

 FLORIDA ATLANTIC UNIVERSITY	NEW COURSE PROPOSAL Undergraduate Programs		UUPC Approval <u>3-28-22</u> UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner Posted _____ Catalog _____
	Department Electrical Eng & Computer Science and Biology College Engineering and Science <i>(To obtain a course number, contact erudolph@fau.edu)</i>		
Prefix IDS Number 4722	<i>(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)</i> Lab Code	Type of Course <input type="text" value="Lecture"/>	Course Title Artificial Intelligence Applications in Biology
Credits <i>(Review Provost Memorandum)</i> 3	Grading <i>(Select One Option)</i> Regular <input checked="" type="radio"/> Sat/UnSat <input type="radio"/>	Course Description <i>(Syllabus must be attached; see <u>Template</u> and <u>Guidelines</u>)</i> This course introduces the underlying concepts, techniques, and the potential of artificial intelligence (AI) in biology. It explores the application of AI and machine learning (ML) methods and algorithms to selected areas in biology. The course also exposes students to contemporary interactive tools to build AI and ML solutions without the need for extensive programming.	
Effective Date <i>(TERM & YEAR)</i> Fall 2022	Prerequisites, with minimum grade* PCB 3063 or BCH 3033 or permission of instructor		Corequisites None
		Registration Controls <i>(Major, College, Level)</i> None	
*Default minimum passing grade is D-. Prereqs., Coreqs. & Reg. Controls are enforced for all sections of course			
WAC/Gordon Rule Course <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to proposal. See <u>WAC Guidelines</u> .		Intellectual Foundations Program (General Education) Requirement <i>(Select One Option)</i> None General Education criteria must be indicated in the syllabus and approval attached to the proposal. See <u>GE Guidelines</u> .	
Minimum qualifications to teach course MS or PhD in a STEM discipline			
Faculty Contact/Email/Phone Oge Marques/omarques@fau.edu/7-3857		List/Attach comments from departments affected by new course	
Approved by Department Chair <u>Sarah L. Putnam</u> College Curriculum Chair <u>Hongbo Su</u> College Dean <u>[Signature]</u> UUPC Chair <u>Ethlyn Williams</u> Undergraduate Studies Dean <u>Dan Meeroff</u> UFS President _____ Provost _____		Date <u>3-14-22</u> <u>3/18/22</u> <u>3/18/22</u> <u>3-28-22</u> <u>3-28-22</u> _____ _____	

Email this form and syllabus to mjennning@fau.edu seven business days before the UUPC meeting.

**Department of Electrical Engineering and Computer Science
and the Department of Biological Sciences
Florida Atlantic University
Course Syllabus - DRAFT**

1. Course title/number, number of credit hours	
Artificial Intelligence Applications in Biology – IDS 4722	3 credit hours
2. Course prerequisites, corequisites, and where the course fits in the program of study	
PCB 3063 or BCH 3033 or permission of instructor	
3. Course logistics	
Term: Fall 2022 Room: TBD; Time: TBD; Final Exam: TBD	
4. Instructor contact information	
<i>Instructor's name</i>	Oge Marques
<i>Office address</i>	Engineering East (EE-96) Bldg., Rm. 441
<i>Office Hours</i>	TBD
<i>Contact telephone number</i>	(561) 297-3857
<i>Email address</i>	omarques@fau.edu
<i>Instructor's name</i>	TBD (from Dept of Biology)
<i>Office address</i>	TBD
<i>Office Hours</i>	TBD
<i>Contact telephone number</i>	TBD
<i>Email address</i>	TBD
5. TA contact information	
<i>TA's name</i>	TBD
<i>Office address</i>	TBD
<i>Office Hours</i>	TBD
<i>Email address</i>	TBD
6. Course description	
This course introduces the underlying concepts, techniques, and the potential of artificial intelligence (AI) in biology. It explores the application of AI and machine learning (ML) methods and algorithms to selected areas in biology. The course also exposes students to contemporary interactive tools to build AI and ML solutions without the need for extensive programming.	
7. Course objectives/student learning outcomes/program outcomes	
<i>Course objectives</i>	By the end of the course, students will be able to: <ul style="list-style-type: none"> 1. Understand the fundamental concepts of artificial intelligence and machine learning. 2. Identify and apply appropriate AI and ML models and computational tools to specific problems in biology. 3. Analyze the performance of specific AI and machine learning models as applied to biological problems and justify their use and limitations.
8. Instructional Method	
This course is designated as In-Person.	
9. COVID-19 Statement	

**Department of Electrical Engineering and Computer Science
and the Department of Biological Sciences
Florida Atlantic University
Course Syllabus - DRAFT**

Due to the surge in COVID-19 cases and the omicron variant, all students regardless of vaccination status are expected to wear masks while indoors in any FAU facilities, including classrooms and laboratories. Students experiencing flu-like symptoms (fever, cough, shortness of breath) or students who have come in contact with confirmed positive cases of COVID-19 should immediately contact FAU Student Health Services (561-297-3512). Symptomatic students will be asked to leave the classroom to support the safety and protection of the university community. For additional information visit www.fau.edu/coronavirus. In classes with face-to-face components, quarantined students should notify me immediately as you will not be able to attend class. I will not be able to offer an online version of the class but will make reasonable efforts to assist students in making up the work.

10. Course evaluation method

Homework assignments (4 out of 5): 60%

Tests (2): 40%

Assignments will be hands-on and will use the latest contemporary tools for AI / ML with minimal or no coding and relevant (publicly available) datasets.

Tests will cover conceptual topics related to AI and ML and their use in selected problems in Biology.

11. Course grading scale

Grading Scale:

93 and above: "A", 90-92: "A-", 87-89: "B+", 83-86: "B", 80-82: "B-", 77-79: "C+", 73-76: "C", 70-72: "C-", 67-69: "D+", 63-66: "D", 60-62: "D-", 59 and below "F."

12. Attendance Policy

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.

13. Policy on makeup tests, late work, and incompletes

Makeup exams are given only if students can provide evidence of a University-approved reasons for their absence as described in the FAU Catalog. Makeup exams will be administered and proctored by department personnel unless other pre-approved arrangements have been made with the instructors. Unless students can provide solid evidence of medical or otherwise exceptional circumstances, *incomplete grades* will not be given.

14. Special course requirements

None

15. 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.

16. Policy on the Recording of Lectures

Students enrolled in this course may record video or audio of class lectures for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording class activities other than class lectures, including but not limited to student presentations

**Department of Electrical Engineering and Computer Science
and the Department of Biological Sciences
Florida Atlantic University
Course Syllabus - DRAFT**

(whether individually or as part of a group), class discussion (except when incidental to and incorporated within a class lecture), labs, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations between students in the class or between a student and the lecturer, is prohibited. Recordings may not be used as a substitute for class participation or class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct and/or the Code of Academic Integrity.

17. 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—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 203 (954-236-1222); or in Jupiter, SR 110 (561-799-8585)—however disability services are available for students on all campuses. For more information please visit the SAS website at www.fau.edu/sas/.

18. Code Academic Integrity/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](http://www.fau.edu/regulations/chapter4/4.001%20Code%20of%20Academic%20Integrity.pdf)

19. 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/>

20. Required texts/reading

- Andreas C. Müller and Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", O'Reilly 2016 - ISBN-13: 978-1449369415\Python Data Science Handbook: Essential Tools for Working with Data, 1st Edition
Author: Jake VanderPlas; ISBN-13: 978-1491912058

21. Course topical outline

Week	Topic(s)	Assignment(s)
Week 1	Introduction to the course contents and tools + What is AI (history, scope, definitions, concepts, applications, limitations, implications)	Assigned readings
Week 2	Python programming bootcamp	Assigned readings
Week 3	Python programming bootcamp	Assigned readings
Week 4	Exploratory Data Analysis (EDA) + Data Visualization + Unique characteristics and challenges in biology - HW 1 posted	Assigned readings Begin HW 1
Week 5	Fundamentals of Machine Learning and Model Thinking + The ML workflow	Assigned readings Continue HW 1
Week 6	Supervised Learning + Linear Models for Regression and Classification + Nearest-Neighbor Methods + <i>Application 1: Gene expression analysis, Biomarker discovery, Precision medicine</i> - HW 2 posted	Assigned readings HW 1 Due Begin HW 2

**Department of Electrical Engineering and Computer Science
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Course Syllabus - DRAFT**

Week 7	Trees, Forests and Ensembles	Assigned Readings Continue HW2
Week 8	Unsupervised Learning, Principal Component Analysis (PCA) + Clustering + <i>Application 2: Single cell RNA-seq analysis, other genomic applications</i> - HW 3 posted	Assigned Readings HW2 Due Begin HW3
Week 9	Model Evaluation, Calibration, Imbalanced Data + Model Interpretation Week 10: Feature Selection and Feature Engineering + <i>Application 3: Gene discovery, Regulatory motif discovery, CpG islands</i> – HW 4 posted	Assigned Readings HW3 Due Begin HW4
Week 11	Parameter Tuning + Experiment management + Automatic Machine Learning	Assigned Readings Continue HW4
Week 12	Neural Networks and Deep Learning + <i>Application 4: Biomedical image analysis</i> – HW 5 posted	Assigned Readings HW4 Due Begin HW5
Week 13	Neural Networks and Deep Learning + <i>Application 4: Biomedical image analysis</i>	Assigned Readings Continue HW5
Week 14	Ethical, legal, and social issues of AI in Biology	Assigned Readings Continue HW5
Week 15	Communicating Results + Deploying AI and ML Solutions – HW 5 due	Assigned Readings HW5 Due