### TECHNICAL UNIVERSITY OF CRETE
### SCHOOL OF ENVIRONMENTAL ENGINEERING

**Code:** ENVE 539  
**Course:** Soil and Groundwater Remediation Technologies

<table>
<thead>
<tr>
<th>Mandatory</th>
<th>Elective</th>
<th>Specialization: X</th>
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**Semester:**  
| F | X | S |

**Teaching Units:** 3  
**ECTS:** 5

**Teaching Hours per week:**  
| T | 2 | E | 1 | L |

**Instructors:** E. Gidarakos, M. Aivalioti

**Textbooks (Eudoxus):**  
Ευάγγελος Γιδαράκος, Μαρία Αϊβαλιώτη, 2005. Τεχνολογίες Αποκατάστασης Εδαφών και Υπογείων Υδάτων από Επικίνδυνους Ρύπους, Εκδόσεις ΖΥΓΟΣ, Θεσ/κη.

**Other recommended books:**  
1. Ευάγγελος Γιδαράκος, 2006. Επικίνδυνα Απόβλητα – Διαχείριση, επεξεργασία, διάθεση. Εκδόσεις ΖΥΓΟΣ, Θεσσαλονίκη.  

**Notes:**  
E-class: (Homeworks)

<table>
<thead>
<tr>
<th>Labs:</th>
<th># of lab exercises:</th>
<th>Individual Reports</th>
<th>Team Reports</th>
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<tr>
<th>Lab final written exam</th>
<th>% of Final Lab Grade</th>
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<table>
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<tr>
<th>Final Grade:</th>
<th>Final Exam</th>
<th>50 %</th>
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<tbody>
<tr>
<td>Project</td>
<td>30 %</td>
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<tr>
<td>Labs</td>
<td>%</td>
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<tr>
<td>Other (Homework)</td>
<td>20 %</td>
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**Course Syllabus:**

- **Hydrodynamic, chemical and biological processes in the subsurface**
- **Transport and fate of pollutants in soil**
  - Hydrodynamic Processes
  - Abiotic processes
  - Biotic processes
- **SOIL RESTORATION TECHNOLOGIES**
- **Physical-Chemical methods**
  - EMF method
  - Stabilization – solidification
- Soil leaching
- Soil washing
- Extraction of soil air
- **Biological treatment**
  - Bioventing
  - Slurry Bioreactors
  - Soil treatment
  - Composting
  - Phytoremediation
- **Thermal treatment**
  - IN-SITU Thermal treatment
  - Incineration
  - Pyrolysis
  - Thermal desorption
- **GROUNDWATER RESTORATION TECHNOLOGIES**
- **EX-SITU Technologies**
  - Pump and treat
  - Advanced oxidation processes
- **IN-SITU Technologies**
  - Permeable reactive barriers
  - Air Sparging
  - Bioslurping
- **Application examples**