ME 374 – Mechatronics Lab
Dr. Matt Bilsky

Instructor’s Contact Information:
Office: Packard 373
Phone:
Email: mjb211
Office Hours: By Appointment:
http://doodle.com/bilsky

Course Information:
ME 374
Spring, 2017
Group Meetings: Mondays, 3pm
Packard 373

Lab Assistant:
Rishit Arora: ria216
*Note: Rishit is not the TA for the course but also works with me in 373 so can be a resource for
where things are and access to the lab.

Course Description
The goal of this course is to provide students with the skillset and mindset necessary to be 21st
century engineers. All aspects of engineering now include some “smart” aspect. The two course
projects will provide the fundamentals to build autonomous and intelligent systems (AIS) that
are the basis for the internet of things (IoT).

Official Course Catalog Listing: “Experiments and applications utilizing combinations of
mechanical, electrical, electronic and microprocessor components. Theory and application of
electronic and electromechanical equipment, operation and control of mechatronic systems.
Projects integrating mechanical, electronic and microcontrollers.”

Course Learning Objectives
By the end of this course, students will be able to:
(1) Create smart, autonomous, and IoT devices
(2) Solve technical problems through mechatronic solutions
(3) Use the internet to teach themselves and understand advanced engineering topics
(4) Demonstrate an ability to use the Engineering Skillset (Make, Measure, Model) to
analyze real-world phenomena
(5) Rapidly develop low-cost prototypes of mechatronic systems
(6) Apply an Entrepreneurial Mindset to both drive and assess the validity of engineering
solutions

Prerequisites
ENGR 10/97 – Introduction to MATLAB and Arduino
Junior/Senior level standing with some technical background in Mechatronic areas
**Required Texts**

There is no required text for this course. As such students are expected to use the Course Site as an initial source for information but self-supplement it with outside sources such as YouTube videos and other readings.

**Expectations**

This is a student-driven experience based on project-based learning (PBL). As such, students are responsible for teaching themselves and each other the material assigned by the instructor. The instructor’s role in this process is as coach, imparter of information, clarifier, and evaluator.

Students are also expected to purchase lab materials as needed for the course

**Assignments**

The course will consist of two projects. Everyone will complete the first project, the thermal chamber. Each student will also propose a second, individual, project that will demonstrate and enhance their knowledge of Mechatronic topics.

**Grade breakdown:**

<table>
<thead>
<tr>
<th>Weight</th>
<th>Topic</th>
<th>Grade Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>Thermal Chamber</td>
<td>A</td>
</tr>
<tr>
<td>20%</td>
<td>Second Project</td>
<td>A</td>
</tr>
<tr>
<td>20%</td>
<td>Activity Journal/Documentation</td>
<td>A</td>
</tr>
<tr>
<td>10%</td>
<td>Course Site Improvement</td>
<td>A</td>
</tr>
<tr>
<td>10%</td>
<td>Course Site Addition</td>
<td>A</td>
</tr>
<tr>
<td>10%</td>
<td>Laboratory Methods</td>
<td>B</td>
</tr>
<tr>
<td>10%</td>
<td>Entrepreneurial Mindset Exploration</td>
<td>C</td>
</tr>
<tr>
<td>100%</td>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

**Grade Criteria:**

A. Projects, Journals, and Course Site
   a. Engineering Skillset: Make, Measure, Model
   b. Clarity and thoroughness of documentation
   c. Completion and timeliness
   d. Effort
   e. YouTube video(s) describing work completed and functionality
      i. Short pitch/overview
      ii. Second longer, more technical video

B. Laboratory Methods
   a. Safe practices
   b. Cleanliness
   c. Teamwork
   d. Parts sourcing
C. Entrepreneurial Mindset Exploration
   a. Entrepreneurial Mindset (below)

   b. Students are expected to assess (at a high level) the business implications of their work especially for their second product. This includes, but is not limited to, the value proposition and business model canaveses see:

   https://strategyzer.com/canvas/value-proposition-canvas and

   https://strategyzer.com/canvas/business-model-canvas

Policies

- Lab Safety
  - All students are expected to abide by posted warnings and lab safety regulations
  - Emergencies should be reported immediately to University Police: 610-758-4200

- Lab Access
  - Packard 373 is reserved for ME 207 Lab on Tuesdays and Thursdays from 12:45-4 pm
    - If lab is finished early you are welcome to come in and work
  - Weekday access: If lab is locked the staff in Rooms 367/356 may let you in
  - Weekend access: restricted to as needed basis. Subject to change

- Office Hours/Clarifications
  - The underlying principle of this course is self-discovery through guided activities. As such, the majority of information needed to complete activities is posted on the Course Site.
  - Part of learning mechatronics is struggling. Debugging is a critical engineering skill that requires time and patience
  - If, after spending a reasonable amount of time, you are still stumped then you can reach out to the instructor for clarification.
    - If you are the first person to ask this question then you are now the cohort’s expert in this area
    - This semester we are experimenting with filming/documenting explanations to make the available online for future/other students
    - Other students with the same question will be directed to the student expert and videos. If they still require clarification then the professor will intervene

Grading Scale
Graded A-F based on performance in each of the above assignments

**Statement on Academic Integrity**

**Student Senate Statement on Academic Integrity**

We, the Lehigh University Student Senate, as the standing representative body of all undergraduates, reaffirm the duty and obligation of students to meet and uphold the highest principles and values of personal, moral and ethical conduct. As partners in our educational community, both students and faculty share the responsibility for promoting and helping to ensure an environment of academic integrity. As such, each student is expected to complete all academic course work in accordance to the standards set forth by the faculty and in compliance with the University's Code of Conduct.

The work you do in this course must be your own. This means that you must be aware when you are building on someone else's ideas—including the ideas of your classmates, your professor, and the authors you read—and explicitly acknowledge that you are do so. Feel free to build on, react to, criticize, and analyze the ideas of others but, when you do, make it known whose ideas you are working with. If you ever have questions about drawing the line between others' work and your own, ask me and I will give you clear guidance or you may visit Lehigh Library’s ‘Proper Use of Information’ page at [http://library.lehigh.edu/content/proper_use_information](http://library.lehigh.edu/content/proper_use_information)

**Intellectual Property**

Students are encouraged to generate intellectual property (IP) especially through the second project of the course. Please refer to the university about ownership of generated IP: [http://www.lehigh.edu/~intectrn/](http://www.lehigh.edu/~intectrn/)

**Attendance**

Due to the self-paced and project-based nature of this course the attendance policy is quite lax compared to other courses. Students may work on the project in the lab or at their home. According to Lehigh policy a 3 credit course should require ~9 hours of effort each week (including lecture and homework). As such, students are expected to put in this effort and document it in their weekly journals.

One common meeting time will be scheduled when Professor will be in the lab to assist the group and have high level discussions regarding the current topics. Once a date and time is selected that works for all participants attendance is required at this meeting.
Additionally, students are encouraged to coordinate with one another to find times that they can be in the lab together. This is not just for safety but to also allow for the bouncing of ideas off each other improving learning.

**Exams**

There are no written exams in this course. We will have two meetings to evaluate the projects. One following spring break to review the thermal chambers and a second, likely scheduled by the registrar during finals, to show off final projects.

**The Principles of Our Equitable Community:**
Lehigh University endorses The Principles of Our Equitable Community [http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf]. We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.

**Accommodations for Students with Disabilities:**
If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services (Williams Hall, Suite 301 / 610-758-4152 / caa4@lehigh.edu) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

**Lehigh University Policy on Harassment and Non-Discrimination**
Lehigh University upholds The Principles of Our Equitable Community and is committed to providing an educational, working, co-curricular, social, and living environment for all students, staff, faculty, trustees, contract workers, and visitors that is free from harassment and discrimination on the basis of age, color, disability, gender identity or expression, genetic information, marital or familial status, national or ethnic origin, race, religion, sex, sexual orientation, or veteran status. Such harassment or discrimination is unacceptable behavior and will not be tolerated. The University strongly encourages (and, depending upon the circumstances, may require) students, faculty, staff or visitors who experience or witness harassment or discrimination, or have information about harassment or discrimination in University programs or activities, to immediately report such conduct.

**If you have questions** about Lehigh’s Policy on Harassment and Non-Discrimination or need to report harassment or discrimination, contact the Equal Opportunity Compliance Coordinator (Alumni Memorial Building / 610.758.3535 / eocc@lehigh.edu)
Logistics
Every student will be invited to a Google Drive for the course. This drive will contain folders where students are expected to maintain their course journal along with store development ideas for their second project.

Schedule (subject to modification)

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Readings and Assignments</th>
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<tbody>
<tr>
<td>1</td>
<td>1/23/17</td>
<td>First Meeting, Course Site Access,</td>
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<tr>
<td>2</td>
<td>1/30/17</td>
<td>Start building chamber</td>
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<tr>
<td>3</td>
<td>2/6/17</td>
<td></td>
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<tr>
<td>4</td>
<td>2/13/17</td>
<td></td>
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<tr>
<td>5</td>
<td>2/20/17</td>
<td>First pitch of 2\textsuperscript{nd} project</td>
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<tr>
<td>6</td>
<td>2/27/17</td>
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<tr>
<td>7</td>
<td>3/6/17</td>
<td>Final 2\textsuperscript{nd} project plan due</td>
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<tr>
<td>8</td>
<td>3/13/17</td>
<td>Spring Break</td>
</tr>
<tr>
<td>9</td>
<td>3/20/17</td>
<td>Thermal Chamber Due (including Videos)</td>
</tr>
<tr>
<td>10</td>
<td>3/27/17</td>
<td></td>
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<tr>
<td>11</td>
<td>4/3/17</td>
<td></td>
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<tr>
<td>12</td>
<td>4/10/17</td>
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<tr>
<td>13</td>
<td>4/17/17</td>
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<tr>
<td>14</td>
<td>4/24/17</td>
<td></td>
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<tr>
<td>15</td>
<td>5/1/17</td>
<td>2\textsuperscript{nd} Project wrap-up (likely overlap into finals week)</td>
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