

# ABEN 452/652 – Bioenvironmental Systems Design – Fall 2024

## **BASIC INFORMATION**

### **Class information:**

3 Credits

Fall 2024

Classroom: Ladd RM 209

Time: 10:00AM - 10:50AM; MWF

### **Instructor information:**

Dr. Iris Feng

Office: Ladd 101F

Phone: 701-231-8351

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**Textbook:** Not required.

### **Recommended materials:**

- Agricultural Buildings and Structures—by Lindley, James A., and James H. Whitaker
- Environment Control for Animals and Plants—by Louis D. Albright
- Midwest Plan Service (MWPS) Standards:
- Structures and Environment Handbook, Mechanical and Natural Ventilation Packages (MWPS 32 & 33), Manure Storages (MWPS 18-S2), Outdoor Air Quality (Livestock Manure) Manure Management System Series (MWPS 18-S3), etc.
- Others as found appropriate.

**Prerequisites:** ABEN 263 or CE309 or ME 350

**Office hours:** 1:00 – 2:00 pm MW and 2:00 – 3:00 pm F; or by appointment or drop in.

**Web pages:** Blackboard

## **COURSE DESCRIPTION**

ABEN 452/652 Bioenvironmental Systems Design covers fundamental principles of environmental control in agriculture and general design criteria of typical agricultural facilities. The students will learn how to control and maintain ideal bioenvironmental parameters such as temperature, moisture, ventilation rates, and lighting in agricultural building constructions under different conditions.

## **ABEN EDUCATIONAL OBJECTIVES AND ABET STUDENT OUTCOMES**

The Accreditation Board for Engineering and Technology (ABET) requires that accredited engineering programs publish their program educational objectives (PEOs) and student outcomes (SOs). A goal of this course is to meet ABET requirements. The ABET criteria developed for this course are listed below:

ABEN program educational objectives and supporting student outcomes.

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Graduates are expected to have established themselves as practicing engineers who, within a few years of graduation:

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- A Successfully address emerging engineering challenges in the design or evaluation of machine, processing, environmental, and natural resources systems that affect the production of food, feed, fuel, and other biobased products.

Technical learning outcomes include student outcomes (1), (2), and (6):

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

- B Effectively use professional communication, critical thinking, and interpersonal skills as team leaders and members.

Communicational learning outcomes include student outcomes (3) and (5):

3. an ability to communicate effectively with a range of audiences  
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

- C Responsibly serve the public and their employers by participating in and promoting professional development, while maintaining the highest standard of professional engineering ethics.

Contextual learning outcomes include student outcomes (4) and (7):

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies
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See <https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2024-2025/#GC3> for information on ABET student outcomes 1-7, effective as part of the "Criteria for Accrediting Engineering Programs, 2024 – 2025."

## **COURSE OBJECTIVES**

After completing this course, students should:

1. Have a basic understanding of heat and mass transfer and psychometrics. (ABET-1)
2. Be familiar with typical bioenvironmental systems in agriculture. (ABET-1)
3. Understand properties and characteristics of insulating materials, cooling and heating systems, ventilation systems, feeding operations, etc. (ABET-1)
4. Be able to calculate and determine required control parameters to meet the animal and plant needs. (ABET-2)
5. Understand the design criteria of livestock buildings, greenhouses, waste treatment, farmstead, and product storage. (ABET-2&4)
6. In addition to all of the above, students will be required to write a term paper and do a presentation in the classroom. (ABET-2&3)

## **EVALUATION PROCEDURES AND GRADING CRITERIA**

**Assignment Policy:** Due dates for the homework and the term paper will be given with the assignments. Late assignments will be accepted with a 10% penalty per NDSU class day. Assignments must be submitted via paper copies, via e-mail, and/or via Blackboard before the announced due dates to be credited to the day it is received. If any homework, quizzes, tests, etc. are submitted electronically and require printing by the instructor, please note that points will be deducted if the instructor cannot open your file and print your work "as is," i.e., no adjustments for print areas, scaling, etc. Late assignments will not be accepted after solutions are posted/handed out/discussed or after 3 NDSU class days from the date they are due.

**Exam Policy:** Missed quizzes and exams will receive zero points unless missed for a valid justification and the instructor is notified prior to the date and time of the quiz or exam. Valid justification is a statement indicating illness, obituary notice (death in family or loved one), or co-curricular activities. For such justified reasons, a make-up exam may be given at a mutually acceptable time or the weight of the missed mid-term exam will be shifted to the final exam. Extracurricular activities, weddings, vacations, hunting and fishing trips, work, dentist's appointments, and undocumented car-related incidents are examples of unjustifiable reasons for missing the scheduled dates and times for exams. The instructor reserves the right to determine whether the excuse is legitimate or not.

**Grading Policy:** All students (undergraduate and graduate) will have to complete the following four categories of work in this course: homework assignments, quizzes, midterm exams, and one comprehensive final exam. Students will be required to complete a term project that includes both a final report and a presentation on the design of a bioenvironmental system. The total of the possible points which can be earned for a student is 1200 (100%). The grading procedure planned for the course is as follows:

Grade components for ABEN 452/652		
Category	Undergraduate	Graduate
Homework	450	450
Field trip	100	80
Quizzes	150	120
Midterm 1	100	100
Midterm 2	100	100
Project	100	150
Final exam	200	200
Total	1200	1200

Each student's final letter grade in the course will be determined by the percentage of the total earned points over the total possible points using the following grading scale (no curve applied):

$90\% \leq A \leq 100\%$
$80\% \leq B < 90\%$
$70\% \leq C < 80\%$
$60\% \leq D < 70\%$
$0\% \leq F < 60\%$

### **TENTATIVE COURSE SCHEDULE / OUTLINE / CALENDAR OF EVENTS**

2024 Fall, ABEN 452/652 8/26/2024-12/20/2024

26-Aug	Mon	
28-Aug	Wed	First day of class-Introduction to ABEN 452/652 and syllabus
30-Aug	Fri	Heat and mass transfer
2-Sep	Mon	HOLIDAY — Labor Day (no classes, offices closed)
4-Sep	Wed	Heat and mass transfer
6-Sep	Fri	Heat and mass transfer
9-Sep	Mon	Heat and mass transfer
11-Sep	Wed	Psychrometrics
13-Sep	Fri	Psychrometrics
16-Sep	Mon	Psychrometrics
18-Sep	Wed	Psychrometrics
20-Sep	Fri	Psychrometrics
23-Sep	Mon	Structures
25-Sep	Wed	Structures
27-Sep	Fri	Structures
30-Sep	Mon	Structures

2-Oct	Wed	Ventilation systems
4-Oct	Fri	Ventilation systems
7-Oct	Mon	Ventilation systems
9-Oct	Wed	Ventilation systems
11-Oct	Fri	Ventilation systems
14-Oct	Mon	<i>Field trip: Livestock buildings--swine</i>
16-Oct	Wed	<b>Midterm 1</b>
18-Oct	Fri	Ventilation systems
21-Oct	Mon	<i>Field trip: Livestock buildings--cattle</i>
23-Oct	Wed	Ventilation systems
25-Oct	Fri	Ventilation systems
28-Oct	Mon	Greenhouses
30-Oct	Wed	Greenhouses
1-Nov	Fri	Greenhouses
4-Nov	Mon	<i>Field trip: Grain bin storage</i>
6-Nov	Wed	Greenhouses
8-Nov	Fri	Greenhouses
11-Nov	Mon	HOLIDAY — Veterans Day (no classes, offices closed)
13-Nov	Wed	Greenhouses
15-Nov	Fri	<i>Field trip: Greenhouses</i>
18-Nov	Mon	Storage
20-Nov	Wed	<b>Midterm 2</b>
22-Nov	Fri	Storage
25-Nov	Mon	Storage
27-Nov	Wed	HOLIDAY — Thanksgiving (no classes; offices closed Thursday, offices open Wednesday& Friday)
29-Nov	Fri	
2-Dec	Mon	Storage
4-Dec	Wed	Storage
6-Dec	Fri	Storage
9-Dec	Mon	Storage
11-Dec	Wed	Final project and exam review
13-Dec	Fri	Dead Week Project presentation
16-Dec	Mon	<b>Final Examinations</b>
18-Dec	Wed	
20-Dec	Fri	

## **ATTENDANCE**

According to [NDSU Policy 333 \(www.ndsu.edu/fileadmin/policy/333.pdf\)](http://www.ndsu.edu/fileadmin/policy/333.pdf), attendance in classes is expected. Attendance is not required for this class but you are responsible for all materials, discussion, and other items presented in class as well as all scheduling changes discussed in class. If you miss class, the instructor will provide handouts upon your return if asked; you are responsible for obtaining notes from a classmate.

If you are unable to attend class due to illness (such as feeling unwell or experiencing COVID-19 symptoms), you are still responsible for completing all assignments, exams, readings, and other work required to meet the class learning objectives. The instructor will work with you to make up any missed material. Please inform the instructor as soon as possible, and ideally in advance, if you will be missing a class session due to illness.

## **ACADEMIC HONESTY**

The academic community is operated on the basis of honesty, integrity, and fair play. [NDSU Policy 335: Code of Academic Responsibility and Conduct](#) applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the [Office of Registration and Records](#). Informational resources about academic honesty for students and instructional staff members can be found at [www.ndsu.edu/academichonesty](http://www.ndsu.edu/academichonesty).

In this class, you may consult with a classmate on procedures for homework designated as requiring individual work, but the final product must be your original work. Homework, reports, or projects which involves team effort, will be designated as such and the following policies apply. The team will typically submit one set of papers for grading. Sharing of the workload, calculations, reporting, etc. is acceptable and expected. It is expected that all participants will have access to copies of the material and that all participants will contribute toward completion of the final product. Sharing of material between teams is not acceptable; the policy above for individual work also applies to interactions between teams.

Quizzes, tests, and the final exam will require individual work with no help from anyone in any form or by any means.

## **STUDENTS WITH SPECIAL REQUIREMENTS**

Any students with disabilities who need accommodations in this course are invited to share these concerns or requests with the instructor and contact the Center for Accessibility and Disability Resources as soon as possible (<http://www.ndsu.edu/disabilityservices/>). The instructor may ask for verification and that, plus other assistance, can be requested from Disability Services in the Lower Level of the NDSU Library (231-8463).

## **VETERANS AND MILITARY PERSONNEL**

Veterans or military personnel with special circumstances or who are activated are encouraged to notify the instructor as early as possible and are encouraged to provide Activation Orders.

## **FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)**

Your personally identifiable information and educational records as they relate to this course are subject to FERPA.

## **HEALTH AND SAFETY EXPECTATIONS**

If you are experiencing COVID-19 symptoms or tested positive, I ask that you wear a mask to help protect my health and the health of your peers.

### **IMPORTANT DATES**

Aug 26	Mon	Classes begin at 4:00 p.m.
Aug 27	Tue	First full day of classes
Sep 2	Mon	HOLIDAY — Labor Day (no classes, offices closed)
Sep 2	Mon	Last day to be added to Campus Connection Wait Lists
Sep 4	Wed	Last day to Add classes via Campus Connection* Permit needed after this date.
Sep 4	Wed	Last day for no-record Drop of classes @ 100% refund*(full semester classes only)
Sep 4	Wed	Last day to Withdraw to Zero Credits @ 100% refund*(full semester classes only)
Sep 10	Tue	Financial aid applied to NDSU account balances
Sep 11	Wed	Payments due for NDSU account balances
Oct 4	Fri	Last day to Withdraw to Zero Credits @ 75% refund*(full semester classes only).
Oct 15	Tue	Late fees applied to unpaid account balances (11:59 p.m.)
Oct 21	Mon	2nd half (8-week session) of Fall semester begins
Nov 3	Sun	Last day to Withdraw to Zero Credits @ 50% refund*(full semester classes only). No refunds issued for withdraw to zero credits after this date.
Nov 11	Mon	HOLIDAY — Veterans Day Observed (no classes, offices closed)
Nov 15	Fri	Last day to Drop classes with 'W' record
Nov 15	Fri	Last day to Withdraw to Zero Credits for Fall
Nov 15	Fri	Late fees applied to unpaid account balances (11:59 p.m.)
Nov 27-29	Wed-Fri	HOLIDAY — Thanksgiving (no classes; offices closed Thurs only)
Dec 9-13	Mon-Fri	Dead Week
Dec 13	Fri	Last day of Fall classes
Dec 16-20	Mon-Fri	Final Examinations
Dec 20	Fri	Commencement ceremony