of precipitation and discharge data aiming at the development of design storm and flood for the study of water resources works.
This course strengthens students' technical and intellectual competency, preparing them for engineering employment or advanced study. The course exposes students to computational techniques of Engineering Hydrology used in modern professional civil engineering practice.
Upon completion of the course, students should be able to demonstrate:

- *Understanding of hydrological cycle and the natural hydrological processes*
- *Ability to define a watershed and its basic geomorphological characteristics*
- *Ability to compute or estimate the spatial and temporal distribution of precipitation in a watershed*
- *Ability to compute the IDF and DDF curves and a design storm over a watershed*
- *Ability to compute or measure the flow in a river cross section and to estimate the flow components*
- *Ability to compute from flow data the unit hydrograph of a watershed and to estimate from geomporphological characteristics the synthetic unit hydrograph of a watershed*
- *Ability to estimate the design flood of a watershed with statistical analysis of flow data or application of unit hydrograph or application of empirical methods*
- *Ability to estimate the flood routing with hydrological methods through a river section and a reservoir or lake*

General Competences

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aim?

Search for, analysis and synthesis of data and information by the use of appropriate technologies,
Adapting to new situations
Decision-making
Individual/Independent work
Group/Team work
Working in an international environment
Working in an interdisciplinary environment
Introduction of innovative research
Project planning and management
Respect for diversity and multiculturalism
Environmental awareness
Social, professional and ethical responsibility and sensitivity to gender issues
Critical thinking
Development of free, creative and inductive thinking
……
(Other…….citizenship, spiritual freedom, social awareness, altruism etc.)
…….

- *Search for, analysis and synthesis of data and information by the use of appropriate technologies,*
- *Decision-making*
- *Individual/Independent work*
- *Group/Team work*
- *Environmental awareness*
- *Critical thinking*
- *Development of free, creative and inductive thinking*

(3) COURSE CONTENT

1. Introduction to hydrological processes -Water Balance
2. Statistics – Probabilistic analysis of hydrological information
3. Study of atmospheric processes and precipitation, Methods of precipitation measurement, Precipitation networks, Analysis of precipitation data, Spatial distribution of precipitation, Calculation of mean areal precipitation
4. Temporal distribution of precipitation, Synthetic methods of temporal distribution of precipitation
5. Calculation of precipitation curves (Intensity-Duration-Frequency, IDF curves and Depth-Duration- Frequency, DDF curves, Estimation of design storm
6. Hydrological abstractions, Methods of measurement and estimation of evaporation and evapotranspiration, interception and infiltration
7. Net rainfall, Estimation methods of rainfall abstractions. Estimation of net rainfall with SCS method
8. Runoff generation, Methods of flow measurement – Hydrometry, Hydrometric stations – hydrometric networks
9. Analysis of hydrometric data, Flow Duration curves, Cumulative flow curves
10. Flood flows, Unit hydrograph, Development of unit hydrograph, Instant unit hydrograph
11. Estimation of concentration and lag time of runoff, Empirical methods for the estimation of design flood, Rational Formula, Synthetic unit hydrograph
12. Flood routing, Hydrological methods of flood routing, Flood routing through a river section (Muskingum Method)
13. Hydrological methods of flood routing, Flood routing through a reservoir, Theory Revision – Theoretical Exercises

(4) TEACHING METHODS-ASSESSMENT

MODES OF DELIVERY **Face-to-face, in-class lecturing, distance teaching and distance learning etc.**	• Lectures • Semester projects - homework
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY **Use of ICT in teaching, Laboratory Education, Communication with students**	• Powerpoint presentation. • e-mail communication. • e-class theory and exercises

<table>
<tr>
<td>COURSE DESIGN
Description of teaching techniques, practices and methods:
Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.

The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.</td>
<td>
<table>
<tr><th>Activity/Method</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td>Workshop</td><td>13</td></tr>
<tr><td>Laboratory work</td><td>-</td></tr>
<tr><td>Theory study</td><td>53</td></tr>
<tr><td>Weekly individual evaluation reports for laboratory exercises</td><td>20</td></tr>
<tr><td>Course total
(25 hours of workload per credit unit)</td><td>125</td></tr>
</table>
</td>
</tr>
<tr>
<td>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS
Detailed description of the evaluation procedures:

Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice tests, short- answer questions, open-ended questions, problem solving, written work, essay/report, oral exam, presentation, laboratory work, other……etc.

Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.</td>
<td>• Final examinations
• Students should watch at least half seminars
• Work will be given during the semester to be assessed at a rate of 30% on the final grade.

<u>Final Grade</u>
70% in Final Exams + 30% in the semester projects</td>
</tr>
</table>

(5) SUGGESTED BIBLIOGRAPHY:

-<u>Suggested bibliography</u>

Mimikou M., and E. Baltas, 2012 «Engineering Hydrology», A. Papasotiriou & Sia, ISBN: 978-960-491-066-3. (in Greek)
Papamichail, D. M., 2001 «Engineering Hydrology of Surface Waters», Giachoudi- Giapoudi, ISBN: 960-7425-81-2. (in Greek)
Tsakiris G., 2012 «Water Resources I. Engineering Hydrology», Symetria, ISBN: 978-960-266-380-6. (in Greek)

English Bibliography
Anderson, M.G., and J.J. McDonnell, (eds.) 2005. Encyclopedia of Hydrological Sciences, Wiley Publications.
Beven, K.J., 2012. Rainfall-Runoff Modelling: The Primer, 2nd Edition, Wiley-Blackwell.
Brutsaert, W., 2005. Hydrology: An Introduction. Cambridge University Press.
Chow, V.T., 1988. Applied Hydrology. McGraw-Hill.
Dingman, S.L., 2015. Physical Hydrology. 3rd Edition, Waveland Press.
Karamouz, M., Nazif, S., Falahi, M., 2013. Hydrology and Hydroclimatology: Principles and Applications. CRC Press.
Maidment, D.R., (ed.) 1993. Handbook of Hydrology. McGraw-Hill.

Mimikou, M., Baltas, E. and Tsihrintzis, V., 2016. Hydrology and Water Resources System Analysis, July 2016, Textbook – 448 Pages – 208 B/W Illustrations, ISBN 9781466581302, CRC Press, Taylor and Francis Group.

-***Complementary bibliography***

Teacher's notes and the full lecture material, which are available through the asynchronous education platform