FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

Department EECS

College ENG&CS

*(To obtain a course number, contact **erudolph@fau.edu**)*

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

Prefix EEL

Number 6556

(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)
Lab Code

Type of Course Lecture

Course Title Signal Processing for Machine Learning

Credits *(Review Provost Memorandum)* 3

Effective Date *(TERM & YEAR)* Spring 2023

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

Course Description *(Syllabus must be attached; see Guidelines)*

This is a project-based course emphasizing signal processing methods that are used to prepare signals for machine learning and signal processing methods that can be adapted into the machine learning architecture.

Prerequisites

None

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

Academic Service Learning (ASL) course ☐

Academic Service Learning statement must be indicated in syllabus and approval attached to this form.

Corequisites

None

Registration Controls *(For example, Major, College, Level)*

Eng or CS Graduate Standing or approval by instructor

Minimum qualifications needed to teach course:
Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)

List textbook information in syllabus or here

See attached syllabus

Faculty Contact/Email/Phone

erdol@fau.edu

List/Attach comments from departments affected by new course

Approved by		*Date*
Department Chair		8/31/2022
College Curriculum Chair		9/19/2022
College Dean	Mihaela Cardei (Oct 13, 2022 10:51 EDT)	9/19/2022
UGPC Chair		Oct 13, 2022
UGC Chair	Mihaela Cardei (Oct 13, 2022 10:51 EDT)	Oct 13, 2022
Graduate College Dean		Oct 17, 2022
UFS President		
Provost		

Email this form and syllabus to UGPC@fau.edu 10 days before the UGPC meeting.

COURSE DESCRIPTION

This is a project-based course emphasizing signal processing methods that are used to prepare signals for machine learning and signal processing methods that can be adapted into the machine learning architecture.

INSTRUCTIONAL METHOD

A brief statement about the Instructional Method and the expectations for student attendance in the class will be included here. For a list of the Instructional Methods and their definitions, see https://www.fau.edu/registrar/courses/Instru_Method.php.

PREREQUISITES/COREQUISITES

None.

COURSE OBJECTIVES/STUDENT LEARNING OUTCOMES

- Learn mathematical models for signals, systems and transformations.
- Learn methods that extract information from signals.
- Learn about the theory of machine learning relevant to signal processing applications
- Learn how to implement algorithms for processing, manipulating, and classifying signals.

COURSE EVALUATION METHOD

THERE WILL BE FOUR PROJECTS:

PROJECT 1: SEPTEMBER 19, 2022

PROJECT 2: OCTOBER 3, 2022

PROJECT 3: OCTOBER 24, 2022

PROJECT 4: DECEMBER 5, 2022.

First three projects will be common to all, i.e. I will assign them. Project number 4 will be proposed by the student.

Deliverables for the first 3 projects will be a report. All reports will contain the m-files developed for the project. If you know how to use MATLAB's report generator, you may use it.

For Project 4, you will submit a report and make a final project presentation.

Class participation involves attending lectures or watching recordings in a timely fashion, asking questions about the subject that motivates discussion, starting or responding to online Discussion Board threads and being able to answer questions about all projects when making the final presentation. I will give a participation score approximately every four weeks.

Assessment		**Weight (%)**
Project 1	September 19, 2022 11:59 PM	15 %
Project 2	October 3, 2022 11:59 PM	15 %
Project 3	October 24, 2022 11:59 PM	15 %
Project 4	December 5, 2022 11:59 PM	40 %
Class Participation	All semester	15%
TOTAL:		**100%**

COURSE GRADING SCALE

Grade Scale

Grade	Total (%)
A	93 – 100
A-	88 – 92
B+	83 – 87
B	78 – 82
B-	73 – 77
C+	68 – 72
C	63 – 67
C-	58 – 62
D+	53 – 57
D	48 – 52
D-	43 – 47
F	0 – 42

POLICY ON MAKEUP TESTS, LATE WORK, AND INCOMPLETES

Project due dates have been announced in the course syllabus and students are expected to adhere to them.

CLASSROOM ETIQUETTE POLICY STATEMENT

Disruptive behavior is defined in the FAU Student Code of Conduct as "... activities which interfere with the educational mission within classroom." Students who disrupt the educational experiences of other students and/or the instructor's course objectives in a face-to-face or online course are subject to disciplinary action. Such behavior impedes students' ability to learn or an instructor's ability to teach. Disruptive behavior may include, but is not limited to, non-approved use of electronic devices (including cellular telephones); cursing or shouting at others in such a way as to be disruptive; or, other violations of an instructor's expectations for classroom conduct.

NETIQUETTE

Due to the casual communication common in the online environment, students are sometimes tempted to relax their grammar, spelling, and/or professionalism. Please remember that you are adult students and professionals—your communication should be appropriate**.** For more in-depth information, please see the fau statement on netiquette

POLICY ON THE RECORDING OF LECTURES (OPTIONAL)

Lectures are automatically recorded and stored in the cloud by zoom. They are available for viewing for all enrolled students on the learning management system in use, canvas.

ATTENDANCE POLICY

Students are expected to attend, and/or watch recorded lectures in synchrony (before the next recording), all their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. Students must comply with the submission deadlines of the projects. 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.

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/

DISABILITY POLICY

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 campuses. For more information, please visit the SAS website at www.fau.edu/sas/

CODE OF ACADEMIC INTEGRITY POLICY STATEMENT

Students at Florida Atlantic University should endeavor to maintain the highest ethical standards. Academic dishonesty is 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 to 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.

Plagiarism is unacceptable in the University community. Academic work must be an original work of your own thought, research, or self-expression. When students borrow ideas, wording, or organization from another source, they must acknowledge that fact in an appropriate manner. Plagiarism is the deliberate use and appropriation of another's work without identifying the source and trying to pass off such work as one's own. Any student who fails to give full credit for ideas or materials taken from another has plagiarized. This includes all discussion board posts, journal entries, wikis, and other written and oral presentation assignments. If in doubt, cite your source.

REQUIRED TEXTS / READING

There is no text book for the course.

Some useful reference books are

- Discrete-Time Signal Processing, Alan Oppenheim, Ronald Schafer et al. Prentice Hall. ISBN-13:978-0-13-198842-2, ISBN-10: 0-13-198842-5
- Adaptive Filter Theory, Simon Haykin, Prentice Hall. ISBN-10:0-13-090126-1

Neural and Adaptive Systems, Jose Principe et al. John Wiley & Sons. ISBN: 0-471-35167-9
Journal Papers:

- Machine learning in acoustics: Theory and applications

Michael J. Bianco,Peter Gerstoft, James Traer, Emma Ozanich, Marie A. Roch,3
Sharon Gannot, and Charles-Alban Deledalle5
https://doi.org/10.1121/1.5133944

- Other papers to be listed

Course Topical Outline

General Topics		Applications
➢ Week 1:	Signal Processing Overview	➢ Speech
➢ Week 1:	DFT/FFT	➢ Audio
➢ Week 2:	Filters	➢ Biomedical signals (ECG, EEG and others)
➢ Week 2:	Spectrograms	➢ Communication Signals
➢ Week 3:	Optimal Filter	➢ Others may be suggested by students
➢ Weeks 4&5:	Adaptive Filters	
➢ Weeks 6&7:	Spectral Estimation	
➢ Weeks 8&9:	Sparse Representations	
➢ Weeks 10&11:	Neural Nets and Deep Learners	
➢ Weeks 12&13:	Feature for NNs and DNs o Wavelet Transforms o Principle Component Analysis o Independent Component Analysis	
➢ Weeks 14-16:	Final Project Presentations	