ENGR 4421: Robotics II (CRN33091)
Spring, 2022

Instructor

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Class & Lab

Time: Tuesday & Thursday, 10:50 AM–1:30 PM
Classroom: Lewis Annex (LSCA) 105

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

Robotics II is an engineering course that introduces a variety of advanced theories and technologies in robotics to our students. Students will be introduced to the principles of navigation, image processing, artificial intelligence, etc.. Students are expected to learn such knowledge by making and tweaking autonomous mobile robots. The classes will mix lectures and labs to help students better understand such principles. Students will work in teams to bring up their robots.

Prerequisites

Minimum grade of C in **ENGR 3421: Robotics I** is pre-required.

Textbooks

No textbook is required. The students are expected to read all kinds of literature from various sources.

Supplies

This course will provide everything 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.

Students can take their own robots, computers and sensors back home to work, but tools, monitors, keyboards and mice have to be kept in the classroom/lab.

Classroom 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 change of a class in advance. No food nor drinks are allowed in the classroom/lab.

Grading

A's are 86-100%, B's are 71-85%, C's are 56-70%, D's are 50-55%, F's are 0-49%. The final grade will be determined by following criteria.

Component	Percentage	Note
Attendance	1%	Show up in every class
Assignments	19%	Individual
Project 1	25%	Team
Project 2	25%	Team
Final Project	30%	Team; Presentation
Total	100%	

Other Policies

The policies and procedures detailed in the UCA 2021-22 Student handbook are also part of this syllabus. Please refer to the relevant policies as your guidance.

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.

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.

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.

Module 1 - Make Robot

- Design a skid steer driven mobile robot.
- Assemble the robot, include new components (RPLidar, Arduino Nano).
- Remote control and test drive.

Module 2 - Gazebo Simulation

- Robot description and URDF.
- Gazebo simulation software.
- Building a robot model using URDF format.
- Use ROS plugins in Gazebo.

Module 3 - Autonomous Navigation

- Adaptive Monte Carlo Localization.
- Simultaneous Localization and Mapping.
- Navigation in Gazebo and in real world.

Module 4 - Artificial Intelligence

- Deep neural networks.
- Reinforcement learning.