

Agricultural and Biosystems Engineering

ABEN 486 – Senior Design Project I

Class Information:

Credit – 2

Fall 2010 (Term: 1110)

Room: ABEN 208

Time: 2:00 - 3:15 pm; Tu, Th

Instructor:

Dr. Ganesh Bora

ABEN 105

Phone: 701-231-7271

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Office Hours: By appointment or drop in.

Textbook: No textbook assigned

Objectives of this Course:

1. To design a system, component, or process to meet desired needs in an agricultural systems, biomaterials systems or environmental system problem incorporating necessary engineering, biological, and/or Biosystems information. Project to be brought to completion in ABEN 487-Design Project II.
2. To use techniques, skills, and modern engineering tools necessary for engineering practice to accomplish objective 1.
3. To develop written, oral, and graphical methods necessary to communicate the work done to appropriate audiences.
4. To consider the social, environmental, and safety factors (as appropriate) in the design.
5. To work in a team setting to accomplish a capstone design project.
6. To comply any other factors necessary for the successful completion of ABEN 486 and ABEN 487

ABET is the Accreditation Board for Engineering and Technology. ABET is a specialized accreditation agency meaning it certifies specific programs at a college or university as compared to institutional accreditation agencies that examine an entire college or university. Each accredited department must be reviewed by a site visit at least once every six years. The method of accreditation has changed with the ABET 2000

initiative. Every department has a set of evaluation criteria it has developed and submits to ABET. These criteria form the evaluation basis for the department by the ABET reviewers. The Agricultural and Biosystems Engineering Department criteria developed for the last ABET accreditation visit, in 2000, are listed below. Please examine these criteria, especially the ones mentioned previously that apply to the ABEN 486-487 sequence.

Educational Objective 1: Provide students with technical knowledge, design, and problem solving skills that are foundational to their engineering careers by ensuring that graduates have ability to:

- a. Apply knowledge of mathematics, science, and engineering.*
- b. Design and conduct experiments, as well as to analyze and interpret data.*
- c. Design a system, component, or process to meet desired needs.*
- e. Identify, formulate, and solve engineering problems.*
- k. Use techniques, skills, and modern engineering tools necessary for engineering practice.*

Educational Objective 2: Provide learning and practice experiences that build student interpersonal and collaborative skills and the capacity for productive careers by ensuring that graduates have:

- d. An ability to function on multi-disciplinary teams.*
- f. An understanding of professional and ethical responsibility.*
- g. An ability to communicate effectively.*
- h. The broad education necessary to understand the impact of engineering solutions in the global and societal context.*
- i. A recognition of the need for and an ability to engage in lifelong learning.*
- j. A knowledge of contemporary issues.*

Educational Objective 3: Provide students with specialized (discipline-specific) knowledge, educational depth, and breadth to meet the challenges of changing careers and opportunities in agricultural and closely related biological industries by ensuring that graduates have competencies in one or more of the following areas:

- l(i) Apply engineering skills to agricultural systems.*
- l(ii) Apply engineering skills to biomaterials systems.*
- l(iii) Apply engineering skills to environmental systems.*

Criterion 4. Professional component from the 2003-2004 Criteria for Accrediting Engineering Programs also states the following:

Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating engineering standards and realistic constraints that include most of the following considerations: economic; environmental; sustainability; manufacturability; ethical; health and safety; social; and political.

The underlined areas in the previous paragraph must be addressed in the written report along with the other aspects of the design project. Each section should have a heading and the content, even if the content is an explanation of why the consideration does not apply to the particular project.

Course Description:

Capstone learning experience-involving principles of design, project management, and evaluation. Student teams define a capstone project in their area of interest. 2 lecture laboratory. Prereq: Senior standing.

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.

It is impossible to thoroughly cover all the topics that may comprise components of a capstone project. Therefore, only broad principles and some specific topics can be covered during the available class time.

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.

It is the student's responsibility to be in class. If you will not be in class, it is your responsibility to obtain notes from a classmate and see the instructor about any handouts given in class. This class involves many activities outside the classroom setting. These will include but are not limited to working with the ABEN 110 class for a brainstorming session, meeting in your project groups, seeking information, making appointments to talk to faculty and other professionals, and other activities necessary to successfully complete a design project.

Grading:

<u>Items</u>	<u>Weight</u>
Quizzes and homework	15%
Presentation	20%
Report correction by NDSU Center for Writers	05%
Project Report	35%
<u>Final Exam</u>	<u>25%</u>
Total	100%

The Cut off for letter Grades: $\geq 90 = A$; $\geq 80 = B$; $\geq 70 = C$; $\geq 60 = D$; $< 60 = F$

All the reports and home work assignments must be submitted on time. Late submission of reports will not be accepted.

All work is to be done on a computer (except in-class items and scratch calculations). All homework turned in must have fewer than 10 errors in spelling, syntax, and grammar. The errors are the ones that the instructor catches. Writing assignments should be written in Times New Roman, 12-point font and double-spaced. **There will be two unannounced quizzes (6% grade) and three homework assignments (9% grade).**

Each student will be given an engineering and scientific paper by the instructor to present in the class (**5% grade**) during the semester. Each team will present their project proposal and will be evaluated by fellow students, faculty and staff who will attend the proposal presentation (**15% grade**).

Project reports are a team effort. Team feedback forms provide peer evaluation for team members. It is possible for individual grades to be higher or lower than the team grade based on these evaluations. The Project Report needs to be presented to NDSU Center for writers for corrections (**5% grade**). The suggested corrections should be incorporated and the **final report (35% grade) should be submitted to the instructor by 12/07/2010**. *A note book should be maintained by each student to catalog all the works about their project work. The evaluation of note book will be part of the grading for project report.* The Final Exam will cover the entire classes instructed (**25% grade**).

Anyone in the class who has a diagnosed disability or other special need should inform the instructor as soon as possible. The counseling center should also be notified so the counseling center can work with the instructor and student to best accommodate the situation.

All students are expected to respect and follow the student honor code (COA) and NDSU Academic Honesty Statements found in the NDSU University Senate Policy Section 335 <http://www.ndsu.nodak.edu/policy/335.htm> .

Key Design Aspects for teams to work on:

The design project task list should include, but is not limited to completing, the following components of the design process during the first semester:

- Problem Statement:
- Literature review report:
- Project Schedule: Gantt chart
- Definition and evaluation of alternative designs:
- Society impacts
- Preliminary design

Other topics covered in the course:

- Design Concepts
- Engineering Economics
- Project presentations
- Brainstorming with ABEN 110 class
- Project management and decision making
- Six Sigma concepts
- FMEA
- Ergonomics

The Project Report should include

- Introduction:
 - o Problem Statement
 - o Rationale and Society impacts,
 - o Objective of the project
- Literature review in details about previous similar work:
- Materials and Methodology:
 - o Definition and evaluation of alternative designs:
 - o Preliminary design
 - o Materials required
 - o Final Design
- Expected results when the project will be completed in Spring
- Project Schedule: Gantt chart

Preparing for Spring Semester: Heads up:

The final oral reports will be made during the first week of April. At that time a completed second draft of your design report is expected. Evidence that this is a second draft that has been edited and modified must be provided with two copies of the report. These copies will be examined by the instructor and hopefully the cooperator to make suggestions and comments to produce a better final report.

Course schedule/outline/calendar of events

Lectures:

<u>Days</u>	<u>Topic</u>	<u>Instructor</u>
Aug 24	Introduction	
26	Design principles	
31	Design principles/ Project Management	
Sept 02	Project Management	
07	Student Presentation	
09	Potential Failure Mode and Effects Analysis - FMEA	
14	Proposal Presentation by Collaborators	
16	Project Selection/ Student Presentation	
21	Ergonomics and Human Factor Engineering	
23	Student Presentation	
28	Individual Team Project Work	
30	Presentation by President of Crary Industry	Keith Nilson
Oct 05	Six Sigma	O P Yadav
07	Individual Team Project Work	
12	Proposal Presentation by Teams	
14	Proposal Presentation by Teams	
18	Freshman interaction	
20	Freshman interaction	
26	Guest Lectures	
28	Technical Writing (NDSU Center for writers)	Mary Pull
Nov 02	Engineering Economics	
04	Engineering Economics	
09	Student Presentations	
11	Holiday – Veterans Day	
16	Individual Team Project Work	
18	Communication Department interaction	
23	Individual Team Project Work	
25	Thanks Giving Holiday	
30	Individual Team Project Work	
Dec 02	Individual Team Project Work	
07	Submission of Final Report	
09	Review	
	Exam (date to be decided)	

(The schedules are subject to change and students will be notified of any changes well ahead of time).