

## **SYLLABUS: EEL 4936-003/IDH 4930**

### **MAKE: HANDS-ON ENGINEERING DESIGN**

#### **Instructors:**

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#### **ABET (Accreditation Board for Engineering and Technology) Student Outcomes:**

Students of this course will acquire:

- c. An ability to design a system, component, or process to meet desired needs.
- e. An ability to identify, formulate and solve engineering problems.
- k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

**Target group:** 1000-4000. This course aims to introduce students to “making”, i.e. the invention, design and building of engineered devices and systems.

**Course Materials:** There is no text book for this course. Various resources will be used. All documents will be posted on Canvas or the course website at [www.makecourse.com](http://www.makecourse.com). Students will use free educational versions of Autodesk Inventor (3D computer aided design), and open source software such as KiCAD (circuit board design) and LTSpice (circuit simulation). All students are required to bring laptops with the necessary software packages installed and Arduino/electronics hardware as appropriate to class.

### **COURSE OBJECTIVES:**

The primary objective of the course is to introduce students to the creative design of devices following the engineering design process. The course will teach students the essential design skills needed for the design of “mechatronic” devices (i.e. devices incorporating electronic, mechanical and software based components). After taking this course students will have basic knowledge in computer aided design, electronic circuit development, programming concepts and control systems.

### **COURSE DESCRIPTION:**

The main goal of this introductory course is to encourage and empower students early on in their careers to pursue their own design projects. All participating students will design and build a device following the engineering design process. The devices must integrate a mechanical motion component as well as an electronic circuit feature integrated with the Arduino micro-controller development platform. The students will be required to develop a full parts list, write a complete service manual and determine the itemized cost of the object. The instructional part of the course aims to instill essential skills in computer aided design as well as entry level programming and electronic circuit design and implementation skills.

**Pre-requisites:** None.

### **COURSE STRUCTURE:**

Two meetings per week.

Location: ENB118

Time: M/W 3:30 - 4:45 pm

### **STUDENTS' OBLIGATIONS:**

Explore and learn to use the software packages, be creative, invent, design device, and Make it.

### **COMMUNICATION POLICY:**

The instructors will use Canvas as main communication channel for announcements and course materials. All students are expected to check Canvas at least once every 48 hours for course announcements.

### **GRADING POLICY:**

1.Homework and attendance (20%). During the first two thirds of the semester each week will have a homework project which needs to be completed by end of the Wednesday class period.

2.Deliverables (80%): The deliverables are in lieu of exams and a final. See [www.makecourse.com](http://www.makecourse.com) for actual schedule and specific deliverables.

### **DESIGN PROJECT**

The students will Make a mechatronic object of their design during the course. This object will be presented to the class at the end of the course and submission of the additional required documents (see Grading Policy). These guidelines must be followed (see [www.makecourse.com/Student Projects](http://www.makecourse.com/Student Projects) for more details):

- 1) The object must be completely designed and simulated in Inventor before it is built.
- 2) It must contain 3D printed moving components that interact with the electronic control circuit.
- 3) It must be controlled by or interact via the Arduino and kit components (use of additional components is encouraged) in some creative way.
- 4) It must have a creative (i.e no simple switch) on/off or control mechanism (remote control, touch sensor etc...)

5) The standard enclosure must be used. All cutouts in the enclosure must be designed in the 3D simulation and professionally implemented. The best way is usually to print the enclosure and/or the lid with the cutouts and fixtures integrated to hold whatever you need to mount.

6) Printed parts cannot exceed the 250mm x 125mm x 125mm build size constraint.

7) The final design must be complete and work, be neatly manufactured with precision, and be original. There will be no A grades for incomplete and/or shoddy put together projects.

### **NOTICE OF PERMISSION/NON-PERMISSION TO SELL NOTES OR RECORDINGS OF CLASS LECTURES:**

It is not permitted to sell notes or recordings of class lectures. All unauthorized recordings of class are prohibited. Recordings that accommodate individual student needs must be approved in advance, and may be used for personal use during the semester only; redistribution is prohibited.

### **POLICY ON RELIGIOUS HOLIDAYS:**

Students who anticipate the necessity of being absent from class due to the observation of a major religious observance must provide notice of the date(s) to the instructor, in writing, by the second class meeting.

### **POLICY ON CAMPUS EMERGENCIES:**

In the event of an emergency, it may be necessary for USF to suspend normal operations. During this time, USF may opt to continue delivery of instruction through methods that include but are not limited to: Canvas, Elluminate, Skype, and email messaging and/or an alternate schedule. It is the responsibility of the student to monitor

Canvas site for each class for course specific communication, and the main USF, College, and department websites, emails, and MoBull messages for important general information.

**SCHEDULE:**

See [www.makecourse.com](http://www.makecourse.com), click on “Lesson Plan” tab.