

BAE 332: Animal Facilities and Environmental Management

Lecture Session: M.W. F. 10:15am – 11:05am, 142 Weaver Labs

Lab Session: M. 12:25pm – 3:10pm, 142 Weaver Labs

SYLLABUS – Spring 2010

Department of Biological and Agricultural Engineering, NCSU

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Instructional Objectives:

This course is designed for undergraduate students who are majoring in agricultural and environmental technology in the department of Biological and Agricultural Engineering. Upon completion of this course, students will be equipped with fundamental working knowledge of (1) structural materials, design and construction; (2) the environmental system requirements for animals in confinement housing; (3) the properties and characteristics of animal waste and technologies available for waste handling; (4) integration of the structural, environmental and waste handling needs for animal housing.

Course Text:

Midwest Plan Service: Structure and Environment Handbook. Eleventh Edition. ISBN 0-89373-057-2

Reference Materials:

- Albright, L.D. *Environment Control for Animals and Plants*. ASAE, 1990. ISBN0929355083
- Zhang, Y. *Indoor Air Quality Engineering*. CRC press, Florida, 2005. ISBN1566706742
- Copies of relevant technical handouts (from ASABE standards, ASHRAE handbook, etc.) will be provided to update materials given in text

Course Description:

The course covers the fundamental principles of structures, environmental and waste management. Subjects to be discussed include:

- Fundamentals of structures: structural loads, design fundamentals, and material selection
- Fundamentals of environmental control: psychrometrics, heat transfer, insulation and vapor barriers, principles of temperature and moisture control, ventilation systems, and indoor air quality control
- Fundamentals of waste management: solid waste handling, manure storage facilities

General Description of Labs:

The lab sessions will be problem sessions with the student assigned more detailed and in-depth problems. The problems of each lab session will be completed and turned in at the end of the lab period. Late lab will be accepted with 20% grade reduction for submission by the end of the day, and 10% additional reduction for delay of every additional day. In addition, there will be at least one field trip scheduled for a lab period; two exams will also be held during the lab periods.

Examinations:

There will be two exams and the final. Missed exams will be a ZERO, except for University Excused Absences. In order to take a makeup exam, students have to inform the instructor about the absence BEFORE the exam unless there is an unexpected accident.

Grade Determination:

- The final grade will be determined based upon the following components:

Lab problems	Exam 1	Exam 2	Final*
25%	25%	25%	25%

* Final: May 5, 2010 at 8:00am – 11:00am

- Grading: border-line grades may be upgraded based upon attendance, class participation, and evidence of improvements.

A ⁺	98-100	B ⁺	87-89	C ⁺	77-79	D ⁺	67-69	F	<60
A	95-97	B	84-86	C	74-76	D	64-66		
A ⁻	90-94	B ⁻	80-83	C ⁻	70-73	D ⁻	60-63		

Academic Integrity:

The Code of Student Conduct at North Carolina State University sets out a code of ethics and personal dignity. Students should refer to this code and value honesty and integrity. The code could be found at www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php.

It is permissible in this course to discuss the interpretation of the problem statement, share ideas or approaches for solving the problem, and explain the concepts involved in the problem. Any other aid is not permissible and considered as a violation of the academic integrity policy. No academic misconduct will be tolerated in this course.

Attendance:

Students are expected to attend class on time. In case of absence, the student must provide documentation substantiating the reason for the absence that is satisfactory to the instructor, within one week of the last date of the absence. For illness, documentation should include a note from a doctor or clinic. For further information, students should refer to the University attendance policy at www.ncsu.edu/provost/academic_regulations/attend/reg.htm.

Students with University Excused Absences will be allowed to makeup missing exam and late homework without any penalty. However, it is the student's responsibility to identify the materials covered during the absence and to contact instructor for scheduling makeup exam.

Incomplete Grades:

The university policy form incomplete grades can be found at <http://www.fis.ncsu.edu/ncsulegal/41.03-codeof.htm>. An IN is not an alternative to an "F"

Students with Disabilities:

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653.

http://www.ncsu.edu/provost/offices/affirm_action/dss/

Tentative Lecture Schedule & Topics* :

Week	Lecture	Date	Topics
1		01-11-2010	Overview of the course
	1	01-11-2010	Lab session: structure loads – snow load
	2	01-13-2010	Wind load
2	3	01-15-2010	Live load and bin design
		01-18-2010	University holiday
	4	01-20-2010	Dead load
3	5	01-22-2010	Structural design fundamentals
	6	01-25-2020	Beam design
		01-25-2010	Lab session: problem solving practice
4	7	01-27-2010	Beam design – continued
	8	01-29-2010	Beam span tables
	9	02-01-2010	Column design
5		02-01-2010	Lab session: problem solving practice
	10	02-03-2010	Column design – continued
	11	02-05-2010	Tributary area and liner foot load
6	12	02-08-2010	Foundation and footing design
		02-08-2010	Lab session: problem solving practice; review for exam 1
	13	02-10-2010	Environmental fundamentals
7	14	02-12-2010	Psychrometrics
	16	02-15-2010	Psychrometrics
		02-15-2010	Lab session: Exam 1
8	17	02-17-2010	Psychrometric processes
	18	02-19-2010	Psychrometric processes
	19	02-22-2010	Heat transfer
9		02-22-2010	Lab session: problem solving practice
	20	02-24-2010	Heat transfer
	21	02-26-2010	Heat losses through building surfaces
10	22	03-01-2010	Energy and mass balances
		03-01-2010	Lab session: problem solving practice
	23	03-03-2010	Energy and mass balances
11	24	03-05-2010	Ventilation basics
	25	03-08-2010	Environments requirements for animals
		03-08-2010	Lab session: problem solving practice
12	26	03-10-2010	Animal heat and moisture production
	27	03-12-2010	Insulation and vapor barriers
		03-15-2010	Spring break
13		03-17-2010	Spring break
		03-19-2010	Spring break
	28	03-22-2010	Ventilation system design
14		03-22-2010	Lab session: problem solving practice
	29	03-24-2010	Ventilation system design
	30	03-26-2010	Ventilation system design
15	31	03-29-2010	Controller and sensors
		03-29-2010	Lab session: problem solving practice
		03-31-2010	Review for exam 2
		04-02-2010	Spring holiday

13	32	04-05-2010	Case studies – poultry and swine productions
		04-05-2010	Lab session: Exam 2
	33	04-07-2010	Environmental control for indoor air quality (IAQ) in animal environments: pollutants of concerns – source and impacts
	34	04-09-2010	Measurements pollutants
14	35	04-12-2010	Measurements of pollutants
		04-12-2010	Lab session: problem solving practice
	36	04-14-2010	Technologies for control and mitigation of IAQ in animal housing
	37	04-16-2010	Technologies for control and mitigation of IAQ in animal housing
15	38	04-19-2010	Effectiveness of ventilation system for IAQ control
		04-19-2010	Lab sessions: field trip – visit of a commercial egg production farm
	39	04-21-2010	Fundamentals of waste management
	40	04-23-2010	Animal waste production
16	41	04-26-2010	Whole farm nutrient balance
Dead	42	04-26-2010	Lab session: sizing manure storage facilities
week	43	04-28-2010	Lagoons for animal waste management
		04-30-2010	Review for the final
05-05-2010 at 8:00 – 11:00am		Final Exam	

* Since the plan is tentative, changes may occur from time to time.

* The lectures cover the following four topic areas:

1. Fundamentals of structure: lecture 1– 12
2. Fundamentals of environmental control: lecture 13 – 32
3. Fundamentals of indoor air quality in animal housing: lecture 33 – 38
4. Fundamentals of waste management: lecture 39 – 43