FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

UGPC Approval _____
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

Department CEECS

College College of Engineering and Computer Science
*(To obtain a course number, contact **erudolph@fau.edu**)*

Prefix CAP **Number** 5625	*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)* **Lab Code**	**Type of Course** Lecture	**Course Title** Computational Foundations of Artificial Intelligence

Credits *(Review Provost Memorandum)*
3

Effective Date *(TERM & YEAR)*
Fall 2019

Grading *(Select One Option)*
Regular (●)
Sat/UnSat ( )

Course Description *(Syllabus must be attached; see Guidelines)*
This course covers the mathematical and programming foundations of artificial intelligence (AI) and machine learning (ML) using contemporary programming languages and tools. As a result, students will develop familiarity with mathematical methods (and associated notation, software packages and libraries) that are widely used in AI and ML projects and literature.

Prerequisites	**Corequisites**	**Registration Controls** *(Major, College, Level)*
Graduate standing or permission of instructor	N/A	Graduate Students in the College of Engineering & Computer Science

Prerequisites, Corequisites and Registration Controls are enforced for all sections of course

Minimum qualifications needed to teach course:	**List textbook information in syllabus or here**
Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)	Math for Machine Learning: Open Doors to Data Science and Artificial Intelligence, by Richard Han. CreateSpace Independent Publishing Platform, 2018. ISBN-13: 978-1722823818.
Faculty Contact/Email/Phone Oge Marques/omarques@fau.edu/(561) 297-3857	**List/Attach comments from departments affected by new course** N/A

Approved by	***Date***
Department Chair	3/8/19
College Curriculum Chair	3/11/19
College Dean	3/11/2019
UGPC Chair	3/27/2019
UGC Chair	3/27/19
Graduate College Dean	3/27/2019
UFS President	
Provost	

Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

GRADUATE COLLEGE
MAR 12 2019
Received

Department of Computer and Electrical Engineering and Computer Science
Florida Atlantic University
Course Syllabus

1. Course title/number, number of credit hours	
Computational Foundations of Artificial Intelligence – CAP 5625	3 credit hours
2. Course prerequisites, corequisites, and where the course fits in the program of study	
Graduate standing or permission of instructor	
3. Course logistics	
Term: Fall 2019 *Room: TBD;* *Time: TBD;* *Final Exam*: TBD	
4. Instructor contact information	
Instructor's name *Office address* *Office Hours* *Contact telephone number* *Email address*	Oge Marques Engineering East (EE-96) Bldg., Rm. 441 TBD (561) 297-3857 omarques@fau.edu
5. TA contact information	
TA's name *Office address* *Office Hours* *Email address*	TBD TBD TBD TBD
6. Course description	
This course covers the mathematical and programming foundations of artificial intelligence (AI) and machine learning (ML) using contemporary programming languages and tools. As a result, students will develop familiarity with mathematical methods (and associated notation, software packages and libraries) that are widely used in AI and ML projects and literature.	
7. Course objectives/student learning outcomes/program outcomes	
Course objectives	By the end of the course, students will be able to: 1. Understand the mathematical foundations of artificial intelligence (AI) and machine learning (ML) from a software development perspective. 2. Demonstrate proficiency in using contemporary programming languages, libraries and tools for solving AI and ML problems. 3. Identify and apply appropriate mathematical models and computational tools to AI and ML problems. 4. Analyze the performance of specific AI and ML models and software libraries as applied to selected problems and justify their use and limitations.
8. Course evaluation method	
Problem Sets (2): 40%; Programming assignments (5): 50%; Quizzes (2): 10%	
9. Course grading scale	
Grading Scale: 90 and above: "A", 86-89: "A- ", 82-85: "B+", 80-83: "B", 76-79: "B- ", 72-75: "C+", 68-71: "C", 64-67: "C-", 60-63: "D+", 56-59: "D", 52-55: "D- ", 51 and below: "F."	
10. Policy on makeup tests, late work, and incompletes	
Makeup exams are given only if there is solid evidence of a medical or otherwise serious emergency that prevented the student of participating in the exam. Makeup exams will be administered and proctored by department personnel unless there are other pre-approved arrangements *Incomplete grades* are against the policy of the department, unless there is solid evidence of medical or otherwise serious emergency situation incomplete grades will not be given.	
11. Special course requirements	

None

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. 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)—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 203 (954-236-1222); or in Jupiter, SR 110 (561-799-8585) —and follow all SAS procedures.

14. Honor code policy

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 unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and place high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. See University Regulation 4.001 at www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf

15. Counseling and Psychological Services 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. Required texts/reading

Math for Machine Learning: Open Doors to Data Science and Artificial Intelligence, by Richard Han. CreateSpace Independent Publishing Platform, 2018. ISBN-13: 978-1722823818.

17. Course topical outline

DATE	TOPIC
Week 1	-Course Introduction -Equations, graphs, and functions (review, from programming perspective) -Python, Jupyter notebooks, and selected Python packages -Programming Assignment (PA) 1 posted
Week 2	- Derivatives and optimization (review, from programming perspective) -Problem Set (PS) 1 posted
Week 3	- Vectors and matrices in machine learning models - Features and models - Least squares, linear independence and orthogonality - Linear classifiers - Loss, risk, generalization -PA 1 due; PA 2 posted
Week 4	- Logistic Regression
Week 5	- Maximal margin classifiers - Support Vector Classifiers - Support Vector Machines -PA 2 due; PA 3 posted
Week 6	- Dimensionality reduction - Singular Value Decomposition - Principal Component Analysis

	- PS 1 due; PS 2 posted
Week 7	- Overfitting and Regularization - PA 3 due; PA 4 posted
Week 8	- Overfitting and Regularization -Quiz 1
Week 9	- Iterative Methods - Stochastic Gradient Descent (SGD) and variations
Week 10	- Neural networks and backpropagation
Week 11	- Neural networks and backpropagation
Week 12	- Statistics and probability (review, from programming perspective) - PA 4 due; PA 5 posted
Week 13	- Statistical Models - Density estimation and maximum likelihood estimation - Gaussian mixture models and Expectation Maximization
Week 14	- Ensemble Methods - AdaBoost - Decision trees - PS 2 due
Week 15	- Random forests, bagging - PA 5 due
Final Exam	Quiz 2