

EML 4930: Autonomous Vehicles Syllabus - Spring 2023

Autonomous Vehicles

EML 4930

Class Period: 1:55 PM - 2:45 PM MWF

Location: MAE-B 238

Term: Spring 2023

Instructor

Dr. Carl Crane

carl.crane@gmail.com

MAE-B 328

(352) 219-6433 (cell)

Office Hours: 9:30AM -10:30AM Tuesday

Teaching Assistant(s)

TBD

Required Textbook(s)

There are no required textbooks, all information to be successful in the class is available on the class website <https://av1tenth-docs.rtf.d.io>.

Course Objectives

By the end of the class, the students should have successfully met these objectives:

- Understand the Linux environment * Use command line tools
- Program in Python
- Use ROS2 to interface with a robotic system
- Understand the basics of vehicle kinematics and dynamics
- Implement PID Controllers in ROS2 and Python (Speed Control, Wall Following)
- Learn about Poses, Twists and Quaternion representations
- Learn about coordinate transformations
- Learn about reactive obstacle avoidance
- Understand path planning (A*, RRT, D*, etc.)
- **Outdoor Autonomous Navigation**
 - Learn about outdoor localization (GNSS)
 - Understand Sensor Fusion
 - Implement a outdoor path following algorithm

- **Indoor Autonomous Navigation**
 - Understand indoor localization (SLAM)
 - Implement indoor path following algorithms

Assignments and Grading

- 8 Milestones 35%
- 3 Projects 65%

The first two milestones will be individual, but the rest will be group work. Each assignment will be broken down further as follows:

- Pseudo Code or Flow Charts 25% of Assignment Grade (A student will be randomly selected from each group to explain their process flow to the instructor)
- Code Review 25% of Assignment Grade (A student will be randomly selected from each group to review the code)
- Program Performance 50% of the Grade

Other Pertinent Information

- All information will be conveyed through Canvas or the class website
- No late work will be accepted

Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

Honesty Penalty

All work is to be done individually or in groups where indicated. Any copied submission will result in a zero for that assignment and a letter grade reduction for the course. For example, if your final grade was to be a B+, it would be reduced to a C+. It will be considered an act of academic dishonesty (on both parties) if a student shares the solution with a student who did not exhibit an effort to complete the activity.

Accommodations for Students with Disabilities

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Student Privacy

There are federal laws protecting your privacy regarding grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.htm>

Health and Wellness

U Matter, We Care

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center

<http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu,
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling

<https://www.crc.ufl.edu/>

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring

<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers

<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus:

https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.