COURSE OUTLINE

(1) GENERAL

SCHOOL	**UNIVERSITY OF THESSALY**		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**ΓΚ2800**	**SEMESTER**	6
COURSE TITLE	HYDROLOGY		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	5
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	General background & skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek. If there are ERASMUS students, material is given in English, and the subjects/exams of the course are in English.
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	https://eclass.uth.gr/courses/CULT_U_242/

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors 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 design of hydrotechnical projects.

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

Skills

The student after completion of the course has advanced skills in the processing, analysis and solution of complex problems of technical hydrology related to

- Design of hydraulic engineering projects.

Competences

The student, after completion of the course is able to make decisions on the design of hydrotechnical and hydraulic engineering projects. He/she is also able to work individually and in teams when designing hydrotechnical projects. In particular, students will be able to

- dimension/design/evaluate designs of hydrotechnical works; and
- synthesise and propose optimal or new solutions based on the above consideration.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Working independently
- Team work on Labs
- Working in an interdisciplinary environment
- Project planning and management
- Production of free, creative and inductive thinking
- Respect for the natural environment

(3) SYLLABUS

The main subjects of this course are: Introduction to Hydrology, Precipitation, Hydrological Losses, Basin Characteristics - Hydrographs, Hydrometry - Processing of Hydrometric Data, Unit Hydrograph - Flood Hydrographs – Routing, Principles of Statistical Hydrology, Probabilistic and Statistical Methods, Theoretical Distributions, Rainfall Intensity-Duration-Frequency (IDF) Curves, Hydrological Design.

The structure of the course is as follows:

Week No.	Course contents
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
14	Theory Revision – Theoretical Exercises

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY ***Face-to-face, Distance learning, etc.***	Face-to-face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Lectures with PowerPoint Notes, Exercises and Announcements in e-class
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop,*	

Activity	*Semester workload*
Lectures	14 * 4 = 56 hours
Exercises – Project	50 hours
Study	41 hours
Exams	3 hours

interactive teaching, educational visits, project, essay writing, artistic creativity, etc. *The student's study hours for each learning activity are given as well as the hours of non- directed study according to the principles of the ECTS*		
	Course total	***150***
STUDENT PERFORMANCE EVALUATION ***Description of the evaluation procedure*** *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open- ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students.*	*Language of Evaluation* Greek (English for Erasmus students) *Evaluation Procedure* To impart the basic theoretical and practical understanding represented by the knowledge and skills outcomes via a mix of self-learning and formal teaching, including formal lectures and exercises with active student participation. Lectures introduce theory and concepts, which are then exemplified in exercises using specialized packages and tailored data sets. For Hydrology, the theory underpinning modern practice is taught in lectures and then is tested in practical exercises. A substantial piece of coursework will test the students' ability to understand and apply the knowledge they acquire, including the use of methods and software in exercises. In addition, a final exam will be used for the final evaluation of the students. 20% Project/Exercises: Comprehensive examples of engineering hydrology exercises. Comprehensive set of technical engineering exercises. Technical report. 80% Written examination: Open books and notes. No audiovisual media. Short answer questions and problem solving in engineering hydrology.	

(5) ATTACHED BIBLIOGRAPHY

-Suggested bibliography:

Greek Bibliography

Mimikou M., and E. Baltas, 2012 «Engineering Hydrology», A. Papasotiriou & Sia, ISBN: 978-960-491-066-3.

Papamichail, D. M., 2001 «Engineering Hydrology of Surface Waters», Giachoudi- Giapoudi, ISBN: 960-7425-81-2.

Tsakiris G., 2012 «Water Resources I. Engineering Hydrology», Symetria, ISBN: 978-960-266-380-6.

Koutsoyiannis, D., & Xanthopoulos, T. (1999). *Engineering Hydrology* [Undergraduate textbook]. Kallipos, Open Academic Editions. https://dx.doi.org/10.57713/kallipos-715

Koutsoyiannis, D. (1997). *Statistical Hydrology* [Undergraduate textbook]. Kallipos, Open Academic Editions. https://dx.doi.org/10.57713/kallipos-714

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.

- Related academic journals:

Advances in Water Resources, Journal of Hydrology, Hydrological Processes, Water, Hydrology, Hydrological Sciences Journal, International Journal of Water Resources Development, Water Resources Management, River Research and Application, Water Resources Research, Journal of Flood Risk Management, Journal of the American Water Resources Association, Wiley Interdisciplinary Reviews: Water, Journal of Hydraulic Engineering, Journal of Irrigation and Drainage Engineering, Journal of Hydrologic Engineering, Journal of Water Resources Planning and Management, Hydrology and Earth System Sciences, Natural Hazards and Earth System Sciences, Advances in Geosciences.