

## SYLLABUS

1. **Number and Name:** 11:117:468 – **HAZARDOUS WASTE TREATMENT ENGINEERING**
2. **Credits and contact hours:** 3 credits, one 180-minute consolidated lecture per week.
3. **Instructor:** Dr. Nazmi Mete Talimcioglu
4. **Text (Reference):** *Geoenvironmental Engineering: Site Remediation, Waste Containment and Emerging Waste Management Technologies*, Hari D. Sharma and Krishna R. Reddy, John Wiley and Sons, Inc., 2004, ISBN: 0-471-21599-6.
5. **Specific Course Information**
  - a. **Catalog Description:** *Engineering and process design aspects of hazardous waste management. Waste reduction and recovery, waste treatment, and site remediation. Case studies and engineering solutions to model hazardous waste problems.*
  - b. **Prerequisites:** 11:117:413 or permission by instructor
  - c. **Course Type:** Required
6. **Course Goals**
  - a. **Specific Instructional Outcomes:** This course instructs students in the utilization of scientific and engineering principles to assess and design treatment systems for remediation of hazardous waste sites. Design and implementation of selected remedial technologies in standard environmental engineering practice are demonstrated with the applicable regulations of the State of New Jersey.
  - b. **Specific Student Outcomes addressed by the course include:**
    - c. **Ability to design a system, component, or process to meet desired needs.**  
**Instructional Activity:** As part of the term-project, students design a full-scale remediation system for an actual, real-life contaminated site in New Jersey. Instructor shares his expertise and experience in all aspects of the design phases of this project and provides insight to students with real-life examples.  
**Assessment Activity:** Final evaluation of the term project with respect to technical correctness, completeness, presentation quality, and reporting.
    - e. **Ability to identify, formulate and solve engineering problems.**  
**Instructional Activity:** All background theory for groundwater hydrogeology, mathematical formulation of governing equations of groundwater flow linked with fate and transport processes of contaminants, and solutions for specific cases of hazardous waste contamination problems are incorporated in lectures, homework and term project.  
**Assessment Activity:** Engineering examples in homework, fundamental concepts and definitions in quizzes, and final design elements in term project.

**j. Knowledge of contemporary issues.**

**Instructional Activity:** Instructor provides real-life cases of contamination scenarios, which involve design and implementation of innovative remedial systems. His practical engineering experience provides students with the latest developments in the treatment engineering field.

**Assessment Activity:** Active class participation and discussion during presentations of real-life cases.

**k. Ability to use techniques, skills, and modern engineering tools.**

**Instructional Activity:** The final term project requires students to utilize all theoretical background learned in class and apply the same to practical design elements with the techniques covered in lectures, as well as with MS-Excel based modeling to calculate certain design parameters.

**Assessment Activity:** Final technical evaluation of the term project and quizzes.

**7. Topics:**

| <b>Week</b> | <b>Topic</b>   |
|-------------|--|
| 1           | Course Overview - Review of Basic Definitions – Regulatory Process   |
| 2           | Introduction to USEPA and NJDEP Regulations – Conceptual Site Models   |
| 3           | Introduction to Hydrogeology – Aquifer Properties  |
| 4           | Groundwater Hydraulics – Darcy’s Law   |
| 5           | Darcy’s Law Problems – Examples – Mathematics of Groundwater Flow  |
| 6           | Flow Net Solutions of Groundwater Flow Problems – Examples   |
| 7           | Analytical Solutions of Groundwater Flow Problems – Examples   |
| <b>8</b>    | <b>SPRING BREAK</b>  |
| 9           | Well Hydraulics  |
| 10          | <b>Midterm Quiz</b> – Re-cap of Contaminant Transport Processes – Examples   |
| 11          | Re-cap of Contaminant Fate Processes – Examples  |
| 12          | Introduction to Remedial Technologies: Engineering and Institutional Controls – Monitored Natural Attenuation Programs – Case Studies  |
| 13          | Soil and Groundwater Remediation Technologies – Theory and Real-Life Examples  |
| 14          | Soil and Groundwater Remediation Technologies – Theory and Real-Life Examples  |
| 15          | Monitoring Well Design and Construction - Well Drilling Technologies – Vapor Intrusion Investigation and Mitigation Technologies – Introduction to Environmental Forensic Engineering – Introduction to Modeling |
| <b>16</b>   | <b>Final Quiz – Term Project Presentations</b>   |

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|----------|--------------|-----|
| Grading: | Homework     | 10% |
|          | Midterm Quiz | 30% |
|          | Final Quiz   | 30% |
|          | Term Project | 30% |

Prepared by: Dr. Nazmi Mete Talimcioglu on April 27, 2018.