AI for Virtual Environments and Games (CEN 4930)
Autonomous Agents in Virtual Environments (CIS 6930)
Academic Term: Fall 2025

Instructor
Jeremiah Blanchard
jjb@eng.ufl.edu

Course Description
This course focuses on the development of artificial intelligence within the context of virtual environments games. Topics include fundamentals of virtual environment and game design and interfaces as well as common topics in AI specific to such environments. Techniques covered include problem-solving algorithms, turn-based decisions, and behavioral / decision-making techniques used to develop agents as characters. The course will focus not just on developing intelligent systems but also those that develop user interest / engagement to enhance user experiences.

Course Pre-Requisites / Co-Requisites
Prerequisite: COP 3530

Course Objectives
By the end of the semester, successful students should be able to:
- articulate critical elements of environment and game design and how they are applied in practice
- implement recognized problem-solving algorithms to solve a well-defined problem
- describe how problem-solving algorithms can be applied as decision-making behaviors
- combine simple steering behaviors to create fluid agent movement
- design agent decision-making behaviors using common industry frameworks
- create systems that are tailored for human rationality and expectations

Required Textbooks and Software
No media purchases are required. All materials will be provided. The College of Engineering requires students to have a mobile computing device (laptop) capable of running Windows, which students are required to bring to class.

Recommended Materials
- Artificial Intelligence for Games, Ian Millington, 2009, 2nd Edition, CRC Press
- The Art of Game Design: A Book of Lenses, Jesse Schell, 2014, CRC Press

Relation to Program Outcomes (ABET)

Outcome	Coverage[*]
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Medium
3. An ability to communicate effectively with a range of audiences	
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Low
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Medium
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

[*]Coverage is given as high, medium, or low. Empty boxes indicate outcomes not covered or assessed in the course.

Course Schedule

Wk	Subject	Quiz	Course Work
0	Syllabus, Introduction, History of Games & Sim	Q0, Q1	
1	Sim. Design & AI Fundamentals	Q2, Q3	G0
2	State Spaces & Breadth-First Searches	Q4, Q5	G1, Ex0 (Review)
3	Graph-Based Problem Solving	Q6, Q7	G2
	TRAVEL TO JAPAN		
4	Search Optimizations	Q8. Q9	G3
5	Alternative Approaches to Search	Q10,Q11	G4
6	*EXAM 1*		P1 (Path Planner)
7	Steering Behaviors	Q12, Q13	G5, Ex1 (Flocking)
8	Game Playing & Its Extensions	Q14, Q15	G6
9	*ASYNCHRONOUS WORK WEEK*		Ex2 (Reversi)
10	Decision-Making Frameworks	Q16,Q17	G7
11	Agent Rationality	Q18,Q19	G8
12	Neural Networks & Influence Maps	Q20,Q21	-
13	*EXAM 2*		
14	**Robocode Tournament**	-	G9, P2 (Robocode)

Evaluation of Grades

General Coursework		
Group Work (10-Drop-1)	10 x 9	9%
Projects (2)	125 x 2	25%
Assessments		
Quizzes (22-Drop-3)	10 x 19	19%
Exams (2)	140 x 2	28%

Differentiated Work	Undergraduate		Graduate	
Professionalism (UG)	10 x 1	1%		
Exercises (3)	60 x 3	18%	30 x 3	9%
Lit. Presentation (G)			100	10%

Grading Policy

Percent	Grade	Pts	Percent	Grade	Pts
93 – 100	A	4.00	73 - 76	C	2.00
90 – 92	A-	3.67	70 – 72	C-	1.67
87 – 89	B+	3.33	67 - 69	D+	1.33
83 – 86	B	3.00	63 - 66	D	1.00
80 – 82	B-	2.67	60 – 62	D-	0.67
77 – 79	C+	2.33	00 – 59	E	0.00

Graduate load is ~133% of undergraduate load. Information on UF policy may be found in the UF catalog (link).

Exercises. Short programming assignments intended to reinforce fundamental AI programming concepts.
Quizzes. Taken each day on the content previously assigned content for reinforcement.
Exams. Summative assessments; one will be taken at the midpoint and another at the end, of the class.
Group Work. Work / deliverables completed weekly by student groups. (*individual submission prohibited*)
Projects. Larger assignments, over multiple weeks, that thread together multiple concepts.

Attendance & Make-Up Policy

Requirements for attendance and make-ups for exams and other work in this course are consistent with university policies: https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

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

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 Expectations

Read and adhere to the syllabus. Emails requesting information contained in the syllabus will receive the lowest response priority with no guaranteed turnaround. Practically, this means responses will come only after the remaining email queue of the instructor is otherwise empty. This condition occurs approx. once every 24 months.

Students must act with honor; academic dishonesty will be strictly addressed. Sharing / copying, "borrowing" of code structure, discussing code structure, looking at code from another student, providing such code, and plagiarism, in addition to other dishonest behaviors, are considered academic dishonesty. No information regarding assignment solutions may be shared by students except at a conceptual level. If students implement algorithms from other sources, they must be cited. Students may not copy code from the Internet or other sources under any circumstances. Any student found to have violated these rules, whether a provider or receiver or unauthorized help, will be assigned a **grade of E (failing) in the course** and referred to the Honor Court. **When in doubt, ask.**

Grade reviews must be requested within one week of a grade being posted. After two weeks, no grades will be revisited. In the event of a grade review, the entire assignment will be reviewed.

All assignments are due by the time listed on Canvas. Projects and homework with a cascading deduction: one (1) weekday late for 10% penalty; two (2) for 25% penalty; or three (3) for 50% penalty. Quizzes and presentations may not be completed late for credit except with instructor approval for extenuating circumstances (see below).

Quiz, presentation, and meeting make-ups will not be permitted except in extenuating circumstances. For make-up consideration students must submit reputable written documentation. For planned events (e.g., weddings), the student must contact the instructor at least two weeks in advance. Please note: there is no guarantee of request accommodation. Social / networking / club event allowances are strictly at the discretion of the instructor.

Students should visit office hours for project help and grade questions. Do not send email to, send private messages to, or "@" instructors or TAs about project help or grades. The TAs and instructor will often try to answer questions in the chat when possible, but the way to get personalized help is to visit or make arrangements!

Students should not distract others in the lab. Students should refrain from watching videos; playing games; talking; sleeping; howling; biting toenails; screeching like a banshee; and other distracting behaviors in the lab.

Important non-project correspondence be via email. The chat system is helpful for simple questions and allows students to help one another, but students should not expect responses to important questions via chat. Please allow 48 business hours for responses; instructors and TAs have many responsibilities and respond as is practical.

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
• Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@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.

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.

Counseling and Wellness Center: https://counseling.ufl.edu, 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 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/state-authorization-status/#student-complaint*.