ABEN 482 Instrumentation and Measurements  
Spring 2017

**Time & Place:** Class: M-W from 9-9:50 a.m. in ABEN 201. Laboratory section: Th from 2:00 to 4:50 p.m. will be in AGHILL CTR room 228, or ABEN 210B &C.

**Instructor & Phone:** Tom Bon (231-7275)  
**E-mail:** Thomas.Bon@ndsu.edu  
**Office:** 202 ABEN  
**Office Hrs:** 10:00 – 10:50 a.m. M, W, & F and 2:00 – 2:50 p.m. T, or by appt, or drop in and see if I am available.

**Bulletin description:** Application of instrumentation and sensor concepts to measurement and control of environmental, biological, and mechanical parameters. Includes sensor principles, signal conditioning, data collection, and data analysis methods. 2 lectures, 1 three-hour laboratory.

**Prerequisites:** PHYS 252 (Physics 252)

**Course objectives:**

After completing this course the student should be able to:

1) design an experiment, conduct the experiment, collect data, analyze the data and draw conclusions from the data. (abet b);  
2) understand the use of equipment to measure and record data. (abet k);  
3) apply engineering knowledge of statics, strength of materials, fluids, and electricity to understand their experiments (abet a);  
4) communicate this information professionally, (abet g); and  
5) understand basic principles of control systems and programmable control units (Arduino), (abet a).

**Grading:**  

<table>
<thead>
<tr>
<th>Item</th>
<th>482</th>
<th>682</th>
<th>% weight on final grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class exams &amp; quizzes</td>
<td>35%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Homework</td>
<td>10%</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>General laboratory exercises</td>
<td>10%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Major lab exercise laboratory</td>
<td>10%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Team Project</td>
<td>10%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>Special development project</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

A ≥ 90%, B = 80-89.9%, C = 70-79.9%, D = 60-69.9%, F < 60%

**Final Exam is 1:00 to 3:00 p.m. Wednesday, May 10, 2017.**
Attendance:

How deeply you participate in class discussions and lectures will undoubtedly determine how much you benefit from this course. *Your full participation is expected*, through classroom discussions, volunteering answers to questions, asking appropriate questions, thoughtful evaluation of a team oral presentation, and by helping to create a spirit of cooperation within the class.

Classroom Topics (tentative, I may change this depending on class background, interests, etc.)

<table>
<thead>
<tr>
<th>Date</th>
<th>Item</th>
</tr>
</thead>
</table>

Items will be posted in Blackboard

Final exam is scheduled from 1:00 to 3:00 p.m. Wednesday, May 10, 2017.

Laboratory Schedule (tentative)

<table>
<thead>
<tr>
<th>Date</th>
<th>Laboratory Topic</th>
</tr>
</thead>
</table>

Will be developed and posted as the semester continues.

Required Student Resources:

Textbook: No textbook is assigned for the course

Students are expected to have daily access to the course Blackboard website to see posted announcements, access student notes, homework problem sets, etc.


Academic Honesty: All work in this course must be completed in a manner consistent with NDSU University Senate Policy, Section 335: Code of Academic Responsibility and Conduct (http://www.ndsu.nodak.edu/policy/335.htm).

Please *do not even give us reason to suspect that you are cheating or abetting a cheat*. The major causes of receiving a grade of D or F in this course are: 1) poor attendance, 2) cheating on tests, and 3) failure to turn in work. We reserve the right to take precautions such as assigned seating during tests, videotaping the room during tests, and using multiple versions of tests.

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)

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.

Veterans and student soldiers with special circumstances or who are activated are encouraged to notify the instructor in advance.

In-class Quizzes/Missed Quizzes:

The purpose of the quizzes is to assess your understanding, reinforce important concepts, and encourage attendance and notes review.

Please be prepared for a quiz at any time.

Quizzes missed due to a valid excuse will not be averaged into your grade. If you believe you had a valid excuse for missing class on a quiz day, send me an e-mail message within two days of the absence stating the day missed and the nature of the excuse. If you request more than three excused absences, you will be asked to furnish documentation (note from a doctor, letter from job interviewer, etc.).

Some information concerning ABET:

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 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

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.