ECE 6562 Syllabus

Autonomous Control of Robotic Systems ECE 6562, Section Q, 3 Credits

Summer 2026

Instructor Information

Instructor: Jeffery Hurley

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General Course Information

Description

Course covers the fundamental issues associated with autonomous robot control. Emphasizes biological perspective that forms the basis of many current developments in robotics.

Course Learning Outcomes

Introduction: Anatomy of a Robot: Classification of Robots; Robot Configurations; Robot Components; Performance Characteristics.

Foundations: 2D and 3D affine transformations. Jacobian matrices. Simulation tools.

Kinematics: Modeling kinematic chains, Forward kinematics, Inverse kinematics.

Perception: Simple pinhole camera model, Basics in camera calibration, Triangular active sensing, Color space, Image filtering algorithms to reduce noise, Edge detection, Hough transform for lines and circles.

Reactive Behaviors: Feedback control. Basic navigation algorithms based on recognized landmarks. Obstacle avoidance. Path following and boundary following. Simple reactive behaviors to object detected by computer vision.

Motion and Path Planning: Distance transform, Breadth first search, the A* algorithm, Potential field-based method.

Dynamics and Control: Rigid body dynamics equations, Controller design for quadrotors and underwater vehicles.

Required Course Materials

Textbook: G.A. Bekey, *Autonomous Robots: From Biological Inspiration to Implementation and Control*, MIT Press, 2005. 978-0262025782.

Grading Policy:

Programming Assignments 70%; Final Project 30%.

A>90; B>80; C>70; D>60

Assignments

- Homework 1, 10%
- Homework 2, 10%
- Homework 3, 10%
- Homework 4, 10%
- Homework 5, 10%
- Homework 6, 10%
- Homework 7, 10%
- Final Project 30%

Description of Graded Components

There is a homework assignment for each of the major topics covered. The final project combines several of the topics covered.

Course Policies

Attendance and/or Participation

This will be an active classroom, where you will be expected to participate. I have noticed a drastic difference in the performance between students who regularly attend class and participate compared to those who don't. Therefore, course attendance and participation is considered when determining your final grade.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Core IMPACTS

This course does not count towards a Core IMPACTS area.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Pre- &/or Co-Requisites

None.

Collaboration, Group Work, and Use of Generative AI

You are allowed to consult with other students on all homework assignments, but any work you turn in must be written in your own hand.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

Late homework will be penalized accordingly. Homework extensions are given for illness, approved Institute activities or religious observances.