ENGR 3421: Robotics I (CRN22663)
Fall, 2023

Class & Lab

Time: Tuesday & Thursday, 10:50 AM–1:30 PM
Location: Lewis Science Center Annex (LSCA) 105
Course Materials: https://linzhanguca.github.io/robotics_1-2023

Instructor

Name: Lin Zhang
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Office Hours: Wednesday 10:00 AM – 12:00 PM *Look for me in LSC 013 or LSC 110 if not in office.*
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Overview

Course Description

Robotics I is a course that introduces the basic scientific and engineering knowledge of robots. Students are expected to familiarize the knowledge by assembling and programming autonomous mobile robots with gradually increased complexity. The classes will mix lectures and labs to help students better understand robotics. Students will work independently to build their own robots, but communications and discussions with others is highly encouraged. See **Course Content** section for more details.

Prerequisites

No courses nor skills are required in advance. Though, taking **ENGR 3410: Microcontrollers** and/or experience of Python programming or Linux may boost the speed of learning.

Textbooks

No textbooks is required. The philosophy of this class is somehow comply with The Robotics Primer by Maja Matarić. Also, the students are expected to read a lot of online materials.

Supplies

This course will provide all the supplies for free, including laptop computers, robot assembly parts, microcontrollers, sensors, crafting tools, measuring tools, programming software etc.. Students are welcome to ask the instructor to purchase helpful supplies if needed.

Students can take the robots and computers out of the classroom. Tools, computer peripherals (monitors, keyboards and mice) can be taken out if asked for permission.

Classroom Policy

The instructor and the students are expected to appear in the classroom/lab in every class. If any student cannot show up on time, he/she needs to contact the instructor in advance. The instructor will notify the students with any changes of a class in advance. No food nor drinks are allowed in the classroom/lab.

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	Notes
Attendance	1%	Attend every class
Assignments	50%	Code
Projects	30%	Code and README
Final Demonstration	19%	Presentation
Total	100%	

Other Policies

The policies and procedures detailed in the UCA 2022-2023 Student handbook are also part of this syllabus. Please refer to the relevant policies as your guidance.
https://uca.edu/student/files/2023/08/STUDENT-HANDBOOK-2023-2024.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 is encouraged to report the act to the Title IX coordinator, deputy coordinator, or employee with the authority to institute corrective measures on behalf of the University. An investigation of a formal complaint of Title IX Sexual Harassment will only be initiated when the Complainant (individual who suffers actual harm from the violation of the Title IX Sexual Harassment Policy) or the Title IX Coordinator signs a complaint. 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 encouraged if the misconduct occurs when the third party is a participant in a university-sponsored program, event, or activity.

Academic Integrity

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.

Building Emergency Plan

An Emergency Procedures Summary (EPS) for the building in which this class is held will be discussed during the first week of this course. EPS and Building Emergency Plan (BEP) documents for

most buildings on campus are available at https://uca.edu/go/bep-library. Every student should be familiar with emergency procedures for any campus building in which he/she spends time for classes or other purposes.

Disabilities

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 Office of Accessibility Resources and Services (OARS), 450-3613.

Course Evaluation

The Student Course Experience Survey is a crucial element in helping faculty achieve excellence in the classroom and the institution in demonstrating that students are gaining knowledge. Students may complete surveys for courses they are taking starting on Monday, November 20th, through the Sunday, December 17th after finals week by logging in to myUCA and clicking on the Course Evaluations task.

Course Contents

Please refer to the following for a tentative course plan. The actual contents will be subject to changes due to the progress of the course. **Note: all assignments and projects due at 1:30 pm on Thursdays.**

Module 1 - Micro-Controller Review

Students will be introduced to the micro-controller, Raspberry Pi Pico and basic skills to operate it.

- **Assignment 1:** Assemble the mobile robot base. **Due date:** Thursday, 08/31/2023.
- **Assignment 2:** Blink LED. **Due date:** Thursday, 09/07/2023.
- **Project 1:** Human Interface. **Due date:** Thursday, 09/14/2023.

Module 2 - Sensing & Actuation

Students will be introduced to the common actuators and sensors used in robotics. Motor driving will be practiced.

- **Assignment 3:** Drive DC motor. **Due date:** Thursday, 09/21/2023.
- **Assignment 4:** Drive Servo motor. **Due date:** Thursday, 09/28/2023.
- **Assignment 5:** Ultrasound distance sensing. **Due date:** Thursday, 10/05/2023.
- **Assignment 6:** Speed, mileage monitoring. **Due date:** Thursday, 10/12/2023.

Module 3 - Decision Making

Students will be introduced to more sensors and the single board computer, Raspberry Pi. Students will expect to build simple autonomous applications based on integrated sensors and actuators.

- **Project 2:** Wall bouncer. **Due date:** Thursday, 10/26/2023.

- **Assignment 7:** Light detection and ranging. **Due date:** Thursday, 11/02/2023.

- **Assignment 8:** ArUco follower. **Due date:** Thursday, 11/09/2023.

- **Final Project:** Assisted navigation. **Due date:** Tuesday, 12/12/2023.