

Fall 2019

ENE 660-101: Introduction to Solids and Hazardous Waste

Rahman Rafique

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JOHN A. REIF, JR. DEPARTMENT OF
**CIVIL AND ENVIRONMENTAL
ENGINEERING**



EnE 660 – Introduction to Solids and Hazardous Waste

Fall 2019

Section: 101

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Textbook: “Solid Waste Engineering, A Global Perspective, 3rd Ed.”, CENGAGE Learning, 2017, by William A. Worrell, P. Aarne Vesilind, and Christian Ludwig. ISBN-13: 978-1-305-63520-3, ISBN-10: 1-305-63520-5.

Introduction to solids and hazardous waste; which includes waste collection, recycling, composting, energy recovery, and landfilling. Federal and state regulations, and application of engineering principles related to these topics are introduced. Students will learn integrated waste management strategies (through reduction, reuse, recycling and recovery), which strategies will assist them as future engineer in pollution prevention and resource conservation.

Prerequisite: **ENE 663**. (May be taken concurrently.) Introduction to solid waste disposal. Industrial and urban sources of solid waste and conventional methods of waste disposal. Application of engineering principles related to these topics.

“Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

	Topic	Text/Chapter	Assignments/Homework
Week 1 (Sep. 05)	Introduction – Integrated Solid Waste Management	1	
Week 2 (Sep. 12)	Municipal Solid Waste Characteristics and Quantities	2	2 – 9 (assume 4 lb/capita/day; loose waste density = 200 lb/yd ³ ; compacted waste density = 750 lb/yd ³), 13, 14, 15 [Due: Sep 18]
Week 3 (Sep. 19)	Hazardous wastes	RCRA Orientation Manual	2 – 17, 18 [Due: Sep 25]
Week 4 (Sep. 26)	Waste collection and transfer stations	3	3 – 1 (0.59 yd ³ generation/location; waste density 250 lb/yd ³), 8 [Due: Oct. 02]
Week 5 (Oct. 03)	Waste collection and transfer stations (continued)	3	3 – 18, 20, 21 [Due: Oct. 09]
Week 6 (Oct. 10)	Mechanical processes	4	4 – 1 (Wood chip SG = 0.7; bulk density = 18.5 lb/yd ³), 6 (coeff. of friction = 0.4), 10, 16 (E _i = 400 kWh/ton) [Due: Oct. 16]
Week 7 (Oct. 17)	Mid-term		
Week 8 (Oct. 24)	Separation processes	5	5 – 1 (waste generation 4 lb/d; sorting 1000 lb/hr/person; wage \$10/hr), 2, 4, 5, 12, 14, 23 [Due: Oct. 30]
Week 9 (Oct. 31)	Biological processes	6	6 – 1, 3 (= g methane/g refuse), 6, 8 [Due: Nov. 06]
Week 10 (Nov. 07)	Thermal processes	7	7 – 10, 12 [Due: Nov. 13]
Week 11 (Nov. 14)	Landfills	8	8 – 2, 3 [Due: Nov. 20]
Week 12 (Nov. 21)	Landfills (continue)	8	8 – 5 (assume methane generation 1110 m ³ /ton; gas emission constant: 0.0307/yr), 9 [Due: Nov. 27]

Week 13 (Dec. 05)	Toward Integrated Resources Management – Environmental, Political and Economic Issues	9	9 – 6, 9 [Due: Dec. 11]
Week 14 (Dec. 12)	Term paper presentation		
Week 15 (Dec. 19)	Final exam.		

Attendance Policy:

Students are expected to attend all class sessions as listed on the course calendar.

Assignment submission: **All assignments for this course will be submitted electronically through Canvas unless otherwise instructed.** Assignments must be submitted by the given deadline or special permission must be requested from Dr. Rafique *before the due date*. Extensions will not be given beyond the next assignment except under extreme circumstances.

All discussion assignments must be completed by the assignment due date and time. Late or missing discussion assignments will affect the student's grade.

Grade Policy:

Assignments/Homework	20%
Mid-Term Exam.	35%
Final Exam.	35%
Term Paper	10%

1. Homework/Assignments are to be solved and turned in the week following the assignment. Term paper presentations (PowerPoint) are due on 14th week. If you submit your homework in digital form, please use your last name and homework/assignment number as the file name, for example, smith_HW1.
2. Term paper can be case study, comparison study, or any topic related to solid waste collection, modeling, disposal, recycling, treatment, and management. The length of the paper is approximately 10 pages with references.

Solid and Hazardous Waste References:

1. RCRA Orientation Manual 2014: <https://www.epa.gov/hwgenerators/resource-conservation-and-recovery-act-rcra-orientation-manual>
2. RCRA laws and regulations: <https://www.epa.gov/rcra>
3. NJ Solid and Hazardous Waste regulation: <https://www.nj.gov/dep/dshw/resource/rules.htm>

4. USEPA – Land, Waste and Cleanup topics: <https://www.epa.gov/environmental-topics/land-waste-and-cleanup-topics>
5. NJDEP state wide solid waste management plan: <https://www.nj.gov/dep/dshw/recycling/swmp/index.html>
6. Waste360 (Waste Age): <https://www.waste360.com> – for News, buyer’s guide, product information, etc.
7. Solidwaste.com: <https://www.solidwaste.com> – for News, buyer guide, product showcase, market research reports.
8. International solid waste association: <https://www.iswa.org> – for News, information, and various publications.

* The NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students.

* Students will be consulted with by the instructor and must agree to any modifications or deviations from the syllabus throughout the course of the semester.