



Course Information

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|-----------------------------------|--|
| Course Code | 5600422 |
| Course Section | 1 |
| Course Title | TREAT.&DISP.OF WATER&WASTEWATER SLUDGE |
| Course Credit | 3 |
| Course ECTS | 6.0 |
| Course Catalog Description | Sources and quantities of sludge produced from water and wastewater treatment plants. Sludge characteristics. Sludge stabilization, pumping, conditioning, thickening, dewatering and drying. Sludge combustion and ultimate disposal. |
| Prerequisites | Students must complete one of the following sets to take this course. |

Set Prerequisites

| | |
|---|------------------|
| 1 | 5600303, 5600304 |
|---|------------------|

Schedule Friday , 13:40 - 16:30, CZ17

Instructor Information

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| Name/Title | Prof.Dr. FAİKA DİLEK SANİN |
| Office Address | Department of Environmental Engineering Room 107 |
| Email | dsanin@metu.edu.tr |
| Office Phone | 210 2642 |
| Office Hours | Students can ask questions any time they want by email or by stopping by my office. |

Course Assistants

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|-----------------------|--------------------------|
| Name/Title | Araş.Gör. ESİN YANDIMATA |
| Office Address | |
| Email | |
| Office Hours | |

Course Objectives

The aim of the course is to provide information about how municipal wastewater sludge is managed from the point of generation till final disposal including estimation of production rates, characteristics, treatment, beneficial use and disposal. This course is also intended to provide background for the capstone design course.

Course Learning Outcomes

Student will be able to know sources and characteristics of sludge, how to estimate sludge quantities, and treatment and disposal of sludge originating from treatment plants.

Students will be able to solve open-ended problems on sources, quantities, characteristics, treatment and disposal of sludge.

Students will be able to use the information taught to design sludge treatment units.

Students will be able to reach current literature on sludge management and maintain and update their knowledge.

Program Outcomes Matrix

Undergraduate

| Program Outcomes | Level of Contribution | | | |
|------------------|-----------------------|---|---|---|
| | 0 | 1 | 2 | 3 |



| Program Outcomes | Level of Contribution | | | |
|--|-----------------------|---|---|---|
| | 0 | 1 | 2 | 3 |
| 1 An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics | | | X | |
| 2 An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors | | | X | |
| 3 An ability to communicate effectively with a range of audiences | | | X | |
| 4 An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts | | X | | |
| 5 An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives | | X | | |
| 6 An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions | X | | | |
| 7 An ability to acquire and apply new knowledge as needed, using appropriate learning strategies | | X | | |

0: No Contribution 1: Little Contribution 2: Partial Contribution 3: Full Contribution

Instructional Methods

The course will be conducted as online lectures via the PowerPoint slide presentations. The lecture notes and videos will be uploaded to ODTUClass. The students are expected to go over the lecture notes and the videos each week. Then live sessions are held weekly during class time to follow up the lecture notes and the videos.

There will be Paper Discussions as scheduled in the coming weeks of the semester. A scientific paper will be assigned to each group of 3 students. Papers should be read by the whole class before coming to the discussion sessions. Papers will be presented during the online sessions (during lecture hour) by the responsible group as scheduled. A 15-20 minute presentation is expected by the contribution of all group members. Then a 10-15 minute class discussion will follow. The presenting group is responsible for moderating the discussion similar to an instructor. Additionally, a maximum two-page summary of the paper will be prepared by the group. Papers, paper summaries and class presentations will be uploaded to ODTUClass for the use of the whole class. Final exam will have questions about the discussion papers.

Tentative Weekly Outline

| Week | Topic | Relevant Reading | Assignments |
|------|-------------------------------|------------------|-------------|
| 1 | Sludge Sources and Quantities | | |
| 2 | Sludge Characteristics | | |
| 3 | Sludge Stabilization | | |
| 4 | Sludge Pumping | | |



| Week | Topic | Relevant Reading | Assignments |
|------|---|------------------|-------------|
| 5 | Sludge Thickening | | |
| 6 | Sludge Dewatering | | |
| 7 | Sludge Conditioning | | |
| 8 | Sludge Drying and Combustion | | |
| 9 | Chemical Sludges | | |
| 10 | Ultimate Disposal of Sludge | | |
| 11 | Beneficial Uses of Sludge | | |
| 12 | Regulations on Sludge Disposal | | |
| 13 | Paper Presentations and Discussions | | |
| 14 | Half-day visit to a wastewater treatment plant and sludge treatment facility. Discussions on the visited sludge treatment facility. | | |

Course Textbook(s)

Sanin, F. D., Clarkson, W. C. and Vesilind, P. A. "Sludge Engineering: The Treatment and Disposal of Wastewater Sludges", Destech Publications, Lancaster, PA, 2011, 393pp.

Course Material(s) and Reading(s)

Material(s)

Vesilind, P.A., Hartman, G.C. and Skene, E. T. "Sludge Management and Disposal for the Practicing Engineer" Lewis Publishers Inc., MI, 1986, 341 pp.

Tchobanoglous, G., Burton, F. L. and Stensel, H. D. [Wastewater Engineering: Treatment and Reuse](#) by Metcalf & Eddy Inc., MacGraw Hill Inc., New York, 2004.

Reading(s)

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Assessment of Student Learning

| Assessment | Dates or deadlines |
|------------|--------------------|
| Homeworks | |
| Term Paper | |
| Exams | |

Course Grading



| Deliverable | Grade Points |
|--|--------------|
| Homework | 10 |
| Quizes | 30 |
| Paper discussion and general contribution to class | 25 |
| Final | 35 |
| Attendance to online lectures | 5 |
| Total | 105 |

Course Policies

Class Attendance

This is a technical elective course in Environmental Engineering curriculum. Attendance is strongly recommended since it is closely related to the success of the students.

Class Participation

Each student is expected to participate in class discussions and in term paper preparation and presentation.

Information for Students with Disabilities

Students who experience difficulties due to their disabilities and wish to obtain academic adjustments and/or auxiliary aids must contact ODTU Disability Support Office and/or course instructor and the advisor of students with disabilities at academic departments (for the list: <http://engelsiz.metu.edu.tr/en/advisor-students-disabilities>) as soon as possible. For detailed information, please visit the website of Disability Support Office: <https://engelsiz.metu.edu.tr/en/>

Academic Honesty

The METU Honour Code is as follows: *"Every member of METU community adopts the following honour code as one of the core principles of academic life and strives to develop an academic environment where continuous adherence to this code is promoted. The members of the METU community are reliable, responsible and honourable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents."*