

## COURSE OUTLINE

### 1. GENERAL

<b>SCHOOL</b>	Environment and Agricultural Engineering		
<b>ACADEMIC UNIT</b>	Department of Natural Resources Development & Agricultural Engineering		
<b>LEVEL OF STUDIES</b>	Master		
<b>COURSE CODE</b>	630041`	<b>SEMESTER</b>	2 <sup>nd</sup>
<b>COURSE TITLE</b>	Special issues of waste management		
<b>INDEPENDENT TEACHING ACTIVITIES</b> <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>	
Lectures and laboratory exercises	3	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> <i>general background, special background, specialised general knowledge, skills development</i>	Specialised general knowledge		
<b>PREREQUISITE COURSES:</b>			
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>	English		
<b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>	Yes (English)		
<b>COURSE WEBSITE (URL)</b>	<a href="https://oeclass.aua.gr/eclass/modules/document/?course=5383">https://oeclass.aua.gr/eclass/modules/document/?course=5383</a>		

### 2. LEARNING OUTCOMES

<p><b>Learning outcomes</b>  <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></p> <p><i>Consult Appendix A</i></p> <ul style="list-style-type: none"> <li>• <i>Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area</i></li> <li>• <i>Descriptors for Levels 6, 7 &amp; 8 of the European Qualifications Framework for Lifelong Learning and Appendix B</i></li> <li>• <i>Guidelines for writing Learning Outcomes</i></li> </ul>
<p>This course focuses on the science, engineering, and policy behind sustainable waste practices. Topics include sustainable water management, wastewater management (including water reuse). The purpose of this course is for students to become familiar with and well versed in sustainable concepts and designs for waste management. Consideration of technical, environmental, economic, and social aspects of these concepts is emphasized. At the conclusion of this course, students will be:</p> <ul style="list-style-type: none"> <li>• Knowledgeable on multiple technologies and concepts for sustainable water and waste management.</li> <li>• Proficient in applying methodologies to develop sustainable wastewater and waste management alternative solutions.</li> <li>• Able to identify environmental, social, and economic issues associated with various wastewater and waste management concepts.</li> <li>• Able to apply sustainability considerations (environmental, social and economic) including multicriteria decision analysis tools (MCDA) to provide recommendations on most appropriate solutions for a design option or problem.</li> </ul>

## 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

Adapting to new situations

Decision-making

Working independently

Team work

Working in an international environment

Working in an interdisciplinary environment

Production of new research ideas

Project planning and management

Respect for difference and multiculturalism

Respect for the natural environment

Showing social, professional and ethical responsibility and sensitivity to gender issues

Criticism and self-criticism

Production of free, creative and inductive thinking

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Others...

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- Team work
- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Decision-making
- Respect for the natural environment
- Project planning and management
- Production of free, creative and inductive thinking

## 3. SYLLABUS

### Week 1-2: Introduction to Wastewater Management

- **Overview of Wastewater Composition:**

- Understanding the sources and components of wastes and wastewater.
- Introduction to different types of wastes and wastewater (domestic, industrial, agricultural).

- **Importance of Effective Waster Management:**

- Exploring the environmental and public health consequences of inadequate waste management.
- Case studies highlighting the impact of poor wastewater management practices.

- **Regulatory Frameworks and Environmental Impact Assessments:**

- Examination of local and international regulations governing waste management.
- Introduction to environmental impact assessment methodologies.

### Week 3-4: Waste and Wastewater Collection and Transportation

- **Collection Systems and Infrastructure:**

- Study of various wastewater collection systems (sewer systems, decentralized systems).
- Design considerations and challenges in implementing effective collection systems.

- **Transportation Methods and Considerations:**

- Overview of transportation methods (collection, pumping, gravity, etc.).
- Case studies on successful transportation systems in urban and rural settings.

- **Case Studies on Successful Collection and Transportation Systems:**

- Guest speakers from municipalities and organizations with effective collection and transportation practices.
- Group discussions on replicable models.

### Week 5-6: Wastewater Characterization and Analysis

- **Methods for Wastewater Characterization:**

- Techniques for physical, chemical, and biological characterization.
- Techniques for wastewater sampling and analysis.

- **Analytical Techniques for Assessing Wastewater Quality:**

- Exploration of laboratory techniques and instruments.
- Interpretation of results and their implications for management.

- **Field Demonstrations and case study experience**

- Visits to waste and wastewater treatment plants and laboratories.
- Hands-on experience in waste facilities.

### Week 7-8: Waste Management Planning and Policy

- **Development of Waste Management Plans:**

- Steps involved in creating comprehensive management plans.
- Group projects to develop sample plans for hypothetical scenarios.

- **Policy Considerations and Implementation Strategies:**

- Examination of local, national, and international wastewater management policies.

- Role-playing exercises for policy implementation challenges.
- **Guest Lectures from Experts in Policy Development:**
  - Invited experts sharing experiences in developing and implementing wastewater management policies.
  - Q&A sessions with the experts.

#### **Week 9-10: Waste Reuse Principles**

- **Introduction to Wastewater Reuse:**
  - Understanding the concept of wastewater reuse and its potential benefits.
  - Differentiating between direct and indirect reuse.
- **Types of Waster Reuse:**
  - Exploration of various applications such as agricultural, industrial, and environmental reuse.
  - Case studies on successful waste reuse projects.
- **Benefits and Challenges of Waste Reuse:**
  - Discussion on economic, environmental, and societal benefits.
  - Addressing concerns and challenges associated with public perception.

#### **Week 11: Agricultural Wastewater and Its Characteristics**

- **Specifics of Agricultural Wastewater:**
  - Understanding the unique characteristics of wastewater generated from agricultural activities.
  - Identification of common contaminants in agricultural wastewater.
- **Contaminants in Agricultural Wastewater:**
  - Analysis of contaminants, including nutrients, pesticides, and pathogens.
  - Implications for soil and water quality.
- **Case Studies of Successful Agricultural Wastewater Management:**
  - Exploration of innovative and sustainable agricultural wastewater management practices.
  - Guest speakers from the agriculture industry.

#### **Week 12: Agricultural Wastewater Reuse Practices**

- **Techniques for Treating and Reusing Agricultural Wastewater:**
  - Overview of treatment methods suitable for agricultural wastewater.
  - Practical demonstrations of treatment technologies.
- **Integrated Approaches for Sustainable Agriculture:**
  - Examining holistic approaches that integrate waste and wastewater management with sustainable agricultural practices.
  - Field trips to farms implementing successful integrated approaches.
- **Field Trips to Sites Implementing Wastewater Reuse:**
  - Visits to agricultural facilities to observe real-world applications of wastewater reuse.
  - Student presentations on observations and learnings.

#### **Week 13: Emerging Trends and Technologies –Circular Economy**

- **Innovations in Waste and Wastewater Management:**
  - Exploration of cutting-edge technologies and innovations in the field.
  - Group discussions on potential future developments.
- **Advances in Monitoring and Control Systems:**
  - Introduction to smart monitoring and control systems for efficient waste management.
  - Case studies on successful implementation of advanced systems.
- **Future Prospects and Research Opportunities:**
  - Discussion on ongoing research and potential areas for future exploration.
  - Student presentations on proposed research projects (final exam).

#### 4. TEACHING and LEARNING METHODS - EVALUATION

<p style="text-align: center;"><b>DELIVERY</b> <i>Face-to-face, Distance learning, etc.</i></p>	<p>Face-to-face &amp; distance learning</p> <ul style="list-style-type: none"> <li>● Lecture-Based Learning</li> <li>● E-Learning</li> <li>● Internships and Work-Study Programs</li> <li>● Field Trips</li> <li>● Guest Lectures</li> <li>● Group Projects</li> </ul>																				
<p style="text-align: center;"><b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b> <i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<ul style="list-style-type: none"> <li>● Basic software (windows, word, excel, power point, web, etc)</li> <li>● Aua webmail</li> <li>● AV material</li> <li>● Powerpoint slides</li> </ul>																				
<p style="text-align: center;"><b>TEACHING METHODS</b></p> <p><i>The manner and methods of teaching are described in detail.</i></p> <p><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></p> <p><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></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"><i>Activity</i></th> <th style="text-align: center;"><i>Semester workload</i></th> </tr> </thead> <tbody> <tr> <td><i>Lectures</i></td> <td style="text-align: center;">24</td> </tr> <tr> <td><i>project, essay writing</i></td> <td style="text-align: center;">6</td> </tr> <tr> <td><i>Waste industry Guest lecturer</i></td> <td></td> </tr> <tr> <td><i>Field visits</i></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td><b>Course total</b></td> <td style="text-align: center;"><b>30</b></td> </tr> </tbody> </table>	<i>Activity</i>	<i>Semester workload</i>	<i>Lectures</i>	24	<i>project, essay writing</i>	6	<i>Waste industry Guest lecturer</i>		<i>Field visits</i>										<b>Course total</b>	<b>30</b>
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<p style="text-align: center;"><b>STUDENT PERFORMANCE EVALUATION</b></p> <p><i>Description of the evaluation procedure</i></p> <p><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></p> <p><i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i></p>	<ul style="list-style-type: none"> <li>● <b>Midterm Examination:</b> Comprehensive test covering material from the first half of the course.</li> <li>● <b>Group Projects on Waste and Wastewater Management Plans:</b> Groups will develop a practical wastewater management plan for a given scenario.</li> <li>● <b>Case Study Analysis:</b> Individual or group analysis of a real-world case study related to waste and wastewater management.</li> <li>● <b>Final Examination:</b> Cumulative test covering material from the entire course.</li> </ul>																				

#### 5. ATTACHED BIBLIOGRAPHY

<p><i>- Suggested bibliography:</i></p> <p><b>Theis, Tom and Jonathan Tomkin (2012) Sustainability: A Comprehensive Foundation</b></p> <p><b>Crites, Ron and George Tchobanoglous (1998) Small and Decentralized Wastewater Management Systems</b></p> <p><b>Sanclar, Ajith (2021), Environmental Management. In Greek: Διαχείριση Περιβάλλοντος ΕΕ Ιωάννης Μουζακίτης, Εκδόσεις Τζιολα.</b></p> <p><i>- Related academic journals:</i></p> <p>Waste management journal</p> <p>Wastewater management journal</p> <p>Waste water journal</p> <p>Water</p>
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