ENGR 3421: Robotics I (CRN22663)
Fall, 2024

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_1-2024

Instructor

Name: Lin Zhang
Office: LSCA 105 *Look for me in LSC 013 or LSC 110 if not in Annex building.*
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Webpage: https://uca.edu/physics/facultystaff/lin-zhang-phd/

Overview

Course Description

Robotics I is a course that introduces the basic scientific and engineering knowledge of robots. Students in this course are expected to gain such knowledge by building and tinkering mobile robots with gradually increased complexity. The classes will mix lectures, workshops and labs to help students better understand robotics. A Students will work independently to build his/her own robot, but discussions with people in and out of the classroom is highly encouraged. See **Course Contents** section for more details.

Prerequisites

No courses nor skills are pre-required. Though, taking *ENGR 2447: Electronics*, *ENGR 3311: Engineering Dynamics*, *ENGR 3410: Microcontrollers*, *ENGR 3447: Microelectronics* in advance may help the students grabbing the essense more quickly. Also, experience with Python programming or any other programming skills may be helpful.

Textbooks

No textbook is required. The philosophy of this class is somehow comply with The Robotics Primer by Maja Matarić.

Supplies

The Department of Physics, Astronomy and Engineering will provide all the supplies for free. Including workbenches, robot assembly parts, laptop computers, tools, software etc.. Students are welcome to ask the instructor to purchase additional supplies if needed.

If a student need to take any provided supplies out of the classroom/lab, please ask for the instructor's permission.

Attendance Policy

- The instructor and the students are expected to appear in the classroom/lab in every class.
- If a 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.

Safety Requirement

- **Wear safety goggles in the classroom/lab all the time!**
- **Disconnect batteries before heading out!**
- No food nor drinks are allowed on the workbench. A snack table will be provided near the entrance.

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	Note
Attendance/Perfection*	1%	Attend every class on time, need a bit good luck.
Assignments	50%	Follow the rubric comes with each assignment.
Projects	30%	Follow the rubric.
Final Demonstration	19%	Peers and faculty members will assess it.
Total	100%	

* No excuse will be accepted unless traveling with UCA athletic teams.

Other Policies

The policies and procedures detailed in the UCA 2024-2025 Student handbook are also part of this syllabus. Please refer to the relevant policies as your guidance.
https://uca.edu/student/files/2024/08/The-UCA-Student-Handbook-2024-2025.pdf

Title IX

UCA has long been committed to providing a fair and consistent process for students, faculty, and staff to report incidents of sexual harassment and sexual misconduct, and will continue to do so under these new Title IX rules. The new rules became effective on August 14, 2020. As always, members of the campus community who have experienced Title IX Sexual Harassment (including sexual harassment, sexual assault, dating violence, domestic violence, stalking, and the unauthorized distribution of sexual images or recordings) are encouraged to report these incidents to the Title IX Coordinator. For further information, please visit: https://uca.edu/titleix/.

The University encourages individuals to report alleged sexual crimes promptly to campus officials and the University of Central Arkansas Police Department. Individuals are strongly encouraged to submit reports promptly in order to preserve evidence for a potential legal or disciplinary proceeding. All complaints or reports of Title IX Sexual Harassment should be submitted to the Title IX Coordinator:

Adam Rose
Associate General Counsel and Title IX Coordinator
Wingo Hall, Suite 207
201 Donaghy Avenue Conway, Arkansas 72035
501-450-3247
Email: arose@uca.edu

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.

Generative AI

Use of Generative AI Tools in Engineering

The usage of generative AI (such as ChatGPT, Gemini, Claude, etc.) is highly encouraged in this course. You can use it for any assignments and projects, but you have to cite it properly.

- **Technical Reports and Projects**: When using AI-generated text or design suggestions in your reports or presentations, cite the tool used, e.g.,:
  OpenAI, "ChatGPT Response to How do I cite chatgpt's response following IEEE's standards?," ChatGPT, [Online]. Available: https://chatgpt.com/share/007f83e5-4426-41ae-88c6-c53343228e44. Accessed on: Aug. 19, 2024.
- **Code and Algorithms**: If AI contributed to a code snippet or algorithm in your work, include a comment noting its origin and a citation if required by the assignment/project guidelines.
- **Acknowledgment in Design or Research**: When AI plays a role in idea generation or refining your designs, include an acknowledgment in your report or project documentation explaining how it was used.

Ethical Use of Generative AI in Engineering

You can access generative AI anytime and anywhere. When using such tools in an engineering context, follow these ethical guidelines:

- **Transparency in AI Assistance**: Clearly disclose when and how AI contributed to your projects, reports, or problem-solving processes. Whether generating design ideas, writing code, or clarifying concepts, it's important to attribute AI's role honestly.
- **Academic Integrity and Learning**: Ensure your work reflects your understanding and effort. AI can assist with problem-solving, but it's crucial that you develop and demonstrate the core engineering skills you're learning in this course.
- **Safety and Accuracy in Technical Work**: AI-generated outputs are not always reliable, especially when it comes to technical calculations, design parameters, or safety-critical applications. Verify all AI-generated content against trusted engineering sources or industry standards.
- **Bias and Ethical Engineering Design**: AI models can introduce biases into design or problem-solving suggestions. It's important to critically evaluate these outputs, particularly in engineering applications that impact diverse populations or involve ethical considerations.
- **Respecting University and Industry Standards**: Adhere to both academic guidelines and professional engineering standards when using AI. Unauthorized or unacknowledged use of AI in technical reports, design projects, or exams can result in academic penalties.

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), (501)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 the courses they are taking starting on **Monday, December 2nd, through Sunday, December 15th** 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 - Getting Started

Students will be introduced to the basic components of a mobile robot. Skills such as power management, mechanical design and Python programming will be covered to help the students getting started.

- **Assignment 1:** Assemble the mobile robot base. **Due date:** Thursday, 08/29.
- **Assignment 2:** Light up an LED. **Due date:** Thursday, 09/05.
- **Project 1:** Human Robot Interface. **Due date:** Thursday, 09/12.

Module 2 - Sensing & Actuation

Students will be introduced to the common actuators and sensors used in robotics. Simple autonomy will be achieved using these components.

- **Assignment 3:** Drive the motors. **Due date:** Thursday, 09/19.
- **Assignment 4:** Ultrasound distance sensing. **Due date:** Thursday, 09/26.
- **Assignment 5:** Speed, mileage monitoring. **Due date:** Thursday, 10/03.
- **Project 2:** Wall bouncer. **Due date:** Thursday, 10/10.

Module 3 - Decision Making

Students will be introduced to controlling strategies of robotics. Autonomous navigating robots will be built with integrated components by the end of the semester.

- **Assignment 6:** Velocity control. **Due date:** Thursday, 10/24.
- **Assignment 7:** Light detection and ranging. **Due date:** Thursday, 11/07.
- **Assignment 8:** ArUco follower. **Due date:** Thursday, 11/21.
- **Final Project:** Integrated navigation. **Due date:** **Thursday @ 11:00 AM - 1:00 PM**, 12/12.