# ENGR 4311: Senior Design I (CRN23901)
# Fall, 2021

### Advisor

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### Lab Meetings

*Time:* Tuesday 2:40 PM–5:20 PM & Friday, 3:00 PM–3:50 PM
*Room:* CCCS 112

**All students are expected to comply with the University policy regarding face coverings. UCA's Coronavirus page for students can be found here: https://uca.edu/coronavirus/students/. Students having any symptom of COVID-19 should stay at home and report to your healthcare provider. Check CDC with the most updated information of COVID-19. https://www.cdc.gov/coronavirus/2019-ncov**

## Overview

### Course Description

Part of the Engineering Physics core. A course that offers diverse experiences in problem analysis and system design similar to professional engineering practice, and an opportunity to practice and perfect the skills of technical writing and oral presentation. Part of a two-semester sequence, this course combined with ENGR 4312 (Senior Design 2) provides the capstone experience for engineering students.
**Students in this course will practise the process of engineering design to build artificial intelligence powered mobile robots.** Through the construction of mobile robots, students are expected to improve their skills and capabilities of identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade-offs, for the purpose of obtaining a high-quality solution under the given circumstances.

### Prerequisites

2.75 GPA or higher in ENGR and PHYS courses and consent of instructor. Not mandatory, but **ENGR 3410: Microcontrollers** and **ENGR 3421: Robotics I** are recommended to be taken in advance. Experience with mechanical design, Python/C++ programming and Robot Operating System (ROS) will be helpful.

## Textbooks

This is an open-ended project without a fixed textbook, but students are expect to read through the ROS Tutorial of Navigation: http://wiki.ros.org/navigation and Donkey Car's official documentations: https://docs.donkeycar.com.

## Supplies

This course will provide most (if not all) project supplies for free, including robot assembly parts, microcontrollers, computers, sensors, crafting tools, measuring tools, programming software etc.. Students are welcome to ask the instructor to purchase upgrading materials for their robots.

## Lab Meeting

Students are expected to attend all lab meetings. Attendance will help you effectively communicate with your advisor and your teammates and is part of your final grade. If you are sick, have a family emergency, or university sanctioned event please let me know in advance via email.
The Senior Design and Senior Capstone students will meet as a group joined by their faculty mentors regularly during the semester. It is expected that students will have brief updates on their project status or progress at these meetings. Feedback from peers and other advisors is encouraged. Clear, concise, and convincing presentation of your work is important.

## Progressive Updates

For the sake of improving academic writing and teamwork capabilities, students are expected to periodically update their projects' progress. Documented weekly updates are expected to be summarized on projects repositories using Github (or whatever platform fits the students' needs). Each team will prepare a mid-term report. The design of the prototypes and preliminary results are expected. All the team will submit a final report to demonstrate the completeness of their project with highlights and details.

## Grading

A's are 90-100%, B's are 80-89%, C's are 65-79%, D's are 64-50%, F's are 0-49%. The final grade will be determined by following criteria.

| Component | Percentage | Requirement |
|---|---|---|
| Prototype | 30% | Functional |
| Reports | 20% | Well-written |
| Attendance | 10% | show up in the lab |
| Weekly updates | 20% | Well-documented |
| Final presentation | 20% | completed and highlighted |
| Total | 100% | |

## Other Policies

The policies and procedures detailed in the UCA 2020-21 Student handbook are also part of this syllabus. Please refer to the relevant policies as your guidance.
https://uca.edu/student/files/2021/03/STUDENT-HANDBOOK-2020-21-2.pdf

If a student discloses an act of sexual harassment, discrimination, assault, or other sexual misconduct to a faculty member (as it relates to "student-on-student" or "employee-on-student"), the faculty member cannot maintain complete confidentiality and is required to report the act and may be required to reveal the names of the parties involved. Any allegations made by a student may or may not trigger an investigation. Each situation differs and the obligation to conduct an investigation will depend on those specific set of circumstances. The determination to conduct an investigation will be made by the Title IX Coordinator. For further information, please visit: https://uca.edu/titleix. *Disclosure of sexual misconduct by a third party who is not a student and/or employee is also required if the misconduct occurs when the third party is a participant in a university-sponsored program, event, or activity

The University of Central Arkansas affirms its commitment to academic integrity and expects all members of the university community to accept shared responsibility for maintaining academic integrity. Students in this course are subject to the provisions of the university's Academic Integrity Policy, approved by the Board of Trustees as Board Policy No. 709 on February 10, 2010, and published in the Student Handbook. Penalties for academic misconduct in this course may include a failing grade on an assignment, a failing grade in the course, or any other course-related sanction the instructor determines to be appropriate. Continued enrollment in this course affirms a student's acceptance of this university policy.

In addition to UCA's Academic Integrity policy we will also be mindful and knowledgeable of the National Society of Professional Engineers Code of Ethics.
https://www.nspe.org/resources/ethics/codeethics

The University of Central Arkansas adheres to the requirements of the Americans with Disabilities Act. If you need an accommodation under this Act due to a disability, please contact the UCA Office of Disability Services, 501-450-3613.

## Project Workflow

### Phase 1 - Project Preparation

Students will be introduced to the projects. Doing literature survey, reading documentations and learning new skills will be necessary. General plans are expected to be proposed. To work as a team, it is recommended to clarify each member's duties.

### Phase 2 - Design and Prototyping

Student will design and construct the prototypes based on their knowledge. The basic safety and functionalities of the prototypes will be tested and reported. Revised plans are expected to be proposed due to the progress.

### Phase 3 - Completing

The robots are expected to be upgraded with more autonomous capabilities. Students will be expected to test and report the more complicated robots, progressively.

### Phase 4 - Finalizing

Student will hand over final report and present the completeness of the robots by the end of the semester. Highlighted and detailed demonstrations are expected.