

ABEN 487 – Design Project II
Spring Semester 2025
2 credits

Instructor and contact information:

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Office hours: T/W/F 2:00 PM – 5:00 PM and by appointment via email.

Class Meeting Days and Times: Tue & Thurs, 11:00 a.m. - 12:15 p.m.

Location: Ladd Hall – Room 114

Description:

Capstone learning experience involving principles of design, project management, and concept design evaluation. Student teams define and execute a capstone project. 2 lecture/laboratory.

Pre-req: ABEN 486

Course Objectives:

1. To design a system, component, or process to meet desired needs in machine systems, processing systems, and natural resources and environmental systems problem incorporating the necessary engineering, biological, and/or biosystems information. (ABET 1 and 2) – see Table 1.
2. To use techniques, skills, and modern engineering tools necessary for engineering project to accomplish objective 1. (ABET 6 & 7) – see Table 1.
3. To develop written, oral, and graphical methods necessary to communicate the work done in a manner appropriate to the audience. (ABET 3) – see Table 1.
4. To consider engineering standards, multiple realistic constraints, environmental, safety factors (as applicable) in the design. (ABET 4) – see Table 1.
5. To work in a team setting to accomplish the capstone design project. (ABET 5) – see Table 1.

Table 1. ABEN program educational objectives and supporting student outcomes⁽¹⁾.

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. |
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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

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- 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

⁽ⁱ⁾ See https://www.ndsu.edu/aben/about/abet_accredited/ for the current ABEN program educational objectives. 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."

Required Student Resources:

No textbook is required for this course. Students are expected to utilize information and resources from previous coursework and to seek other necessary sources of information and other resources pertinent to their particular capstone project.

Purpose:

ABEN 486 and ABEN 487 are the capstone design sequence for students majoring in Agricultural and Biosystems Engineering (ABEN). During this course, student teams work on actual problems that have been proposed by industrial, university or individual cooperators.

Aspects of this course include innovation, analysis, synthesis, and communication. Each concept is important to successful design engineering. The goal of this sequence of courses is to develop a solution to a problem to the point of an experimental prototype or final specification drawings and documents as the requirements of the project dictate.

Communication is important in this class. An engineer must sell his/her ideas to others. They must provide suitable information to allow proper completion of the project.

Communication involves verbal, written, drawn, and numerical calculations to present and describe a project. Teams will be expected to maintain regular contact with their cooperators, faculty consultants, and the instructor, preferably on at least a weekly basis.

ABEN 486 goal is to present the cooperator and department with a project plan, design alternatives explored and the proposed design direction documentation.

ABEN 487 focuses on concept development which may include modeling, validating the design, prototyping as appropriate and/or a second iteration as needed. The semester will include more presentations of the design including presentation at the Ag Tech Expo, the Engineering Capstone Expo and developing the final report.

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.” Students who have an absence should notify the instructor in advance of the absence, if possible, to make arrangements for the make-up work. If it is not possible to provide advance notice, the student should inform the instructor as soon as possible after the absence to arrange for missed work.

Assignments:

Course deliverables consist of a series of individual and team assignments. For team assignments you are expected to work as a team and will be graded with one grade per team.

Late assignments docked one grade level per working day late.

- For Example:
 - An assignment graded Good, Satisfactory, Needs Improvement, Non-Existent drops from Good to Satisfactory, at best, if assignment is one day late.
 - Assignments graded on a percentage basis are docked 10% for each day late.
- Working days are Monday, Tuesday, Wednesday, Thursday and Friday, except when defined as a holiday by the NDSU Academic calendar or campus closed due to weather.

NOTE: Time received is based on the electronic date recorded per email or Blackboard. If the assignment is due Tuesday and the electronic date Tuesday 11:59:59 PM, it is still on-time. If the electronic date is 12:00:00 AM Wednesday, the assignment is one day late.

Individual Assignments: 22%

Class Participation (Attendance and Active Engagement): 7%

Team Work - Evaluation of Peers: 5%

(Graded: Good - 95%, Satisfactory - 75%, Needs Improvement - 65%, Non-Existent - 0%)

Team Work - Instructor Evaluation: 10 %

(Graded: Good - 95%, Satisfactory - 75%, Needs Improvement - 65%, Non-Existent - 0%)

Team Assignments: 78%

Stand-Up Presentations and Activity Log: 5%

(Graded: Good - 95%, Satisfactory - 75%, Needs Improvement - 65%, Non-Existent - 0%)

Ag Tech Expo: 5%

Draft Submitted for Feedback (Graded: 0 or 2%): 1%

Physical Presentation Material: 2%

Team Presentation: 2%

Capstone Expo: 13%

Draft Submitted for Feedback (Graded: 0 or 2%): 3%

Physical Presentation Material: 5%

Team Presentation: 5%

Prototype: 15%

Physical Prototype: 10%

Validation of Design: 5%

Semester Report: 40%

Draft Submitted for Feedback (Graded: 0 or 2%): 2.5%

Center for Writers Leveraged (Graded: 0 or 2%): 2.5%

Written Report: 35%

Total: 100%

No grading curve will be applied.

>= 90% is an A

>= 80% and < 90% is a B

>= 70% and < 80% is a C

>= 60% and < 70% is a D

< 60% is an F

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.

Students with special requirements: 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 as soon as possible. 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). <http://www.ndsu.edu/disabilityservices/>.

Veterans and Military Personnel:

Veterans and student service members with special circumstances or who are active are encouraged to Notify the instructor as soon as possible and are encouraged to provide Activation Orders.

Students with Special Needs and/or Circumstances:

Any students with disabilities who need accommodations in this course are encouraged to speak with the instructor as soon as possible to make appropriate arrangements for these accommodations. All students are welcome to record lectures.

COE Honor Pledge:

All students are required to have a signed copy of the Engineering Honor Pledge on file with their major department. <http://www.ndsu.edu/cea/ug-honor-code.php>

“On my honor I will not give nor receive unauthorized assistance in completing assignments and work submitted for review or assessment. Furthermore, I understand the requirements in the College of Engineering and Architecture Honor System and accept the responsibility I have to complete all my work with complete integrity. Students who are suspected of academic dishonesty may not withdraw from the course in which dishonesty is suspected while the case is under review by the Honor Commission (NDSU Policy 335.b)

Academic Dishonesty Defined (Source: [NDSU Policy 335, 2a-m](#))

Academic misconduct (intentional or otherwise) includes but is not limited to the following:

1. Plagiarizing, i.e., submitting work that is, in part or in whole, not entirely one's own, without attributing such portions to their correct sources.

- Cases of apparently unintentional plagiarism or source misuse must be handled on a case-by-case basis and in the context of the instructor's policies. Unintentional plagiarism may constitute academic misconduct.
 - Improper attribution of sources may be a symptom of bad writing and not plagiarism. Instructors are encouraged to recognize that citation skills are developed over time and are contextual.
2. Receiving, possessing, distributing or using any material or assistance not authorized by the instructional staff member in the preparation of papers, reports, examinations or any class assignments to be submitted for credit as part of a course or to fulfill other academic requirements.
 3. Unauthorized collaborating on individual assignments or representing work from unauthorized collaboration as independent work.
 4. Having others take examinations or complete assignments (e.g., papers, reports, laboratory data, or products) for oneself.
 5. Stealing or otherwise improperly obtaining copies of an examination or assignment before or after its administration, and/or passing it onto other students.
 6. Unauthorized copying, in part or in whole, of exams or assignments kept by the instructional staff member, including those handed out in class for review purposes.
 7. Altering or correcting a paper, report, presentation, examination, or any class assignment, in part or in whole, without the instructional staff member's permission, and submitting it for re-evaluation or re-grading.
 8. Misrepresenting one's attendance or the attendance of others (e.g., by PRS or attendance sheet) in a course or practical experience where credit is given and/or a mandatory attendance policy is in effect.
 9. Fabricating or falsifying information in research, papers, or reports.
 10. Aiding or abetting academic misconduct, i.e., knowingly giving assistance not authorized by the instructional staff member to another in the preparation of papers, reports, presentations, examinations, or laboratory data and products.
 11. Unauthorized copying of another student's work (e.g., data, results in a lab report, or exam).
 12. Tampering with or destroying materials, (e.g., in order to impair another student's performance).
 13. Utilizing false or misleading information (e.g., illness or family emergency) to gain extension or exemption on an assignment or test.