

## COURSE OUTLINE

### (1) General information

|  |                        |                              |                 |
|--|------------------------|------------------------------|-----------------|
| <b>FACULTY/SCHOOL</b>  | TECHNOLOGY             |                              |                 |
| <b>DEPARTMENT</b>  | ENVIRONMENTAL SCIENCES |                              |                 |
| <b>LEVEL OF STUDY</b>  | <i>Undergraduate</i>   |                              |                 |
| <b>COURSE UNIT CODE</b>  | <b>NEW COURSE</b>      | <b>SEMESTER</b>              | 7 <sup>th</sup> |
| <b>COURSE TITLE</b>  | SOIL REMEDIATION       |                              |                 |
| <b>INDEPENDENT TEACHING ACTIVITIES</b><br>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 |                        | <b>WEEKLY TEACHING HOURS</b> | <b>CREDITS</b>  |
| <b>THEORETICAL BACKGROUND</b>  |                        | 4                            | 4               |
| <b>COURSE TYPE</b><br>Background knowledge, Scientific expertise, General Knowledge, Skills Development  | BACKGROUND             |                              |                 |
| <b>PREREQUISITE COURSES:</b>   | NO                     |                              |                 |
| <b>LANGUAGE OF INSTRUCTION &amp; EXAMINATION/ASSESSMENT:</b>   | GREEK                  |                              |                 |
| <b>THE COURSE IS OFFERED TO ERASMUS STUDENTS</b>   | YES                    |                              |                 |
| <b>COURSE WEBSITE (URL)</b>  |                        |                              |                 |

### (2) LEARNING OUTCOMES

|   |
|---|
| <p><b>Learning Outcomes</b><br/>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:</p> <p><b>APPENDIX A</b></p> <ul style="list-style-type: none"> <li>• Description of the level of learning outcomes for each level of study, in accordance with the European Higher Education Qualifications' Framework.</li> <li>• Descriptive indicators for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and</li> </ul> <p><b>APPENDIX B</b></p> <ul style="list-style-type: none"> <li>• Guidelines for writing Learning Outcomes</li> </ul> |
| <p>The course provides specialized knowledge on cutting-edge technologies used to restore contaminated soils and water with an emphasis on physicochemical, biological and thermal methods of soil restoration, as well as in-situ and ex-situ groundwater restoration technologies. Removal of potentially toxic metal elements are considered as an example of application.</p>   |

Upon successful completion of the course, the student will be able to:

1. Understand the processes by which the transport and disposal of pollutants in the soil and subsoil takes place.
2. To evaluate methods and techniques for the restoration of pollution, based on their viability and the possibilities of their application in different pollution scenarios.
3. Take responsibility and strategically design innovative solutions in the service of sustainable pollution recovery.
4. To process and evaluate the results of rehabilitation tests.

### **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, analyze and synthesize data and information, using the necessary technologies
- Decision making
- Autonomous work
- Teamwork
- Production of new research ideas
- Project design and management
- Respect for the natural environment
- Promoting free, creative and inductive thinking

### **(3) COURSE CONTENT**

#### **Theory**

1. Introduction - General concepts
2. Transport of pollutants to the soil
3. Physicochemical recovery methods
4. Biological treatment
5. Thermal treatment
6. Ex-situ treatments
7. In-situ treatments
8. Heavy metal management
9. Examples of applications

#### (4) TEACHING METHODS-ASSESSMENT

| <p><b>MODES OF DELIVERY</b><br/>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</p>   | <ul style="list-style-type: none"> <li>• Lectures in the classroom or by distance</li> <li>• Team discussion</li> </ul>  |                          |                        |                          |          |    |              |    |              |    |  |            |
|--|--|--------------------------|------------------------|--------------------------|----------|----|--------------|----|--------------|----|--|------------|
| <p><b>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</b><br/>Use of ICT in teaching, Laboratory Education, Communication with students</p>  | <ul style="list-style-type: none"> <li>• Powerpoint.</li> <li>• View video material</li> <li>• e-mail.</li> <li>• e-class</li> </ul>   |                          |                        |                          |          |    |              |    |              |    |  |            |
| <p><b>COURSE DESIGN</b><br/>Description of teaching techniques, practices and methods:<br/>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, Internship, Art Workshop, Interactive teaching, Educational visits, projects, Essay writing, Artistic creativity, etc.</p> <p>The study hours for each learning activity as well as the hours of self-directed study are given following the principles of the ECTS.</p>   | <table border="1"> <thead> <tr> <th data-bbox="678 613 1011 640"><i>Activity/Method</i></th> <th data-bbox="1015 613 1335 640"><i>Semester workload</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="678 645 1011 672">Lectures</td> <td data-bbox="1015 645 1335 672">52</td> </tr> <tr> <td data-bbox="678 676 1011 703">Theory study</td> <td data-bbox="1015 676 1335 703">38</td> </tr> <tr> <td data-bbox="678 707 1011 734">Team working</td> <td data-bbox="1015 707 1335 734">10</td> </tr> <tr> <td data-bbox="678 739 1011 828"><b>Course total</b><br/><i>(25 hours of workload per credit unit)</i></td> <td data-bbox="1015 739 1335 828"><b>100</b></td> </tr> </tbody> </table> |                          | <i>Activity/Method</i> | <i>Semester workload</i> | Lectures | 52 | Theory study | 38 | Team working | 10 | <b>Course total</b><br><i>(25 hours of workload per credit unit)</i> | <b>100</b> |
|  | <i>Activity/Method</i>   | <i>Semester workload</i> |                        |                          |          |    |              |    |              |    |  |            |
|  | Lectures   | 52                       |                        |                          |          |    |              |    |              |    |  |            |
|  | Theory study   | 38                       |                        |                          |          |    |              |    |              |    |  |            |
|  | Team working   | 10                       |                        |                          |          |    |              |    |              |    |  |            |
| <b>Course total</b><br><i>(25 hours of workload per credit unit)</i>   | <b>100</b>   |                          |                        |                          |          |    |              |    |              |    |  |            |
|  |  |                          |                        |                          |          |    |              |    |              |    |  |            |
| <p><b>STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS</b><br/>Detailed description of the evaluation procedures:</p> <p>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.</p> <p>Specifically, defined evaluation criteria are stated, as well as if and where they are accessible by the students.</p> <p><b><u>Students are assessed in Greek or English. The final grade is formed by tests which include:</u></b></p> <ul style="list-style-type: none"> <li>• Written exam: 70% of the final grade (A)</li> <li>• Tasks: 30% of the final grade (B)</li> </ul> <p><b>Final grade = 70% (A) + 30% (B)</b></p> |  |                          |                        |                          |          |    |              |    |              |    |  |            |

## (5) SUGGESTED BIBLIOGRAPHY:

### -Suggested bibliography

- **Soil Remediation and Rehabilitation Treatment of Contaminated and Disturbed Land**  
Authors: Meuser, Helmut. eBook ISBN: 978-94-007-5751-6. DOI: 10.1007/978-94-007-5751-6. 2013, Springer.
- **Τεχνολογίες αποκατάστασης εδαφών και υπόγειων υδάτων από επικίνδυνους ρύπους**  
Συγγραφείς: Ε. Γιδαράκος, Μ. Αϊβαλιώτη, ISBN: 960-8065-52-6, Εκδόσεις Ζυγός 2005
- **Εδαφικές Διεργασίες και Αποκατάσταση Εδαφών**  
Συγγραφείς: Ε.Μ. Παπαθεοδώρου, Γ.Π. Στάμου, ISBN: 978-960-603-314-8, ΣΥΝΔΕΣΜΟΣ ΕΛΛΗΝΙΚΩΝ ΑΚΑΔΗΜΑΪΚΩΝ ΒΙΒΛΙΟΘΗΚΩΝ, ΕΜΠ
- **Green and Sustainable Remediation: A Practical Framework**  
Prepared: The Interstate Technology & Regulatory Council Green and Sustainable Remediation Team, November 2011
- **European achievements in soil remediation and brownfield redevelopment**  
JRC102681 – 2017, ISBN 978-92-79-71690-4 (PDF), doi:10.2760/818120 (online)