Sustainable Water and Waste Management

Spring 2018

CIVE 575

Course Instructor:

Dr. Sybil Sharvelle

Associate Professor, Dept. of Civil and Environmental Engineering

Office: Scott Bioengineering 246; Office Phone: 970-491-6081

Email: Sybil.Sharvelle@colostate.edu

Office Hours: Monday and Wednesday, 12:30 – 2:00 pm

Canvas: We will use Canvas in this course. Powerpoints will be made available prior to class. Grades and homeworks will be posted on Canvas.

Course Description: This 3 credit hour course focuses on the science, engineering, and policy behind sustainable water and waste practices. Topics include sustainable urban water management, wastewater management (including water reuse), and biomass conversion to energy technologies (focus on waste conversion to energy). The purpose of this course is for students to become familiar with and well versed in sustainable concepts and designs for water and waste management. Consideration of technical, economic, and social aspects of these concepts is emphasized.

Course Prerequisite: CIVE 322 or Instructor Approval

Course Objectives: At the conclusion of this course, students will be:

- Knowledgeable on multiple technologies and concepts for sustainable water and waste management.
- Proficient in applying models to develop sustainable water and waste management solutions.
- Able to identify environmental, social, and economic issues associated with various water and waste management concepts.
- Able to apply sustainability considerations (environmental, social and economic) to multicriterion decision analysis tools to provide recommendations on most appropriate solutions for a design or problem.

Book: Theis, Tom and Jonathan Tomkin (2012) Sustainability: A Comprehensive Foundation, available free online:
https://www.earth.illinois.edu/UserFiles/Servers/Server_4102/File/documents/sustain_comp_found.pdf

Course Outline: This course will address topics associated with water and waste (municipal, industrial, and agricultural waste). Practical homework exercises will be administered to enhance student learning in each of the content areas.

Introduction [1]

Environmental and Resource Economics [3]

Fundamentals of Biological Processes [1]

Waste Management

Advanced Concepts for Management of Municipal Waste [2]

Economics of Curbside Recycling [1]

Composting: Guest Lecture, Addy Elliot **[1]**

Application of Anaerobic Digestion to Municipal, Industrial, and Agricultural Waste [2]

Field Trip to New Belgium Anaerobic Digester [2]

Other Bioenergy Conversion Technologies [2]

Economics of Anaerobic Digestion [1]

***Midterm Exam* [1]**

Multicriterion Decision Analysis [3]

Urban Water Management

Overview of Urban Water and Wastewater Management [2]

Energy Demands for Water Supply and Wastewater Treatment and Approaches for Energy Conservation [1]

Low Energy Wastewater Treatment:

- **Constructed Wetlands [2]**
- **Anaerobic Treatment of Wastewater [1]**

Risk Based Approach for Fit for Purpose Water [1]

Reclaimed Wastewater Reuse [3]

Water Law and Western Water Policy: Guest Lecture, Chris Goemans CSU **[1]**

Graywater Reuse [2]

Stormwater Best Management Practices [3]

Stormwater Capture and Use [2]

Decentralized Management of Water and Wastewater [1]

Application of an Integrated Urban Water Model to Estimate Water and Cost Savings [3]

Overcoming Institutional Barriers to Adoption of New Concepts in Water Management: Guest Lecture, Neil Grigg **[1]**

Exam [1]

Course Evaluation:

1) **Homework assignments** (15% of your grade)

All assignments must be submitted at the start of class on the due date. Homeworks received on the due date after the start of class will receive a 25% reduction. **No assignments will be accepted after the due date.** While discussion is encouraged on assignments, your submission must reflect your own individual work.

2) **Mid-term exam** (25% of your grade)

   Note: Material covered during guest lectures will be included on the exam

3) **Final Exam** (25% of your grade)

   Note: Material covered during guest lectures and student presentations will be included on the exam

4) **Project** (35% of your grade)

Term grades for this course will use the +/- grading system as described in the CSU catalog.

Project Description: The final project will require application of multicriterion decision analysis (MCDA) to a water or waste management project. Relevant stakeholders will be identified and a recommendation will be provided on the best solution which addresses technical, social, and economic issues associated with the project.