

 <b>FLORIDA ATLANTIC UNIVERSITY</b>	<b>COURSE CHANGE REQUEST</b> <b>Graduate Programs</b>		UGPC Approval _____ UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner _____ Catalog _____
	<b>Department</b> CEECS  <b>College</b> Engineering and Computer Science		
<b>Current Course Prefix and Number</b> CAP 6629	<b>Current Course Title</b> Reinforcement Learning		
<i>Syllabus must be attached for ANY changes to current course details. See <a href="#">Guidelines</a>. Please consult and list departments that may be affected by the changes; attach documentation.</i>			
<b>Change title to:</b>  <b>Change prefix</b> <b>From:</b> _____ <b>To:</b> _____ <b>Change course number</b> <b>From:</b> _____ <b>To:</b> _____ <b>Change credits*</b> <b>From:</b> _____ <b>To:</b> _____ <b>Change grading</b> <b>From:</b> _____ <b>To:</b> _____ <b>Academic Service Learning (ASL) **</b> <b>Add</b> <input type="checkbox"/> <b>Remove</b> <input type="checkbox"/>		<b>Change description to:</b>  <b>Change prerequisites/minimum grades to:</b> None.  <b>Change corequisites to:</b>  <b>Change registration controls to:</b>  Please list existing and new pre/corequisites, specify AND or OR and include minimum passing grade.	
<b>Effective Term/Year for Changes:</b> Spring 2021		<b>Terminate course? Effective Term/Year for Termination:</b>	
<b>Faculty Contact/Email/Phone</b> Hanqi Zhuang/zuang@fau.edu/ 297-3413			
<b>Approved by</b> Department Chair _____ Hanqi Zhuang College Curriculum Chair _____ Francisco Presuel-Moreno College Dean _____ <i>M. Cardelino</i> UGPC Chair _____ UGC Chair _____ Graduate College Dean _____ UFS President _____ Provost _____		<b>Date</b> _____ _____ 10/25/2020 _____ _____ _____ _____	

Email this form and syllabus to [UGPC@fau.edu](mailto:UGPC@fau.edu) 10 days before the UGPC meeting.

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<b>1. Course title/number, number of credit hours</b>	
Reinforcement Learning – CAP 6629	3 credit hours
<b>2. Course prerequisites, corequisites, and where the course fits in the program of study</b>	
Prerequisites: None	
<b>3. Course logistics</b>	
Term: Spring 2021	
Class location and time: TBA	
<b>4. Instructor contact information</b>	
<i>Instructor's name</i>	Dr. Zhen Ni / Xingquan Zhu
<i>Office address</i>	Engineering East (EE-96) Bldg., Room 436/EE 503B
<i>Office Hours</i>	TBA
<i>Contact telephone number</i>	561-297-0035/561-297-3452
<i>Email address</i>	zhenni@fau.edu / xzhu3@fau.edu
<b>5. TA contact information</b>	
<i>TA's name</i>	N/A
<i>Office address</i>	N/A
<i>Office Hours</i>	N/A
<i>Contact telephone number</i>	N/A
<i>Email address</i>	N/A
<b>6. Course description</b>	
Reinforcement learning aims to build programs to learn how to predict and act in a stochastic environment, based on past experience. This course will study theoretical properties and practical applications of reinforcement learning. Course topics include Markov decision process, dynamic programming, temporal-difference learning, planning and learning with tabular methods, and deep reinforcement learning.	
<b>7. Course objectives/student learning outcomes/program outcomes</b>	
<i>Course objectives</i>	The goal of this class is for students to gain theoretical knowledge and hands-on experiences of reinforcement learning. The class will study classical reinforcement learning methods, such as Markov decision process, dynamic programming, Q-learning, as well as advanced deep reinforcement learning methods. At the end of the class, students should be able to understand the whole process of building rewarding and learning solutions.
<b>8. Course evaluation method</b>	

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Home Work -	30%	(four homework, 10 pts each)
Midterm -	15%	(one midterm test)
Term Project -	25%	(one term project)
Reading material -	15%	(one student presentation on selected research paper)
Final -	15%	(one final exam)

**9. Course grading scale**

Grading Scale:  
90 and above: "A", 85-89: "A-", 76-84: "B+", 70-75: "B", 66-74: "C+", 60-65: "C", 50-59: "D", 49 and below: "F."

**10. Policy on makeup tests, late work, and incompletes**

*Makeup tests* are possible, and are given only if there is solid evidence of medical or otherwise family/personal emergency issues that prevent the student from participating in the exam. Makeup exam should be administered and proctored by department personnel unless there are other pre-approved arrangements

*Late work* is not acceptable.

*A grade of incomplete* will be assigned only in the case of solid evidence of medical or otherwise serious emergency situation.

**11. Special course requirements**

N/A

**12. Classroom etiquette policy**

University policy requires that in order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular phones and laptops, are to be disabled in class sessions.

**13. Attendance policy statement**

Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

**14. Disability policy statement**

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all

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campuses. For more information, please visit the SAS website at [www.fau.edu/sas/](http://www.fau.edu/sas/)

**15. Counseling and Psychological Services (CAPS) Center**

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>

**16. Code of Academic Integrity Policy Statement**

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see [University Regulation 4.001](#).

**17. Required texts/reading**

Richard S. Sutton and Andrew G. Barto, Reinforcement learning: An introduction, Second Edition, MIT Press, 2019

**18. Supplementary/recommended readings**

Csaba Szepesvari (Author), Ronald Brachman (Series Editor), Thomas Dietterich (Series Editor), Algorithms for Reinforcement Learning, Morgan and Claypool Publishers; 1 edition (June 25, 2010)

**19. Course topical outline, including dates for exams/quizzes, papers, completion of reading**

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<b>Weekly course topics</b>	
<b>Weekly schedule</b>	<b>Topic</b>
Week 1	Introduction to reinforcement learning
Week 2	Multi-armed bandits
Week 3	Goal, rewards, and policy evaluation functions (homework 1 posted)
Week 4	Dynamic Programming
Week 5	Asynchronous dynamic Programming (homework 1 due)
Week 6	Monte Carlo Methods (homework 2 posted)
Week 7	Temporal-difference learning
Week 8	Q-learning (homework 2 due)
Week 9	n-step Bootstrapping (homework 3 posted)
Week 10	Planning and Learning (mid-term test, term project announcement)
Week 11	Policy prediction with approximation (student presentation announcement, homework 3 due)
Week 12	Stochastic-gradient and semi-gradient methods
Week 13	Policy gradient methods: Actor-critic methods (homework 4 posted)
Week 14	Deep Reinforcement Learning
Week 15	Student Presentation (term project report due, homework 4 due)

**Project:** The goal of the term project is to practice knowledge learned from the class and have each student to work on a hands on project during the second part of the class. Each student is required to identify a suitable topic (such as Q-learning for stock trading), and apply reinforcement learning algorithms learned from the class to solve a research problem, implement and validate the design, and collect experimental results for reporting. Students will prepare a minimum 4-page term project technical report.