

This course has now been changed to Civil and Environmental Engineering Capstone Design. It now focuses on design and cost estimation of projects that involve significant environmental and civil engineering challenges. The 2009 project was design and cost estimation of a waste to energy facility on a landfill. Three designs were submitted: one for production of bio diesel from frier oil, and two for production of heating methane from food waste. The 2010 project will be the design of a renewably powered system to oxygenate the water of the North Shore canal.

Enrollment of other engineering and non engineering students is encouraged; however enrollment of non engineers is limited to 25%.

The problem statement and syllabus for the 2009 project follow

2009 Capstone Design Problem Statement (version 2) - 090413

Your company (Wildcat Engineering or other suitable moniker) has been awarded the feasibility design contract for the Village of Winnetka's Waste to Energy facility under consideration for construction on the village landfill site. The facility is to be constructed on the landfill near the existing Village maintenance facility and the planned Park District maintenance building in order to provide heat for these facilities.

The proposal accepted by the Village of Winnetka and the Winnetka Park District involves some 8 tasks or work units to be brought to 30% design. This level of design includes 1) architectural renderings, 2) design drawings, 3) supported by calculations of sufficient detail to allow a preliminary estimation of 4) construction and operational costs/savings and 5) construction schedule. A preliminary break down of the work units or tasks includes design of the following critical components

- Storm water retention, drainage, piping for utilities, paving
- Access/traffic control for delivery of feed stock

- Intake, storage, processing of feed stocks and storage of fuel products

- Digestion and / or processing to produce methane gas or liquid fuel, e.g. biodiesel from various feed stocks (specified as a) brewery fermentation yeast cake b) restaurant / other food wastes and /or c) friar oil waste)

- Foundations for all facilities
- Enclosure structures and vessels for gas generation
- Cost and scheduling
- CAD for engineering and 3D architectural presentation
- Sustainable design (LEED)

Given that the optimum number of students per design team is thought to be 6 or 7, some of these design components may need to be shared.

Syllabus

CIV-ENV 382 – Capstone Design Spring 2009

C. Dowding: A122 1-4338 **D. Corr:** A335 7-0890
J. Fitzpatrick: A224, 1-4033 **N. Blair:** A228 1-8790

Description – This course provides a structured, integrated, interdisciplinary exercise in the engineering design of a constructed facility. For seniors in Civil and Environmental Engineering, it is the required capstone design experience that involves application of discipline specific concepts and tools in a team setting.

The course is designed for senior Civil & Environmental Engineers, other senior engineers, graduate students, and a limited number of seniors outside of engineering.

Approach – Students work in teams to undertake a quarter-long design activity culminating in a facility design presented publicly as a professional quality oral briefing supported by a written report. The written report will present quantitative assessments of the ability of the constructed facility to meet functional, regulatory and cost requirements.

The ABET Connection – For seniors in Civil and Environmental Engineering, this course fulfills the requirement for a capstone design experience, in which students will exercise their key design skills on a realistic design problem. It fulfills these specific ABET (Accreditation Board for Engineering and Technology) criteria:

- Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical health and safety, manufacturability, and sustainability
- Ability to function on multidisciplinary teams
- Ability to identify, formulate and solve engineering problems

Course Operations -

Design activities will be supported by a team of Civil and Environmental Engineering faculty and professional mentors selected to provide technical guidance in the broad spectrum of disciplines necessary to complete the design to a level of detail sufficient for a preliminary estimate of costs and construction schedule.

Course Schedule –The class is scheduled to meet on Tuesday and Thursdays from 12:30 until 2:00 for design workshops and consultation sessions. These meetings will serve as checkpoints to review progress and plan next steps. It is certain that teams will need to meet additional times through the week outside of scheduled classes. Instructors will be available to meet with design teams one afternoon per week to be selected by the class.

On the first Monday of Exam week, at a time to be determined, teams will present oral briefings on their designs, after which each team will submit a detailed written report that includes

drawings and associated design computations. These reports must be submitted in electronic form by 11:59 p.m. on that day. The oral reporting session will be open to a broader audience, including practicing engineers and other professionals, who will be invited to comment on the design products.

Grades will be determined by faculty and referee judgment of the overall project as well fellow student evaluation of team contribution

Detailed Daily Class Schedule. See third page

Date	Day	Topic	Responsible
31-Mar	T.1	Introduction, Design Problem, Components	Dowding
	T.2	Preferences due by Tues midnight	Students
2-Apr		Team assignments and leadership organization	
	Th.1	Methanogenesis Process Lecture 1 (video)	Blair
	Th.2	Methanogenesis Process Lecture 2 part 1	Fitzpatrick
6-Apr	Sun	Leadership descisions due by Sun midnight	Students
7-Apr	T.1	Methanogenesis Process Lecture 2 part 2 OR Winnetka Village Engineer	Fitzpatrick
	T.2	Geotechnical design considerations	Dowding
9-Apr	Th.1	Storm water / utilities	Clark/Gemmell
	Th.2	Structures I	Corr
14-Apr	T.1	Structures II	Corr
	T.2	Transport/logisitics/parking	Nei
15-Apr	WED	Graphics: special meeting at 5:30-6:30	Bielski
16-Apr	Th.1	Capital cost/scheduling considerations	Hadavi
	Th.2	TBD	
16-Apr		Individual Progress Reports Due	Students
21-Apr	T.1	TBD	Blair
	T.2	LEED Design	Corr to engage
23-Apr	Th.1	Oral Team Progress Reports Given	Students
	Th.2		
28-Apr	T.1	Faculty to provide specialized consulting services as needed	
	T.2	Classes meet regularly to allow faculty to address all groups at once	
30-Apr	Th.1	Initial Design Reports Due	Students
	Th.2		
5-May	T.1		
	T.2		
7-May	Th.1	Quantitative Design Performance Reports Due	Students
	Th.2		
12-May	T.1		
	T.2		
14-May	Th.1	Finalization of computation products	Students
	Th.2		
19-Apr	T.1		
	T.2		
21-May	Th.1	Cost and Quantities Report Due	Students
	Th.2		
26-May	T.1		
	T.2		
28-May	Th.1	Final Drawings and Calculations Due	Students
	Th.2		
2-Jun	T.1		
	T.2		
4-Jun	Th.1	Practice presentations (dry runs)	Students
	Th.2		
8-Jun	M	Final Oral Presentations to owners/referees	Students

