

The Pennsylvania State University
Department of Agricultural and Biological Engineering

Course Outline

Biological Engineering 463

Fall 2013

Course Description

B E 463 - Dairy Manure System Design - This is a capstone course in which the student will learn to apply their knowledge of the subject areas of hydraulics, open-channel flow, electricity, 3D computer-aided design, computer modeling, and project management to the design of commercial dairy manure handling and treatment systems. The following topics will be covered: Pumping systems and pipelines, manure collection and transport methods, reception pits, settling basins, liquid manure storage ponds and treatment lagoons, facility design and layout, manure processing equipment selection, and electrical control systems. At the end of this course, the successful student will complete a final project involving the design of a comprehensive dairy manure handling and treatment system for a commercial dairy farm. Prerequisite BE302, BE306, ME320, EDSGN497.

Meeting Times and Location

Lectures M W F 9:05 – 9:55am 124 Agricultural Engineering Building

Instructor

Daniel W. Hofstetter

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Phone: 865-1783

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Office hours: Tuesday and Thursday 2:30pm – 4:30pm and by appointment

Course Requirements and Grading

Percent

Exam # 1 Scrape Systems	20
Scrape System Applications (Written Report)	10
Scrape System Homework / Quiz	10
Exam # 2 Flush Systems	20
Flush Systems Homework / Quiz	10
Exam # 3 Electric Motors & Controls	20
Electrical Homework / Quiz	10
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Total	100

One homework or quiz score (whichever is lower) will be dropped.

The class will be graded on a straight percentage, using the University +/- system. A(94+), A-(90+), B+(86+), B(82+), B-(78+), C+(74+), C(70+), D(60+), F(59-).

Attendance Policy

There is a mandatory attendance policy. Each student is allowed three unexcused absences. Beyond that, your final grade will be docked by 5% for each class missed.

Text and References R/L-required, S-supplied, W-website, O-optional

- R/L Liquid Manure Application Systems Design Manual, NRAES-89
- W Baldor.com; click support, select product literature, select AC motors category, select promotional, select PR2525, Cowen Papers “Baldor Motors and Drives”
- S ARO Fluid Power Text by ARO Corporation, IR Fluid Products, Bryan, OH.
- O Engine and Tractor Power by Carroll E. Goering, ASAE, 3rd Edition, ISBN 0-929355-30-X (Text required for ASM 320, available online in the computer lab)
- O A Style Manual for Engineering Students by J. Schall, Burgess Publishing, Edina, MN. ISBN0-8087-9754-9 (copy available in student lounge and Engineering Library)

Assignments

All assignments must be legible, and multiple pages must be stapled together. You will generally have one week to complete assignments. Assignments are due by 5pm on the dates shown on the syllabus. Late assignments will be accepted up to one week past the due date, but you will lose 10% for each day late. No late assignments will be accepted after 5pm on 12/9 (the last day of classes). Project Reports will be neatly typed following a report format as outlined in Schall.

Academic Integrity

Academic integrity, as defined by University Faculty Senate Policy 49-20, is the pursuit of scholarly activity free from fraud and deception and is an educational objective of this institution. Academic dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating of information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students.



Week	Date	Topic	Readings & Assignments
1	8/22	Orientation to class, class requirements, Introduction to Pumping Systems	Course Outline
	8/24	Review: Open Channel Flow and Piping	
	8/26	Pumping Systems and Components	NRAES-89 CH 1-2
2	8/29	Pressure Piping Systems	
	8/31	Gravity Flow Pipelines	
HQ	9/01	Manure Collection and Transport Systems	NRAES-89 CH 3
3	9/05	Labor Day – No Classes	
	9/07	Mechanical Scraping Systems	
H	9/09	Horizontal Manure Augers	NRAES-89 CH 5
4	9/12	Scrape-Flume Systems	Scrape Systems Report
	9/14	Flume Pipeline Analysis / Valves	Topic Due: Paragraph and
HQ	9/16	Pressure Pipelines and Hoses	verbal report for class.
5	9/19	Scrape Systems Review & Exam Preparation	
	9/21	Scrape Systems Exam	
H	9/23	Post-Exam Review	
6	9/26	Introduction to Flush Systems	
	9/28	Scrape System Design Project (7 Reports)	Student Reports
HQ	9/30	Scrape System Design Project (3 Reports)	Student Reports
7	10/03	Scrape System Design Project (3 Reports)	Student Reports
	10/05	Scrape System Design Project (7 Reports)	Student Reports
	10/07	Scrape System Design Project (3 Reports)	Student Reports
8	H 10/10	Flush System Pumps and Valves	
	10/12	Flush System Tanks and Pipelines	
	10/14	Flush Control System Logic	

Week	Date	Topic	Readings & Assignments
9	10/17	Reception Pits and Settling Basins	NRAES-89 CH 6
	10/19	Liquid Manure Storage Ponds	
H	10/21	Liquid Manure Treatment Lagoons	NRAES-89 CH 7
10	10/24	Flush Systems Review & Exam Preparation	
	10/26	Flush Systems Exam	
HQ	10/28	Mechanical Aeration Equipment	
11	10/31	Manure Separation Methods	
	11/02	Rock Traps and Sedimentation Basins	
H	11/04	Manure Pumps and Agitators	
12	11/07	Separation Facility Layout	
	11/09	Solids Storage Facilities	
	11/11	Stacking Conveyors and Augers	
13	11/14	Composting Systems: Static Pile	
	11/16	Composting Systems: Aerated Static Pile	
HQ	11/18	Electrical Circuits Review	BALDOR CH 1-2
	11/21 - 25	Thanksgiving Vacation	Happy Thanksgiving
14	11/28	Electrical Controls: Pumps & Agitators	BALDOR CH 3-4
	11/30	Electrical Controls: Scrape Systems	
	12/01	Electrical Controls: Flush/Flume Systems	
15	12/05	Electrical Controls: Conveyors	BALDOR CH 5
	12/07	Electrical Controls: Separators	
HQ	12/09	Electrical Controls: Composting Facility	
Final Exams: December 12 - 16, 2013			TBD

This syllabus is subject to change depending on student progress and scheduling.