

## INTRODUCTION TO AGRICULTURAL & BIOSYSTEMS ENGINEERING (ABEN 110) COURSE SYLLABUS

### BASIC INFORMATION

**Number of credits:** 3 credits

**Time and places:** Lectures MW 10:00-10:50 a.m. @ Ladd 114

Labs W 2:00-3:50 p.m. @ Ladd 114

**Office hours:** Monday and Thursday 1:00-2:00 p.m. or by appointment.

**Instructor's name:** Dr. Zhulu Lin

**Office location:** Ladd 104C

**Contact information:** zhulu.lin@ndsu.edu/231-7118

### BULLETIN DESCRIPTION

Introduction to agricultural and biosystems engineering (ABEN) for students interested in pursuing the major and profession. Content emphasizes ABEN sub-disciplines through engineering problem solving and introductory design. 2 lectures, 1 laboratory. Prerequisites MATH 103 or MATH 107.

### ABEN EDUCATIONAL OBJECTIVES AND ABET STUDENT OUTCOMES

**Educational Objective 1:** Within a few years of graduation, graduates are expected to have established themselves as practicing engineers who successfully address emerging engineering challenges in the design or evaluation of machine systems, processing systems, and natural resources and environmental systems affecting the production of food, feed, and other biobased products.

This objective addresses the following student outcomes through this course:

ABET-(1): an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

**Educational Objective 2:** Within a few years of graduation, graduates are expected to have established themselves as practicing engineers who effectively use professional communication, critical thinking, and interpersonal skills as team leaders and team members. This objective addresses the following student outcomes through this course:

ABET-(3): an ability to communicate effectively with a range of audiences, and

ABET-(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.

**Educational Objective 3:** Within a few years of graduation, graduates are expected to have established themselves as practicing engineers who responsibly serve the public and their employers by participating in professional development and by maintaining the highest standard of professional engineering ethics. This objective addresses the following student outcomes through this course:

ABET-(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.

### COURSE OBJECTIVES

After completing this course, students should be able to

1. Solve basic and practical problems related to Agricultural and Biosystems Engineering [ABET-(1)].
2. Demonstrate a basic understanding of the engineering design process, team work and professional communication [ABET-(3) & (5)].
3. Explain the basic sub-disciplines of Agricultural and Biosystems Engineering [ABET-(4)].

**STUDENT LEARNING RESOURCES**

**Textbook (optional):**

- Field, H.L. & J.M. Long (2018). Introduction to Agricultural Engineering Technology: A Problem Solving Approach (4th Edition), Springer.
- Holden, N. M., Wolfe, M. L., Ogejo, J. A., & Cummins, E. J. (Eds.). (2020). Introduction to Biosystems Engineering, ASABE and Virginia Tech Publishing.  
doi:10.21061/IntroBiosystemsEngineering, CC BY 4.0,  
<https://creativecommons.org/licenses/by/4.0>

**Other Resources:**

- A calculator, a SD card (<16GB) or USB drive, and a smartphone or a laptop computer are required. Computers (Ladd 208) and 3D printers (Ladd 200) are available to complete homework and lab assignments.

**TENTATIVE COURSE SCHEDULE<sup>1</sup>**

| Wk | Day | Date | Topics  | Sub-Discipline <sup>2</sup> | Notes/<br>Faculty Intro         |
|----|-----|------|---|-----------------------------|---------------------------------|
| 1  | W   | 8/23 | Class introduction & Kahoot! survey   |                             |                                 |
|    | W   | 8/23 | <i>Machine shop, computer lab &amp; 3D printer orientation</i>  |                             | <i>Julie, Taylor &amp; Jana</i> |
| 2  | M   | 8/28 | ABEN, ASABE & ABET  | General                     | Club Officers                   |
|    | W   | 8/30 | Basic numerical skills  |                             |                                 |
|    | W   | 8/30 | <i>Lab 1 – 3D printing (Ladd 201 &amp; 200)</i>   |                             |                                 |
| 3  | M   | 9/4  | Labor Day (no class)  |                             |                                 |
|    | W   | 9/6  | Basic numerical skills  | General                     |                                 |
|    | W   | 9/6  | <i>ABEN 496 internship presentations</i>  |                             |                                 |
| 4  | M   | 9/11 | Basic numerical skills  | General                     |                                 |
|    | W   | 9/13 | Basic numerical skills  | General                     |                                 |
|    | W   | 9/13 | <i>Lab 2 – Big Iron Farm Show at RRV Fairgrounds</i>  |                             |                                 |
| 5  | M   | 9/18 | Engineering design  | General                     |                                 |
|    | W   | 9/20 | Engineering design  | General                     |                                 |
|    | W   | 9/20 | <i>Lab 3 – Engineering &amp; Tech Expo at Fargodome</i>   |                             |                                 |
| 6  | M   | 9/25 | Simple machines   | General                     |                                 |
|    | W   | 9/27 | Teambuilding and teamwork (Mr. Brian Gregor)  | General                     | Guest Lecture                   |
|    | W   | 9/27 | <i>1. Product Development Process (Mr. Nathan Carlson – CNH Industrial)<br/>2. Student sharing of lab experiences</i> |                             | <i>Guest Lecture</i>            |

| 3. HW1 review |   |       |   |      |   |
|---------------|---|-------|---|------|---|
| 7             | M | 10/2  | Simple machines   | MS   |   |
|               | W | 10/4  | Engines   | MS   |   |
|               | W | 10/4  | Simple machine design project poster presentation   |      | Catapult, poster, receipt & peer evaluations due              |
| 8             | M | 10/9  | Engines   | MS   |   |
|               | W | 10/11 | Powertrains   | MS   |   |
|               | W | 10/11 | Exam 1  |      | Exam  |
| 9             | M | 10/16 | Powertrains   | MS   |   |
|               | W | 10/18 | Powertrains   | MS   |   |
|               | W | 10/18 | Field - Drone flying experience (weather permitting or individual group meetings for powertrain design) |      |   |
| 10            | M | 10/23 | Powertrains   | MS   |   |
|               | W | 10/25 | Rain, runoff & erosion  | NRES |   |
|               | W | 10/25 | Lab 4 – Soil & water lab  |      |   |
| 11            | M | 10/30 | Rain, runoff & erosion  | NRES |   |
|               | W | 11/1  | Rain, runoff & erosion  | NRES |   |
|               | W | 11/1  | Powertrain design project individual group meeting  |      |   |
| 12            | M | 11/6  | Rain, runoff & erosion  | NRES |   |
|               | W | 11/8  | Rain, runoff & erosion  | NRES |   |
|               | W | 11/8  | Exam 2  |      | Exam  |
| 13            | M | 11/13 | Moisture content  | PS   | Dr. Bon   |
|               | W | 11/15 | Moisture content  | PS   | Dr. Eshkabilov  |
|               | W | 11/15 | Powertrain design project oral presentation   |      | Cart, poster, receipt, notebook, peer evaluation & report due |
| 14            | M | 11/20 | Moisture content  | PS   | Dr. Steele  |
|               | W | 11/22 | Thanksgiving Holiday (no class)   |      |   |
|               | W | 11/22 | Thanksgiving Holiday (no lab)   |      |   |
| 15            | M | 11/27 | Moisture content  | PS   | Dr. Jia   |
|               | W | 11/29 | Waste management  | PS   | Dr. Feng  |
|               | W | 11/29 | Lab 5 – Part 1: Moisture content measurement (Pilot Plant, Dr. Monono)                                  |      | Dr. Monono  |
| 16            | M | 12/4  | Waste management  | PS   | Dr. Clementson  |
|               | W | 12/6  | Processing system review  | PS   |   |
|               | W | 12/6  | Lab 5 – Part 2: Moisture content & processing (Pilot Plant, Dr. Monono)                                 |      |   |
| 17            | T | 12/12 | Exam 3 (8:00 - 10:00 a.m.)  |      | Exam  |

1 Except for examination dates, the above course schedule is subject to change.

2 MS – Machine Systems, NRES – Natural Resources and Environment Systems, and PS – Processing Systems.

### **ATTENDANCE POLICY**

In accordance with NDSU Policy 333 (<http://www.ndsu.edu/fileadmin/policy/333.pdf>), class participation is expected at all regularly scheduled class and lab times as they are critical to every student's success in this course. Students are expected to attend every class and remain in class for the duration of the session. Although students are expected to participate in the course in person, when needed occasionally students may request the instructor to record the lecture and review it at a different time. If you are unable to attend class at the regularly scheduled time due to health issues, contact the instructor prior to the class meeting time for alternate arrangements, including recordings of class sessions and accommodations needed for assignments.

### **EVALUATION PROCEDURES AND GRADING CRITERIA**

**Assignment Policy:** The due dates for homework, lab reports and projects will be given with the assignments. Late assignments will be accepted with a 10% penalty per NDSU class day. All assignments must be submitted before 5 p.m. to be credited to the day it is received. Late assignments will not be accepted after solutions are posted/handed out/discussed or after 2 NDSU class days from the date they are due.

You are encouraged to work together with others for your homework and lab assignments because that will help you learn. Mentors are also available through our department's mentoring program and NDSU ACE tutoring (<https://www.ndsu.edu/ace/tutoring/>). You are also encouraged to contact the instructor for assistance during office hours or by appointment. Although students are encouraged to work together and assist one another with assignments, all work submitted should be created by that individual. If it is apparent that work has simply been copied from other's work, all students involved will receive zero point for that assignment.

To do well on your homework, you should read the attached ABEN Homework Guidelines carefully. This document explains what is expected and how your homework assignments will be graded by the instructor.

**Exam Policy:** Quizzes will be given regularly throughout the semester and no make-up quizzes will be given for any reason. As for scheduled midterm and final exams, missed exams will receive zero point unless missed for a valid justification *and* the instructor is notified prior to the date and time of the 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. The grades for group design projects may be adjusted individually based on group feedback.

**Grading Policy:** The course work consists of the following five categories: 1) homework assignments, 2) labs, 3) Blackboard quizzes, 4) group design projects, and 5) exams. The group design projects are a team work and each team may consist of 3-4 members. The requirements for the term design project include a notebook with well-documented lab notes, in-class poster presentation, and a written report for the second design project. The possible points can be earned for all work categories are listed in the table below. Each student's final letter grade will be

determined by the percentage of the total earned points over the total possible points using the following grading scale:  $A \geq 90\%$ ,  $80\% \leq B < 90\%$ ,  $70\% \leq C < 80\%$ ,  $60\% \leq D < 70\%$ ,  $F < 60\%$ .

| Work category               | Possible Points |
|-----------------------------|-----------------|
| 1. Homework assignments (6) | 120             |
| 2. Labs (5)                 | 60              |
| 3. Quizzes (12)             | 120             |
| 4. Design projects (2)      | 150             |
| 5. Exams (3)                | 350             |
| Total                       | 800             |

### **ACADEMIC HONESTY STATEMENT**

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).

### **AMERICAN DISABILITIES ACT FOR STUDENTS WITH SPECIAL NEEDS STATEMENT**

Any students with disabilities or other special needs, who need special accommodations in this course are invited to share these concerns or requests with the instructor and contact the Disability Services Office as soon as possible. Assistance is also available from Disability Services in 212 Ceres Hall (231-8463). <http://www.ndsu.edu/disabilityservices/>

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

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

### **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.

### **ADDITIONAL RESOURCES FOR STUDENTS**

As a member of the NDSU community, resources are available for you should you need help in dealing with adverse reactions to things happening in the world today. A variety of resources are listed below. For students on campus and remotely (telehealth):

- Counseling Services: 701-231-7671; <https://www.ndsu.edu/counseling/>
- Disability Services: 701-231-8463; <https://www.ndsu.edu/disabilityservices/>
- Student Health Service: 701-231-7331; <https://www.ndsu.edu/studenthealthservice/>
- Dean of Students Office: 701-231-7701; <https://www.ndsu.edu/deanofstudents/>

In a crisis or emergency situation:

- Call University Police: 701-231-8998

- Call 9-1-1
- Go to a Hospital Emergency Room
- Go to Prairie St. Johns for a Needs Assessment: 701-476-7216 (510 4th St. S.)
- Call the FirstLink Help Line: 1-800-273- TALK (8255) or 2-1-1
- Call Rape and Abuse Crisis Center: 701-293-7273

**IMPORTANT DATES**

<https://www.ndsu.edu/onestop/academic-calendar>

|           |  |
|-----------|--|
| Aug 28    | Last day to be added to Campus Connection Wait Lists   |
| Aug 30    | Last day to Add classes via Campus Connection* Permit needed after this date.  |
| Aug 30    | Last day for no-record Drop of classes @ 100% refund*(full semester classes only)  |
| Aug 30    | Last day to Withdraw to Zero Credits @ 100% refund*(full semester classes only)  |
| Sep 4     | HOLIDAY — Labor Day (no classes, offices closed)   |
| Sep 5     | Financial aid applied to NDSU account balances   |
| Sep 6     | Payments due for NDSU account balances   |
| Sep 11    | Last day to submit requests to Audit, Pass/Fail  |
| Sep 29    | Last day to Withdraw to Zero Credits @ 75% refund*(full semester classes only).  |
| Oct 13    | Grades of 'Incomplete' convert to 'F'  |
| Oct 15    | Late fees applied to unpaid account balances (11:59 p.m.)  |
| Oct 26    | Spring/Summer registration begins online based on total credits completed  |
| Oct 29    | Last day to Withdraw to Zero Credits @ 50% refund*(full semester classes only).<br>No refunds issued for withdraw to zero credits after this date. |
| Nov 9     | Last day to Drop classes with 'W' record   |
| Nov 9     | Last day to Withdraw to Zero Credits for Fall  |
| Nov 10    | HOLIDAY — Veterans Day Observed (no classes, offices closed)   |
| Nov 17    | Fall Commencement Participation deadline   |
| Nov 22-24 | HOLIDAY — Thanksgiving (no classes; offices closed Thursday, offices open Wednesday & Friday)  |
| Dec 4-8   | Dead Week  |
| Dec 11-15 | Final Examinations   |
| Dec 15    | Commencement ceremony  |

**SYLLABI ON WEB PAGES**

The course syllabus is also available at Blackboard.

**APPENDIX**

QR code used in the first lab.

