

## **MAE 4710: MECHATRONICS – Engineering Supergenius Edition**

Mechatronics involves the integration of mechanical engineering with electronics and intelligent computer control in the design and manufacturing of industrial products and processes. It's synergy at its best. This course surveys basic electrical circuits, electromechanical actuators, analog signals, digital signals, various sensors, basic control algorithms, and microcontroller programming. This course includes weekly, hands-on, laboratory exercises as well as design projects involving both hardware and software. Note that MAE 4710 is a 4-credit, 4000-level course. You will do a lot of work.

In this TLP edition of the course, we'll do things a little differently than the "regular" section run by Gavin Garner, though we'll rely on much of the excellent content he has developed over the years. Because we have fewer students, we can spend more time doing projects, as opposed to 'just' labs. This will be a little experimental. Please have patience.

### **Instructor:**

Greg Lewin: [engineering.supergenius@virginia.edu](mailto:engineering.supergenius@virginia.edu)

### **Lab Assistant:**

TBD

### **Office Hours:**

TBD

### **Lectures:**

MWF 11:00 – 11:50 in Rice 120.

### **Laboratories:**

Labs will be held Wednesdays from 2:00 – 5:00 and 6:00 – 9:00. I don't care which section you show up to, but you need to be consistent from week to week (with exceptions, should something unexpected arise).

### **Grading:**

Grading will be a combination of homework, worksheets, post-lab quizzes and design challenges, and projects. Because I am rearranging the course a bit this year, I honestly don't know exactly how many of each we'll have, but expect: 8 – 10 labs (each with a pre-lab, worksheet, and quiz), 2-3 projects throughout the term, plus a final project. The grade breakdown will be:

- Homeworks/worksheets/pre-labs (20%)
- Quizzes (40%)
- Projects (20% performance; 20% understanding)

### **Attendance:**

The material covered in this course is centered on the laboratory experiments. You are therefore required to complete *all* of the labs in this course. One full letter grade will be deducted from your final grade for every lab that is missed and not made up within a reasonable time (generally, a week). If you know in advance that you absolutely must miss a lab, your group

should alert the instructor as soon as reasonable and reschedule to meet during a make-up lab session. If you must miss a lab at the last minute (due to sudden illness or an emergency) please email the instructor before the lab starts or as soon as reasonable. In this case, your partner(s) should work through the lab without you, and you will need to make up that lab within one week. If your group is unable to finish all of the experiments in a lab assignment within the allotted lab time, *you must complete the remaining experiments within one week.*

You are expected to attend all lectures and watch all of the assigned videos before coming to class. If your absence from the lectures is noticed (or if you consistently arrive late), your grade will be lowered or in extreme cases, you will be asked to drop the course.

### **Post-lab Quizzes:**

There will be several, short (nominally 20-25 minute, but they usually take longer), post-lab quizzes that will be taken at a time to be determined. These will take the place of traditional post-lab assignments. These quizzes will test your general understanding of the concepts and terminology in this course and will usually involve true/false, multiple-choice, or fill in the blank questions that do not require lengthy calculations or derivations. If you pay close attention during the lab experiments and the lectures, you should find these weekly quizzes to be fairly easy.

### **In-class workshops and projects:**

The labs often present one of many alternatives for solving a particular problem. From time to time, you will be challenged to find alternative solutions or to combine concepts from previous labs in novel ways to solve a particular problem. These problems will be discussed in class, and you will have to create solutions to them. You will typically receive points as a team.

### **Final Project:**

How well your group is able to achieve the project's objective(s) will determine half of your project grade. The other half will be determined based on an individual interview in which you will explain your team's project solution to the instructor and answer questions about how it works.

There is no written final exam.

### **Textbook and Materials:**

- Lab handouts will be provided in .pdf format.
- Other supplementary reading materials (such as datasheets and reference manuals) will be posted on the course website. You are not required to print these out.
- *Introduction to Mechatronic Design*, by Carryer et al. (ISBN-13: 978-0131433564).

### **Reading:**

You should read through the labs *before* you work through them in your lab section. Note that the procedures in the lab write-ups are designed to take you roughly two hours to work through, but they assume that you have already carefully studied the material before actually performing the lab experiments. Knowing your work habits, I expect three hours per lab. It is also suggested that you re-read the lab write-ups (along with any notes that you may have added to them during the lab) in preparation for the weekly post-lab quizzes. Other relevant reading material may be posted on the course website and assigned during the lectures.