

**AI for Computer Games**  
CAP 4053  
*Academic Term: Spring 2020*

**Instructor:**

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**Course Description**

Examines the use of A.I. in computer games. Topics include general A.I. knowledge, path finding, movement, tactics and planning, strategy, state machines, learning, dialogue, and emotions.

**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 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

**Materials and Supply Fees**

None

**Professional Component (ABET):**

This course serves criteria (b) of ABET Professional Component, namely: “one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student’s field of study”. This course constitutes one-semester of engineering-specific coursework.

**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	High
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	Medium
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

\*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

## Required Textbooks and Software

There are no required materials for this course. All materials will be provided by the instructor. The College of Engineering requires students to have a mobile computing device (laptop) capable of running Windows.

## Recommended Materials

- Artificial Intelligence for Games
- Ian Millington
- 2009, 2<sup>nd</sup> Edition

## Course Schedule

Week 0:	History of Game AI (Quiz: Syllabus)
Week 1:	Game Design & AI Fundamentals (Quiz: History & Design; Ex0 Due)
Week 2:	Knowledge Representation & Basic Search (Quiz: Fundamentals & Representation)
Week 3:	A* and Graph Types (Quiz: Basic Search & A*)
Week 4:	Hierarchical Path Planning & Action Planning (Quiz: Graphs & HPP)
Week 5:	Other Searches & Steering Introduction (Quiz: Action Planning & Other Searches; P1 Due)
Week 6:	Steering Behaviors & Genetic Algorithms (Quiz: Steering)
Week 7:	Q&A and Midterm Examination (Ex1 Due)
Week 8:	Gameplaying Introduction
Week 9:	Minimax Algorithms & Decision Making Basics (Quiz: Gameplaying; Ex3 Due)
Week 10:	Behavior Trees & Irrational Agents (Quiz: Decision Frameworks)
Week 11:	Utility, Risk, & Influence Maps (Quiz: Utility Agents)
Week 12:	Neural Networks & Rule-Based Systems (Quiz: Pattern-Based Techniques)
Week 13:	Q&A and Final Examination
Week 14:	Team Project Presentations

## Attendance Policy, Class Expectations, and Make-Up Policy

Attendance in classroom sections is mandatory and will be taken each class. Attendance will be scored as part of class participation. Tardy students will be eligible for 75% credit if arriving within 15 minutes of the start of class. Tardies beyond 15 minutes will be considered unexcused absences. No makeups will be provided unless due to emergency or pre-arranged and approved by the instructor. Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.

## Evaluation of Grades

Assignment	Total Points	% of Final Grade
Exercises (3)	70 each	21%
Projects (2)	140 each	28%
Quizzes (10-Drop-1)	20 each	20%
Midterm Exam	120	12%
Final Exam	180	18%
Professionalism	10	1%
Extra Credit Project	30	3%
		<b>103%</b>

Final grades will be rounded to the nearest whole percentage point.

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

## Grading Policy

Percent	Grade	Grade Points
93 - 100	A	4.00
90 - 92	A-	3.67
87 - 89	B+	3.33
83 - 86	B	3.00
80 - 82	B-	2.67
77 - 79	C+	2.33
73 - 76	C	2.00
70 - 72	C-	1.67
67 - 69	D+	1.33
63 - 66	D	1.00
60 - 62	D-	0.67
0 - 59	E	0.00

### ***Students Requiring Accommodations***

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 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/>.

### ***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/policies/student-honor-code-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 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](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto: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](mailto: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](mailto: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](mailto: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://care.dso.ufl.edu>.

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