

# ECE 495 – Fundamentals of Robotics Research

## POLICIES AND ADMINISTRATION

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### 1. Course Goals:

Cadets shall develop fundamental skills using Linux, Python, and the Robotics Operating System to enable robotics research within the ECE department.

### 2. Course Objectives:

Cadets shall be able to:

- i. Utilize Linux operating system to run embedded systems.
- ii. Write, compile, and run Robotics Operating System (ROS) code in Python.
- iii. Interpret and explain in writing the functions laboratory work.
- iv. Evaluate, analyze, debug, and modify a given program to improve its execution of a specified task.
- v. Demonstrate a working knowledge of ROS and implement a controller interface between a specified microcomputer and other hardware.
- vi. Demonstrate the ability to solve well and ill-defined problems.

### 3. Course Prerequisites: None

### 4. Grade Distribution and Policy:

<u>Prog</u>		<u>Final</u>	
GRs	20%	GRs	20%
Labs	75%	Labs	50%
Quizzes	5%	Quizzes	5%
		Final Project	25%
<b>Total</b>	<b>100%</b>	<b>Total</b>	<b>100%</b>

Electrical and Computer Engineering courses are contract graded using the following 100 point scale:

<u>Grade</u>	<u>Grade</u>	<u>Grade</u>	<u>Grade</u>
$93 \leq A \leq 100$	$87 \leq B+ < 90$	$77 \leq C+ < 80$	$60 \leq D < 70$
$90 \leq A- < 93$	$84 \leq B < 87$	$74 \leq C < 77$	$0 \leq F < 60$
	$80 \leq B- < 84$	$70 \leq C- < 74$	

***You must complete all minimum functionalities on labs in order to complete the course. Even if an assignment is so late that no credit will be received, the assignment must be completed to the satisfaction of the instructor to prevent a grade of "Incomplete."***

**5. Primary Communication and Control (C2):** All communication and course material will be provided through a course/section **Team**. A Blackboard course will be used to provide grades. Lastly, GitHub will be used for cadets to provide their source code for laboratories.

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6. **Course Text:** There is no printed textbook for ECE 495. Reading materials/labs are posted on the **Teams** site.
7. **Course Website:** All files are conveniently distributed via the **Teams** site.
8. **Collaboration Policy:** For all assignments in this course, unless otherwise noted on the assignment, you may work with anyone. We expect all graded work, to include code, lab notebooks, and written reports, to be in your own work. Copying another person's work, with or without documentation, will result in **NO** academic credit. Furthermore, copying without attribution is dishonorable and will be dealt with as an honor code violation.
9. **EI Policy:** Schedule EI with an instructor if you are having difficulty with the course material. You must have read the assignment and attempted the homework *before* requesting EI. Note: You are responsible for material if you miss class, so get notes from someone in your section. For example, you miss the lesson where the instructor announces a quiz for the next lesson, or the instructor assigns homework due next lesson. Even though you missed the lesson, you are still responsible for the quiz, homework, or any other assignments made. It is in your best interest to check with your classmates after an absence. After you've read the assignment, attempted the homework, and checked with your classmates, you may then schedule EI if you have difficulty with the material—not to make up a class you missed.
10. **CAS Policy:** You must notify your instructor of any class absence (with a descriptive reason—don't just send a CAS code or SCA number) as soon as possible, preferably before the absence occurs. E-mail is the preferred method to notify your instructor. Be sure to check your SCA to see if instructor "notification" or "permission" is required. There is a difference! If you need "permission," be sure to ask as soon as you know you need it.
11. **Late Work Policy:** All work is due as shown on the syllabus or in the assignment. If problems arise with graded assignments, see your instructor in advance. Assignments turned in later than the due date **without prior permission** from the instructor will be penalized (with instructor discretion) 25% per **calendar** day.
12. **Readings:** Reading assignments are provided in the syllabus and should be done *prior* to class.
13. **Assignments:** Assignments and due dates are included in the syllabus.
14. **Exams and Quizzes:** All exams and quizzes are closed textbook and notes. Quizzes will be given at instructor discretion. Testable material includes any concepts from the labs, lectures, exercises, homework, and assigned readings. **Not all testable concepts will necessarily be covered in class (e.g., readings).**

For missed GRs, the following policies are outlined in USAFA FOI 537-3:

- **Scheduled Absence** - If you know that you will be unable to take the GR during the scheduled GR period, you are required to inform your instructor as soon as possible before the GR and to schedule a make-up exam.
- **Unscheduled Absence** - If you miss the GR for reasons beyond your control (e.g. hospitalization, emergency leave, delayed field trip return, etc.), you must contact DFEC (x3190) within two working days to schedule a makeup. Exceptions can only be granted by the Department Head.

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15. **Laboratories:** Labs are held in 2E48, but may include a prelab assignment that must be done before coming to class. The labs tend to be very hardware intensive and will probably require debugging to isolate and fix problems. In-class time is your primary chance to get active help for these problems so the more you prepare outside of class, the more successful you'll be. The 53 minutes go by extremely fast - don't waste them!

16. **Final Project:** The final project will be a culmination of the learned material and will include a robot competition. The final project will include a formal laboratory write-up and may include a five-minute presentation describing your design, solution, and results. The final project is worth 25% of your final grade.

17. **Miscellaneous:** This course is designed to help in your development as a robotics engineer. Feel free to provide feedback on the lessons and labs at any time. If you have ideas to improve or enhance the course, please let me know. The class builds on concepts from the prerequisites so it is important for you to seek help as soon as you need it. Procrastination is truly the enemy in a hardware design course. A little foresight and planning and a lot of effort will result in an extremely rewarding experience serving as the basis for future microprocessor design work.

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### 18. Course Schedule as of **31 January 2022**

Lsn	Topic	Due Before Class	During Period
1	Module 0 – Course Introduction, Master and Robot Introduction, GIT setup		Introduction & Admin
2	Module 1 – ROS		
3			Quiz 1 & ICE 1
4	Module 2 – Linux for Robotics		
5			Quiz 2 & ICE 2
6	Module 3 – Python3 for Robotics		
7			Quiz 3 & ICE 3
8			
9	Module 4 – Driving the Robot		ICE 4
10	Module 5 – Custom Messages		ICE 5
11			Lab 1
12			Lab 1
13	Module 6 – IMU	Lab 1	ICE 6
14			Lab 2
15			Lab 2
16	Module 7 – Launch file	Lab 2	ICE 7
17	<b>GR 1</b>		
18	Module 8 – LIDAR		ICE 8
19			Lab 3
20			Lab3

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Lsn	Topic	Due Before Class	During Period
21	Module 9 – Computer Vision: OpenCV	Lab 3	ICE 9
22			Lab 4
23			Lab 4
24			Lab 4
25	Module 10 – Computer Vision: AprilTags	Lab 4	ICE 10
26			Lab 5
27			Lab 5
28			Lab 5
29	Final Project – Requirements	Lab 5	Design Phase
30	Final Project – Design Briefs	Design phase brief	Briefings
31	Final Project – Implementation		Final Project
32			Final Project
33			Final Project
34			Final Project
35			Final Project
36			Final Project
37			Final Project
38			Final Project
39			Final Project
40	Final Project – Demos	Final Project Report	Demos