SYLLABUS

1. **Number and Name: 11:117:462 – DESIGN IN SOLID WASTE TREATMENT SYSTEMS**

2. **Credits and contact hours:** 3 credits, two 80 min. lecture periods per week and three voluntary field trips (MRF, waste-to-energy facility, landfill)

3. **Instructor:** Uta Krogmann

4. **Text:** Worrell, W.A., Vesilind, P.A. and Ludwig, C. 2016. *Solid Waste Engineering: A Global Perspective.* Third Edition. Cengage Learning, Stamford, CT.
   Reference: Vesilind, P.A. 2007. *Public Speaking and Technical Writing Skills*. Lakeshore Press, Woodsville, NH.
   Christensen, T.H. (ed.). 2010. *Solid Waste Technology & Management*. John Wiley & Sons, Ltd., Chichester, UK. (Available online at the Rutgers University library)

5. **Specific Course Information**
   - ***a.*** **Catalog Description:** *Analysis and design of integrated solid waste management systems, including waste minimization, quantity estimates, waste characteristics, life-cycle thinking in waste management, collection, composting and anaerobic digestion, materials recovery, recycling, waste-to-energy, and landfilling.*
   - **b. Prerequisites:** 01:640:152 (Calc II for Sci), 11:375:201 (Bio. Prin. Env. Sci.), 14:180:215 (Eng'g Graph.)
   - **c. Course Type:** Required

6. **Course Goals**

   a. Specific Instructional Outcomes: Students will be versed in the principles of solid waste management and treatment.

   b. Specific Student Outcomes addressed by the course include:

   c. Ability to design a system, component or process to meet desired need.
   Instructional Activity: Design activities will be included in lectures, homework assignments and projects. Experienced design engineers will discuss solid waste management treatment facility designs.
   Assessment Activity: Second project and small design problem in final exam.

   e. Ability to identify, formulate and solve engineering problems
   Instructional Activity: Engineering problems of solid waste treatment facilities and their solutions will be included in lectures and homework assignments. Experienced design engineers will present examples of engineering problems encountered in their design and present solutions.
   Assessment Activity: Engineering problems in homeworks and final exam.

   g. Ability to communicate effectively
   Instructional Activity: Instruction about report writing will be included in course. Bad examples of report writing will be provided for critique.
   Assessment Activity: Written report of second project and written reports of field trips.

h. An understanding of engineering in a global and societal context
Instructional Activity: In-class exercises and homework assignments will be included that address materials and resources management, the movement of wastes and recyclables beyond national borders, and waste management in developing countries.
Assessment Activity: Problems in midterm and final exam.

j. Knowledge of contemporary issues
Instructional Activity: In-class exercises and homework assignments will be included that address contemporary issues related to waste management.
Assessment Activity: Problems in homeworks and final exam.

7. Topics:

Lecture	**Topic (unless noted otherwise the chapters refer to Worrell et al. (2016))**
1	Introduction of integrated solid waste management systems (Chapter 1 w/o 1-1-2))
2	Legislation and regulations (Section I in the RCRA Orientation Manual 2014: Resource Conservation and Recovery Act (http://www.epa.gov/sites/production /files /2015-07/documents/rom.pdf (except RCRA Today)); Chapter 1-1-2; Chapter 9-6)
3	County responsibilities in solid waste management (Middlesex County Division of Solid Waste) (Chapter 9-2, 9-3, 9-4)
4-5	Characteristics of solid waste (Chapter 2)
6	Recycling aspects (Christensen, Chapter 5.1-5.4)
7	Business communication in waste management projects (Al Mellini, formerly Mott MacDonald)
8	Sustainability and life-cycle assessment in waste management (Christensen, Chapter 3.1)
9-11	Solid waste collection and transfer stations (Chapter 3)
12, 14-15	Material Recovery Facilities (Chapter 4, Chapter 5 and Chapter 9-5)
13	Midterm examination
16	Material Recovery Facility design (Al Mellini, formerly Mott MacDonald)
17-18	Thermal processing, waste-to-energy (Chapter 7)
19	Air pollution control in waste-to-energy facilities (Michael van Brunt, Covanta)
20-22	Composting and anaerobic digestion (Christensen, Chapter 9.2; Worrell et al., Chapter 6-1)
23-26	Landfilling (Chapter 8)
27	Landfill design (Brian Henning, Mott MacDonald)
28	Integrated waste management (Chapter 9-7, 9-8 and 9-9)

Grading: Midterm examination - 20%
Project 1 and 2- 30%
Homework assignments - 15%
Reading assignment quizzes – 10%
Final examination - 25%

Prepared by: Uta Krogmann 01/31/18