

## COURSE OUTLINE

### (1) GENERAL

|                                                                                                                                                                                                                                                                       |                                        |                              |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------|----------------|
| <b>SCHOOL</b>                                                                                                                                                                                                                                                         | UNIVERSITY OF THESSALY                 |                              |                |
| <b>ACADEMIC UNIT</b>                                                                                                                                                                                                                                                  | DEPARTMENT OF CIVIL ENGINEERING        |                              |                |
| <b>LEVEL OF STUDIES</b>                                                                                                                                                                                                                                               | UNDERGRADUATE                          |                              |                |
| <b>COURSE CODE</b>                                                                                                                                                                                                                                                    |                                        | <b>SEMESTER</b>              | th             |
| <b>COURSE TITLE</b>                                                                                                                                                                                                                                                   | Water Resources Management             |                              |                |
| <b>INDEPENDENT TEACHING ACTIVITIES</b><br><i>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</i> |                                        | <b>WEEKLY TEACHING HOURS</b> | <b>CREDITS</b> |
|                                                                                                                                                                                                                                                                       |                                        | 4                            | 5              |
|                                                                                                                                                                                                                                                                       |                                        |                              |                |
|                                                                                                                                                                                                                                                                       |                                        |                              |                |
| <i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>                                                                                                                                              |                                        |                              |                |
| <b>COURSE TYPE</b><br><i>general background, special background, specialized general knowledge, skills development</i>                                                                                                                                                | <i>special background</i>              |                              |                |
|                                                                                                                                                                                                                                                                       |                                        |                              |                |
| <b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>                                                                                                                                                                                                                      | Greek and English for ERASMUS students |                              |                |
| <b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>                                                                                                                                                                                                                      | YES                                    |                              |                |
| <b>COURSE WEBSITE (URL)</b>                                                                                                                                                                                                                                           |                                        |                              |                |

### (2) LEARNING OUTCOMES

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <b>Learning outcomes</b><br><i>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.</i><br><i>Consult Appendix A</i> <ul style="list-style-type: none"> <li>• Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</li> <li>• Descriptors for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</li> <li>• Guidelines for writing Learning Outcomes</li> </ul> |
| <u>Knowledge</u><br>Upon completing the course, the student will have advanced knowledge that includes a critical understanding of theories and principles related to: <ul style="list-style-type: none"> <li>• design water resources management projects</li> <li>• calculate a water volumetric budget</li> <li>• design water resources management plans at basin level.</li> <li>• Meeting water scarcity and supply demands</li> </ul>                                                                                                                                                                                                                    |
| <u>Skills</u><br>Upon completing the course, the student will have advanced skills in solving complex problems related to: <ul style="list-style-type: none"> <li>• design and operation of water resources management projects</li> <li>• calculate a water volumetric budget</li> <li>• design water resources management plans at basin level.</li> <li>• Meeting water scarcity and supply demands</li> </ul>                                                                                                                                                                                                                                               |
| <u>Competencies</u> <ul style="list-style-type: none"> <li>• Upon completing the course, the student will be able to design and study water resources management plans at any level</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

They will also be capable of working independently and collaboratively in the design of such projects. In particular, students will be able to:

- Evaluate and assess technical, environmental, social, and economic factors during the design of water resources management projects
- Develop and propose optimal or innovative solutions based on the above evaluations

### 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?*

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

- Search, analysis, and synthesis of data and information using the necessary technologies
- Adaptation to new situations
- Decision-making
- Independent work
- Teamwork
- Project planning
- Respect for the natural environment

### (3) SYLLABUS

1. Introduction
2. Water scarcity: Overview and analysis of the phenomenon
3. Introduction to the design and analysis of water resources systems. Analysis methods.
4. Objectives for water resources design.
5. Design models. Decision methods
6. Linear programming.
7. Dynamic programming
8. Probabilistic approach
9. Stochastic simulation and time series.

|                                                                                         |
|-----------------------------------------------------------------------------------------|
| 10. Risk-based Analysis                                                                 |
| 11. Application on the design of reservoirs. Surface water discharges forecasting.      |
| 12. Conjunctive use of surface and groundwater resources.                               |
| 13. Application for an integrated management study at the level of the hydrologic basin |
| 14. Application for an integrated management study at the level of the hydrologic basin |

#### (4) TEACHING and LEARNING METHODS - EVALUATION

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                 |                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>DELIVERY</b><br><i>Face-to-face, Distance learning, etc.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Face to face                                                                                                    |                          |
| <b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b><br><i>Use of ICT in teaching, laboratory education, communication with students</i>                                                                                                                                                                                                                                                                                                                                                                          | Lectures with PowerPoint, Notes, Exercises, Announcements on e-class                                            |                          |
| <b>TEACHING METHODS</b><br><i>The manner and methods of teaching are described in detail.</i><br><i>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i><br><br><i>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</i> | <b>Activity</b>                                                                                                 | <b>Semester workload</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Lecturew- Exercises                                                                                             | 54 hours                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Study                                                                                                           | 25 hours                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Project                                                                                                         | 54 hours                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Examination                                                                                                     | 3 hours                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Study of Exams                                                                                                  | 7 hours                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Education Visit                                                                                                 | 2 hours                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                 |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                 |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Course total                                                                                                    | 143 hours                |
| <b>STUDENT PERFORMANCE EVALUATION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Evaluation Language<br>Greek or English                                                                         |                          |
| <b>Description of the evaluation procedure</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Evaluation Methods                                                                                              |                          |
| <i>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</i>                                                                                                                                                                                        | 20% Project: Education from the students of a water resources project. Oral presentation and examination        |                          |
| <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>                                                                                                                                                                                                                                                                                                                                                                                                         | 80% Written Examination: Open books and notes. No audiovisual means. Short answer questions and problem solving |                          |

#### **(5) ATTACHED BIBLIOGRAPHY**

***-Suggested bibliography:***

1. N. Mylopoulos, "Water Resources Management", University of Thessaly
2. G. Tsakiris "Water Resources" Symmetria

***- Related academic journals:***