Sensor-based Robot Planning
EML 6934/4930
Class Periods: MWF Period 8 (3:00 PM – 3:50 PM)
Location: MAEB 211
Academic Term: Spring 2026

Instructor:
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Office Hours: Wednesdays 4-5 PM, NEB 565, or by appointment

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
TBD

Course Description
An introductory course on robot planning methods for a robotic platform with onboard sensors. Methods for robot path and motion planning will be covered in detail in this course. Robotics application problems, such as detection, classification, target tracking, and localization, will be covered. Topics also include basic machine learning, probability, Bayesian networks, and information theory, as they apply to applications previously mentioned.

Course Pre-Requisites / Co-Requisites
- A solid background in engineering mathematics, probability theory, dynamics and controls, kinematics, algorithms, and geometry
- Experience with MATLAB and/or Python
- EGM 3401 (Engineering Mechanics –Dynamics), EML 4312 (Control of Mechanical Engineering Systems) and EML 6281 (Robot Geometry I) with minimum grades of C.

Course Objectives
- Students will understand, analyze, and implement classic robot path and motion planning methods, such as cell decomposition, roadmaps, and sampling-based methods.
- Students will understand theoretical concepts in sensor planning, such as configuration spaces, C-obstacles, and C-targets, and apply the concepts in robotics applications.
- Students will be able to understand and formulate robotics problems such as detection, classification, target tracking, localization, and pursuit-evasion problems.
- Students will be able to formulate sensor planning problems and design and implement suitable algorithms for the problem.
- Students will understand and implement information-driven planning methods in robotics applications.

Materials and Supply Fees
None

Required Textbooks and Software
- No textbook is required. A couple of optional textbooks are listed below. No reading or problems will be assigned from these optional textbooks.
- Either MATLAB or Python 3 is required.

Recommended Materials
- (Optional) Silvia Ferrari and Thomas A. Wettergren, "Information-Driven Planning and Control," The MIT Press.
- (Optional) Sebastian Thrun, Wolfram Burgard and Dieter Fox, "Probabilistic Robotics," The MIT Press.
- (Optional) Jean-Claude Latombe, "Robot Motion Planning," Springer Science & Business Media.

Course Contents and Schedule
The contents and schedule are subject to change. All changes will be updated on Canvas.
Week 1:   Introduction, graph search algorithms
Week 2:   Configuration space
Week 3:   Cell decomposition, probabilistic road map (PRM)
Week 4:   Rapidly exploring random tree (RRT), holonomic and nonholonomic constraints
Week 5:   Potential field, information field, sensing objectives
Week 6:   Exam 1 (take-home)
Week 7:   Information theory for information gain, probabilistic sensor models (Bayesian network)
Week 8:   Pre-trained sensor model, next-best-view planning, multi-view planning
Week 9:   Exam 2 (take-home)
Week 10:   Spring break
Week 11:   Recursive state estimation and uncertainties, Bayes filters
Week 12:   Localization, active localization
Week 13:   Target tracking, active target tracking
Week 14:   Paper discussion 3: information gain-based exploration
Week 15:   Paper discussion 3: information gain-based exploration

Attendance Policy
Regular class attendance (In-person) is expected. Class participation will be graded based on in-class activities, such as quizzes, polls, surveys, and open discussions.
Excused absences must be consistent with university policies in the Graduate Catalog (https://catalog.ufl.edu/graduate/regulations) and require appropriate documentation. Additional information can be found here: https://gradcatalog.ufl.edu/graduate/regulations/

Class Expectations
Regular class attendance and active participation in paper discussion is expected. Paper discussions will follow a format of 'Role-Playing Paper-Reading Seminars': See https://colinraffel.com/blog/role-playing-seminar.html.

Make-Up Policy
Instructor notifications are required. See https://care.dso.ufl.edu/instructor-notifications. Note that, "Professors have the right to accept or reject the notification."

Evaluation of Grades

Assignment	Percentage of Final Grade
Participation	20%
Exam 1	30%
Exam 2	30%
Paper Discussion	20%
Total	100%

Grading Policy
Students are guaranteed to earn the grade point shown in the table based on their percent earned grade. For example, if a student earns 88.60% (Percent Grade Earned %GE = 88.60) then their grade point will be 3.33 (B+). %GE are rounded to the hundredths decimal place. For example, if a student earns 79.995% (Percent Grade Earned %GE = 79.995) it will be rounded up to 80.00%, and their grade will be 2.67 (B-). Higher grades can be assigned if the class is curved.

Percent Range	Grade	Grade Points
$94.00 \leq \%GE < 100.00$	A	4.00
$90.00 \leq \%GE < 94.00$	A-	3.67
$86.00 \leq \%GE < 90.00$	B+	3.33
$83.00 \leq \%GE < 86.00$	B	3.00
$80.00 \leq \%GE < 83.00$	B-	2.67

76.00 ≤ %GE < 80.00	C+	2.33
73.00 ≤ %GE < 76.00	C	2.00
70.00 ≤ %GE < 73.00	C-	1.67
66.00 ≤ %GE < 70.00	D+	1.33
63.00 ≤ %GE < 66.00	D	1.00
60.00 ≤ %GE < 63.00	D-	0.67
0.00 ≤ %GE < 60.00	E	0.00

More information on UF grading policy may be found at:
UF Graduate Catalog
Grades and Grading Policies

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University 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." The Honor Code (https://sccr.dso.ufl.edu/process/student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment
The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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
• HWCOE Human Resources, 352-392-0904, student-support-hr@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

Software Use
All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy
There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: https://registrar.ufl.edu/ferpa.html

Campus Resources:
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.
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> **Counseling and Wellness Center:** https://counseling.ufl.edu, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.
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> **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 suppor*t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Connections Center, Reitz Union, 392-1601. Career assistance and counseling; https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/;https://care.dso.ufl.edu.

On-Line Students Complaints*: https://distance.ufl.edu/getting-help/; https://distance.ufl.edu/state-authorization-status/#student-complaint.*