FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

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

Department EECS

College ENG&CS

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

Prefix CAP

Number 5405

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

Type of Course Lecture

Course Title Digital Image Processing

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 course introduces students image processing principles, tools, techniques, and algorithms. Topics include image representation, analysis, filtering, and segmentation, and pattern recognition. Students are trained to use image processing software tools for lab assignments and projects.

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

omarques@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	9/19/2022
UGPC Chair Mihaela Cardei (Oct 13, 2022 10:50 EDT)	Oct 13, 2022
UGC Chair Mihaela Cardei (Oct 13, 2022 10:50 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.

CAP 5405
Digital Image Processing

3 credits

Spring 2022

Prof. Oge Marques, PhD

TA name: N/A
Office: EE 441 (Building 96)
Office hours: TBA
Phone: 561-297-3857
Email: omarques@fau.edu

Course Description

Introduction to image processing principles, tools, techniques, and algorithms. Includes topics in image representation, analysis, filtering, and segmentation, and pattern recognition. Use of image processing software tools for assignments and projects.

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

Upon successful completion of this course, students will be able to:

1. Explain the main challenges behind the design of image processing and analysis solutions.
2. Compare and contrast different approaches for fundamental image processing operations, explaining their strengths and limitations.
3. Design and implement algorithms for image processing and analysis using MATLAB.
4. Design and implement algorithms for visual pattern recognition and image classification using MATLAB.
5. Contextualize the latest advances in deep learning and their impact on the advancement of image processing and computer vision.

Course Evaluation Method

Hands-on assignments	50%
Research Paper	20%
Final Project	30%

There should be 6 (six) hands-on assignments. I will drop the lowest grade, i.e., only the 5 best grades will count toward the 50% of the grade.

The research paper will cover latest developments in image processing and computer vision.

The Final Project will give students a chance to develop, document, and present (via video recording or equivalent) a complete solution for an image processing / computer vision of their choice.

Course Grading Scale

In keeping with University policy, students will be graded on a scale of A through F according to the following schedule:

Total points	100-93	92.9-90	89.9-87	86.9-83	82.9-80	79.9-77	76.9-73	72.9-70	69.9-67	66.9-63	62.9-60	<60
Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

Policy on Makeup Tests, Late Work, and Incompletes

Makeup tests 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 exam should be administered and proctored by department personnel unless there are other pre-approved arrangements.

Assignments are usually due by 11:59 PM on the due date indicated in the course schedule. **Late assignments will be graded with a penalty of 10% of the grade for each day after the assignment's due date, up to a maximum of 3 days late (i.e., 30% penalty), beyond which the assignment will receive a grade 0 (zero).**

Incomplete grades are given only if there is solid evidence of medical or otherwise serious emergency situation and the student is currently passing the class.

Classroom Etiquette Policy

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.

For more information, please see the FAU Office of Student 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

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 (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.

By registering for this class, the students hereby consent to recording of the class and potential use of the class material for other purposes.

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.

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

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.

Required Texts/Readings

"Practical Image and Video Processing Using MATLAB"
by Oge Marques
Wiley/IEEE Press, 2011
ISBN-10: 0470048158 | ISBN-13: 978-0470048153

Supplementary/Recommended Readings

Additional reading materials will be provided during the course.

Course Topical Outline

Module	DATES	TOPIC	READ/LISTEN/VIEW	TO DO
START HERE	1/8 – 1/16	Introduction to Course	Syllabus Course Schedule Instructor Introduction	
1	1/8 – 1/14	Introduction to image processing and computer vision	Textbook – Chapter 1 Selected readings and websites	Assignment 1 out
2	1/15 – 1/20	Image processing fundamentals	Textbook – Chapters 2, 5, and 6, and Appendix A Selected readings and websites	Assignment 2 out
3	1/21 – 1/26	MATLAB and relevant toolboxes	Textbook – Chapters 3 and 4 MathWorks "MATLAB Onramp" Selected readings and websites	Assignment 1 due (Jan 26)
4	1/27 – 2/2	Geometric operations	Textbook – Chapter 7 MathWorks "Image Processing Onramp" Selected readings and websites	Assignment 3 out
5	2/3 – 2/11	Intensity transformations	Textbook – Chapter 8 Selected readings and websites	Assignment 2 due (Feb 11)
6	2/12 – 2/17	Summary statistics of images and histogram processing	Textbook – Chapter 9 Selected readings and websites	Assignment 4 out
7	2/18 – 2/28	Image filtering and enhancement	Textbook – Chapters 10 and 11 Selected readings and websites	Assignment 3 due (Feb 23)
8	3/1 – 3/4	Deep Learning basics	MathWorks Deep Learning eBooks MathWorks " Deep Learning Onramp" Selected readings and websites	Assignment 5 out Final Project out Research Paper out
9	3/12 – 3/16	Image denoising	Textbook – Chapter 12 Selected readings and websites	Assignment 4 due (Mar 14)
10	3/17 – 3/21	Color image processing	Textbook – Chapter 16 Selected readings and websites	Assignment 6 out
11	3/22 – 3/25	Image segmentation	Textbook – Chapter 15 Selected readings and websites	Assignment 5 due (Mar 25)
12	3/26 – 3/29	Global feature detection and extraction	Textbook – Chapter 18 Selected readings and websites	
13	3/30 – 4/3	Local feature detection, extraction and matching	Selected readings and websites	Assignment 6 due (Apr 2)
14	4/4 – 4/14	Image classification	Textbook – Chapter 19 Selected readings and websites	Final Project due (Apr 14)
15	4/15 – 4/25	Applications, case studies, and ongoing research topics	Selected readings and websites	Research Paper due (Apr 25)

*The schedule can change at the instructor's discretion.

The course uses Canvas for notes, assignments, announcements, and all course information (restricted to enrolled students).