

CEE 3341 INTRODUCTION TO SOLID & HAZARDOUS WASTE MANAGEMENT**Instructor:** Wenjie Sun, Ph.D.Office: Embrey 301Q
E-mail: wsun@lyle.smu.eduTelephone: (214) 768-1373
Fax: (214) 768-2164**Lecture:** Class room: TBD

Class time: 10 am to 12 pm and 1 pm to 3 pm

Office Hours: By appointment**Catalog Course Description**

Solid and hazardous waste are defined. Technology, health, and policy issues associated with solid waste and hazardous materials are examined. Methods of managing solid and hazardous waste are introduced and regulations presented where appropriate. The characteristics of hazardous and solid waste materials, health frameworks, and the distribution of contaminants in the environment are reviewed.

Although its engineering subject, this course is not a treatment course; it is a management course.

The course is extremely broad in scope spanning laws, regulations, treatment technologies and risk assessment. While treatment technologies are presented, and basic process design information is covered, the course is designed for breadth, not depth, in process design and hazardous waste management.

This class consists of students with a tremendous variety of backgrounds. Undergraduate students from CEE department take this class as a part of the requirement for Environmental Engineering (EnvE) major and Civil Engineering (CE) majors an Environmental Engineering emphasis. Undergraduate students from other engineering majors, and non-engineering majors in College of Humanities & Sciences (e.g. Chemistry, Environmental Science, Environmental Studies, and Biological Science), have never had any courses in EnvE, will also complement their knowledge by learning the technology, health, and policy issues associated with hazardous waste management.

Prerequisites

CEE 2304 Introduction to Environmental Engineering and Science, and CEE 2421 Aquatic Chemistry for CEE students; Or General Chemistry courses for students from other engineering and non-engineering majors.

Textbook and Other Related Material

1. LaGrega, Michael D., P.L. Buckingham, and J.C. Evans. *Hazardous Waste Management*. 2nd Edition, 2001.
2. Class note handouts, and other handout materials.

Course Learning Outcomes/Expected Performance Criteria

The objective of the course is to provide a comprehensive and historical overview of hazardous waste management, drawing from both scientific and engineering principles, and prepare our students to be well-qualified and competitive in the engineering design and consulting responsibility in the field of hazardous waste management.

- ❖ Provide comprehensive and historical overviews of hazardous wastes management from both scientific and engineering principles;
- ❖ Define and characterize solid and hazardous wastes from technical and regulatory points of view;
- ❖ Identify current statutory and regulatory cradle to grave framework related to hazardous waste management;
- ❖ Describe factors which will determine the characterization, the distribution and fate of chemical compounds in the environment;
- ❖ Understand how quantitative risk assessments are conducted for toxic substances and their adverse effects on living organisms and the environment, and the limitations of the results of these analyses;

- ❖ Introduce the environmental audits and pollution prevention programs, including the LEED Green Building Rating System, as effective waste management practices;
- ❖ Identify the most common techniques for preventing, minimizing, recycling, disposing and treatment of waste and their application on site remediation.

Course requirements are:

- Homework/Quizzes –30% of grade, covering reading assignments and quantitative problems
- Class Attendance/Participation – 10% of grade, students will sign daily attendance sheets
- Mid-term Exam – 20% of grade, in-class, closed book/closed notes
- Final Exam – 40% of grade, comprehensive in-class open book/open notes

Attendance of lectures is required for the May term. In general, absences are excused only for university sanctioned extracurricular activities, or due to illness confirmed in writing and signed by a medical professional.

Class/Laboratory Schedule

Four hour daily lecture given 10 am to 12 pm and 1 pm to 3 pm with one-hour lunch break.

Contribution to Curriculum Components

Engineering Science and Design: 3 Semester Credit Hours or 100 percent of the course content

Relationship of Course to Student Outcomes

This course includes, but is not limited to content that supports the educational objectives and outcomes of the environmental and civil engineering programs. Specific emphasis is placed on students attaining and demonstrating:

- An ability to identify, formulate, and solve engineering problems (Outcome E).
- An understanding of professional and ethical responsibility (Outcome F).
- An understanding of professional practice issues and an understanding of the roles and responsibilities of public institutions and private organizations pertaining to environmental and civil engineering (Outcome L)

Topics Covered

- I. Introduction to Solid and Hazardous Wastes ([May 14: 10 am – 12 pm](#)) (Chapter 1)
- II. Statutory and Regulatory Framework of Waste Management ([May 14 – 15](#)) (Chapter 2)
- III. Process Fundamentals ([May 18 – 19](#)) (Chapter 3, Sections 3-1 and 3-2)
 - A. Basic Chemistry of Environmental Contaminants
 - B. Physical-Chemical Properties of Environmental Contaminants
- IV. Fate and Transport of Contaminants ([May 20](#)) (Chapter 4, Sections 4-1 to 4-3)
- V. Environmental Audits ([May 21 10 am – 11 am](#)) (Chapter 6)
- VI. Pollution Prevention ([May 21 11 am – 12 pm](#)) (Chapter 7)

MIDTERM EXAM (Closed Book/Closed Notes, [5/21/15, 1 pm – 3 pm](#))

- VII. Physical and Chemical Treatment Methods ([May 22 and 26](#)) (Chapter 9, Sections 9-1 to 9-4)
 - A. Air Stripping
 - B. Activated Carbon Adsorption
 - C. Chemical Precipitation
 - D. Chemical Oxidation and Reduction

- VIII. Stabilization and Solidification ([May 27 10 am – 11 am](#)) (Chapter 11, Sections 11-1 to 11-7)
- IX. Biological Treatment Processes ([May 27](#)) (Chapter 10, Sections 10-1, 10-2, and 10-5 to 10-10)
- A. Overview of Microbiology
 - B. Biosolids Handling and Composting
 - C. Miscellaneous Biotreatment Options
- X. Thermal Treatment Processes ([May 28 10 am – 12 pm](#)) (Chapter 12, Sections 12-1 to 12-13)
- A. Incineration
 - B. Emerging Thermal Treatment Technologies
- XI. Land Disposal – Landfills ([May 28 1 pm – 3 pm](#)) (Chapter 13, Sections 13-1, 13-3, and 13-4)

FINAL EXAM (Open Book/Open Notes, [5/29/15 10 am – 12 pm review; 1 pm – 3 pm exam](#))

Prepared by: Wenjie Sun

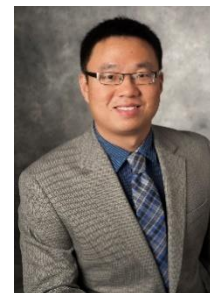
Date: February 12, 2015

Disability Accommodations: Students needing academic accommodations for a disability must first be registered with Disability Accommodations & Success Strategies (DASS) to verify the disability and to establish eligibility for accommodations. Students may call 214-768-1470 or visit <http://www.smu.edu/alec/dass.asp> to begin the process. Once registered, students should then schedule an appointment with the professor to make appropriate arrangements.

Religious Observance: Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

Excused Absences for University Extracurricular Activities: Students participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue)

Biography



Wenjie Sun, Assistant Professor, Ph. D.
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Dr. Wenjie Sun is an Assistant Professor in the Department of Civil and Environmental Engineering at Southern Methodist University. He received his Ph.D. degree on December, 2008 in Environmental Engineering with Minor in Soil, Water and Environmental Science from the University of Arizona. Dr. Sun worked as a Postdoctoral Research Associate (2009-2011) and then Research Assistant Professor (2011-2012) in the Department of Chemical & Environmental Engineering at the University of Arizona, and Research Scholar (2012-2014) in the Department of Civil, Construction, and Environmental Engineering at North Carolina State University.

Dr. Sun's interests are driven by the desire to understand the role of microbes and manage microbial processes to provide service to interdisciplinary nexus of waste (water)-environment-sustainability. Dr. Sun's researches aim to explore the interfaces between microbiological and chemical processes and their practical applications to solve environmental problems. with focuses on: 1) Environmental biotechnology for the treatment of hazardous pollutants in water, wastewater and sediment; 2) Bioremediation of soil and groundwater contaminations; 3) Integrated solid waste disposal and management with a specific emphasis on biological and chemical processes in landfills that influence the fate of municipal and industrial wastes and landfills behavior as well as improved planning on landfill gas-to-energy system; 4) Environmental application of molecular microbial biology in natural and engineered ecosystems.

Dr. Sun currently teaches both undergraduate and graduate courses: as an instructor for Introduction to Solid & Hazardous Waste Management (CEE3341) and Environmental Organic Chemistry (CEE5317/7317), and as a guest lecturer for Introduction to Environmental Engineering and Science (CEE2304), Introduction to Civil & Environmental Engineering (CEE1302), and Engineering and Beyond (Engr1101) at SMU. Dr. Sun taught other courses in the field of environmental engineering and sciences, such as Environmental Chemistry and Microbiology and Microbiology for Engineers.

Dr. Wenjie Sun is the author and co-author of more than 20 peer-reviewed journal articles. His works have been published in the top journals in the field of environmental engineering and science, such as Environmental Science & Technology, Water Research, Applied and Environmental Microbiology, Bioresources Technology, Biotechnology and Bioengineering, FEMS Microbiology Ecology, Waste Management, Chemosphere, and Biodegradation. Dr. Sun's research has been supported by government agencies (United States Geological Survey, National Institute of Environmental Health and Sciences, and National Science Foundation), private foundations (Environmental Research and Education Foundation and Semiconductor Research Corporation), and industrial funds (Waste Management Inc.).

Dr. Sun serves as an Editorial Board Member for two international journals and reviewer for more than 20 peer-reviewed journals. Dr. Sun serves as reviewer or review panelist for funding agencies (e.g. National Science Foundation, Dutch Research Council, and Romania National Research Council) and private foundation (e.g. Environmental Research and Education Foundation).