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**i**ntroduction to **C**oding, **R**obotics, **E**lectronics, **A**nd **T**echnology I

***Faculty***

<*add instructor(s) contact info here*>

***Support for <****Your college/university name****> Systems***

In person:

Email:

Phone:

***Course Description***

This interdisciplinary project-based course introduces the basics of programmable robotic systems.  Using systematic approach students will learn to use a design process to apply engineering and programming concepts to create simple robotic projects.

This course will run in a studio-like setting using an active learning method of instruction. Problem-based projects, small group discussions and team collaboration will facilitate the development of critical thinking and logical reasoning skills, creative thinking and communication skills.

Students are encouraged to take advantage of available career exploration and mentoring opportunities.

3 Credits, pre-requisites: None

***Instructional Outcomes***

The goal of this course is to provide students with multidisciplinary instructions, where students can learn about coding, robotics, electronics, and engineering design to create a robotic system.

Students who complete this course successfully will be able to:

* Describe the system development cycle
* Identify and draw use-cases
* Write system requirements
* Create an electronic circuit
* Implement controls for circuits
* Develop problem solving and critical and logical thinking skills
* Analyze and distinguish a few computing devices
* Apply engineering design methodologies
* Design and build a robot support structure
* Apply all skills to creatively implement a new robotic project
* Obtain support for future career decision making
* Communicate and work in a team

### Teaching Procedures

This course mainly involves hands-on work with occasional just-in-time lectures. Students will be working both individually and in teams to perform different tasks of the course. Slides and other learning resources as well as instructions for study, exercises, and assignments will be available. Students are encouraged to talk with other students, course assistants, or the instructors to maximize the amount of learning that occurs in class.

***Communication***

Email communication with students will be through **<***college/university name***> email address** **only.** Announcements will be through <college LMS>. **Students are required to check both their <***college/university name***> email and <**college LMS**> often or at least once a day.**

### Attendance and Participation

Students are expected to attend all class sessions and are responsible for all material covered during that time. Work outside of class will be assigned regularly and is due on or before posted due date. It is the responsibility of the student to be mindful of his/her status on attendance and completed work.

<*edit the following based on your college/university policies*>

According to the College Catalog, “**If a student’s absences exceed five class hours, the instructor may withdraw the student from the course by notifying the Registrar**.” *The student who wishes to withdraw should do so through the registrar’s office, since the instructor is not required to withdraw the student and may instead assign the grade of F*.

### Grading Policy

**Assignments: Assignments must be submitted on time**. They are due at the end of the day (11:59 pm) on the due date, unless otherwise indicated.

<*edit the following based on your college/university policies*>

Academic Integrity is a serious matter in this class. Students should familiarize themselves by reading the section on “Academic Integrity” under “Student Responsibilities: The Code of Student Conduct” in the Student handbook.

*Collaboration is encouraged and good; cheating deprives you of something valuable and cheapens your own education. Examples of collaboration are: discussing work on homework and cases, helping explain concepts and ideas, and checking answers. Examples of cheating include copying work by any means (electronic included). Identical work will receive an identical grade: F.*

**Grades**: The grades in this class will be based on:

|  |  |
| --- | --- |
| **Assignments** | **50%** |
| **Final project** | **50%** |

***Optional Course Materials***

If you have a computer at home and would like to complete your homework at home or practice with the tools that we will be using in class, please feel free to access/ install the following:

**Tinkercad Circuits**  
With this tool we will be able to design and simulate any electronic circuit for iCREAT I, including any circuit using an Arduino. This tool is also very useful for circuit documentation. You must create an account to work in class and at home**:**

* <https://www.tinkercad.com/circuits>

**SolidWorks**  
SolidWorks software is used in this course to design and model the autonomous robot. Other 3D modeling software can also be used.

**Arduino**

If you would like to work on your **Arduino** at home, you may download the software at:

* **Arduino IDE**: <https://www.arduino.cc/en/Main/Software>

***Course Schedule***

|  |  |  |
| --- | --- | --- |
| **Module** | **Topic and Notes** | **Instructor** |
| 1 | Intro to iCREAT I course. |  |
| 2 | Intro to electronic components, circuit and diagram simulation tools. Intro to coding environment and tools. |  |
| 3 | Intro to Ohm Law, microcontroller, resistors, LEDs, breadboard, and buzzer. Diagram, simulate and create circuits. Use code to control circuit. |  |
| 4 | Diagram, simulate and create circuits using a microcontroller with a photoresistor, a potentiometer and a button. Use code to control circuit. |  |
| 5 | Diagram, simulate and create circuits using a microcontroller with an ultrasonic sensor. Use code to control circuit and calculate distances. |  |
| 6 | Intro to the motor controller shield, DC and Servo motors. Use code to control motors. |  |
| 7 | Use the ultrasonic sensor to control the motors through the motor shield. Review collision detection algorithms. |  |
| 8 | Intro to SolidWorks -parts and assemblies. Discuss and sketch project design ideas. |  |
| 9 | Prototype project design - models of mechanical components. Start working on designs in SolidWorks |  |
| 10 | Peer review - show mechanical models, discuss any modifications. Work on term project (SolidWorks, coding, debugging) |  |
| 11 | Work on term project (SolidWorks, 3D printing, coding, debugging) |  |
| 12 | Project - Compile all documentation and presentation for the STEM Expo  Work on term project (SolidWorks, 3D printing, coding, debugging) |  |
| 13 | Present avoidance algorithm strategy. Work on term project (SolidWorks, 3D printing, coding, debugging, documentation) |  |
| 14 | Work on term project (SolidWorks, 3D printing, coding, debugging, documentation) |  |
| 15 | Continue work on term project.  Exhibit projects |  |