

CAP 4410.01 – Computer Vision

Course Information

- **Course Number and Title:** CAP 4410.01-Computer Vision
- **Credit Hours:** 3
- **Academic Term:** Spring 2026

Instructor Information

- **Instructor:** Dr. Muhammad Abid
- **Office Location:** BARC 2231
- **Office Hours:**
 - Mon 09:55 AM – 10:55 AM
 - Wed 09:55 AM – 10:55 AM
 - Fri 09:55 AM – 10:55 AM
- **Email address:** mabid@floridapoly.edu

Course Description

- **Delivery Mode:** Face-to-face, MWF, IST-1032, 08:00 AM – 08:50 AM
- **Course Website:** Canvas
- **Official Catalog Course Description:** This course introduces how computers see and interpret the visual world and how this interpretation can be used to enhance game play experience. Topics covered: projections and coordinate systems, camera modeling, stereo vision, edge detection, filtering, segmentation, optical flow, motion vision, color vision, object representation, face recognition, object recognition.
- **Course Pre-Requisites:**
 - MAS 3114- Computational Linear Algebra
 - (COP 4415 – Data Structures OR
 - COP 3530 – Data Structures & Algorithms)
- **Communication/Computation Skills Requirement (6A-10.030):** No
- **Required Texts and Materials:**
 - No Textbook

Course Learning Outcomes (CLOs)

- CLO-1 **Identify** basics concepts in image data.
- CLO-2: **Identify** basics concepts in image processing and analysis.
- CLO-3: **Apply** image segmentation techniques.
- CLO-4: **Apply** feature detection and tracking techniques.
- CLO-5: **Apply** object detection techniques.

Alignment with Program Outcomes (ABET)

The Computer Science program at Florida Polytechnic University has aligned its Program Outcomes with the ABET Students Outcomes 1-6 from the ABET General Criterion 3 and the ABET Program Criteria. The table shown below summarizes how the CLOs stated above align with the Program Outcomes (ABET 1-6).

These outcomes are:

1. **Analyzing a Problem:** Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions
2. **Implementing a Solution:** Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline
3. **Communicating Effectively:** Communicate effectively in a variety of professional contexts
4. **Performing Legal & Ethical Analysis:** Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles
5. **Collaborating as a Team:** Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline
6. **Applying theory:** Apply computer science theory and software development fundamentals to produce computing-based solutions.

Program Outcome (ABET)	CLO-1	CLO-2	CLO-3	CLO-4	CLO-5
Analyzing a Problem	X	X	X	X	X
Implementing a Solution	X	X			
Communicating Effectively					
Performing Legal & Ethical Analysis					
Collaborating as a Team					
Applying theory			X	X	X

Course Policies

Attendance

- Students in **face-to-face (this includes labs and C-courses)** courses are expected "to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor" (University Policy, FPU-5.0010AP).

Participation

Students are expected to participate in the classroom experience. The use of earbuds/headphones during class is specifically not allowed and students who engage in this behavior may be asked to leave the class for the day (noting exceptions for authorized accommodations). In addition, students who routinely do not bring materials to class that are required for participation, will not be given credit for class attendance, and if this becomes a pattern of behavior, may be asked to leave the class for the day. Persistent problems with participation may result in a [code of conduct](#) referral.

Late Work/Make-up work

Make-up exams will be given only in extreme circumstances with a documented excuse. If you miss an exam because you are participating in a college-sponsored activity, inform your instructor at least 72 hours before the exam and provide them with documentation. Late homework will receive a **20%** penalty if received up to **one** day late. Homework received more than one day after the due date will not receive credit.

Grading Scale

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

Assignment/Evaluation Methods

Assignments	30%
Quizzes	10%
Attendance	5%
Exam-1	20%
Final Exam	15%
Final Project	20%
Total	100%

Course Schedule (Tentative)

- Important Dates: <https://floridapoly.edu/academics/academic-calendar/index.php>

Week (Day)MWF	Topics	Assignments
1	Introduction of course, expectations, syllabus discussion	Quiz
2, 3	What is an image, construction of the digital image, algebraic representation of image, sliding window concepts, RGB introduction, Use of histogram in the image. Impact of sliding histogram on image in terms of brightness and contrast, histogram equalization	Quiz Assignment 1 (Implementation of image processing by creating an application)
4	Image and its Fourier spectrum, differentiation between Fourier series and Fourier transform, the introduction of discrete Fourier transform, introduction of filters in frequency domain,	Quiz
5	Colors impact images in spatial and temporal domain, electromagnetic spectrum, retina human eye and its resemblance with image, gamut of human vision, color blindness, different color models details	Quiz
6, 7	Image processing, noise removal techniques from image, mathematical implementation of calculating histogram equalization, convolution, filters in spatial and temporal domain, different filters implementation, derivative of image, correlation of image, edge detection techniques, corner detection,	Quiz Assignment 2 (Filter application on image and its practical details to cover different sliding windows impact on image)
8, 9	Image segmentation techniques, foreground, and background extraction by using image segmentation, different problem solving in computer vision by image segmentation, comprehensive coverage of significant image segmentation techniques, its application and implementation, seed growing and image segmentation, mean shift object tracking comprehensive mathematical detail with implementation, the Bhattacharyya coefficient implementation with mean shift tracking	Quiz Assignment 3 (Implementation of multiple segmentation techniques, their impact on different kinds of images, understanding the usage of different segmentation techniques as per variation of data) Exam
10, 11	Connectedness concept in image, regions of images, image topology, pixel neighborhoods, adjacency relationships, multilevel images, border tracing strategy	Quiz

	in the image, line fitting algorithms in the image includes straight lines, circles and ellipses, arbitrary shapes	
12, 13	Feature detector and feature description algorithms in computer vision, the concept of scale space, concept of Laplacian, concept of Laplacian of gaussian, concept of difference of Gaussians,	Quiz Assignment 4 (Implementation of feature extraction and feature description methods)
14	Correspondence problem, finding outliers, image stitching methods	Quiz
15	Object tracking algorithms, tracking in fixed camera, tracking in moving camera, tracking in multiple cameras, displacement models parametrization, Jacobian implantation in image, finding multiple image alignment	Quiz
16	Gradient computation in image for object detection, multiple vector concatenation for object detection, image clustering methods, image classification methods, evaluation metrics Note: (if time allows than concepts of deep learning and its impact on computer vision)	Quiz

Note: number of assignments, quizzes and exams may change.

Academic Support Resources

- **Library:** Students can access the Florida Polytechnic University Library through the University website and [Canvas](#), on and off campus. Students may direct questions to library@floridapoly.edu.
- **Tutoring and Learning Center (TLC):** : The Tutoring and Learning Center (The TLC) provides tutoring to all Florida Poly students who may need additional academic support. The TLC is staffed by students who have excelled in the courses they tutor. They offer support by reviewing concepts and materials from class, clarifying points of confusion and providing assistance with learning strategies. While the focus of TLC is to provide support to students in freshman-level courses, upper-level courses are also tutored at the Center. The TLC is located in the IST Commons (second floor).
- **Knack Tutoring:** Students looking for additional assistance outside of the classroom are advised to consider working with a peer tutor through Knack. Florida Polytechnic University has partnered with Knack to provide students with access to verified peer tutors who have previously aced this course. To view available tutors, visit floridapoly.joinknack.com and sign in with your student account.
- **Academic Success Coaches:** All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center:** Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit <https://floridapoly.edu/writingcenter>.

University Policies

Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The University, through the Office of Disability Services (ODS), facilitates reasonable accommodation for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodation.

If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the [ODS student portal](#) and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodation must be made in advance. Accommodation is not retroactive.

If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible.

The Office of Disability Services (ODS):
DisabilityServices@floridapoly.edu
(863) 874-8770
The Access Point
[ODS website: www.floridapoly.edu/disability](http://www.floridapoly.edu/disability)

Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See [University Policy](#).)

Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. You may speak to your professor, but your professors have an obligation to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University [Ombuds Office](#), BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at [Peace River Center](#), 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The [Title IX Coordinator](#) is available for any questions to discussion [resources and options](#) available.

Academic Integrity

The faculty and administration take academic integrity very seriously. Violations of [academic integrity regulation](#) include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in an academic integrity hearing and sanctions against the accused student if found in violation. Sanctions range from receiving a zero on the exam or assignment, to expulsion from the university. Repeat offenders are subject to more severe sanctions and penalties.

Any "special" instructions that are appropriate for academic integrity and the course should go here.

Recording Lectures

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action).

*Recording class activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is **prohibited**.*

Civility and Collegiality

Faculty and students come to the university for the same reason, which is to participate in a highly professional educational environment. To that end, both students and faculty are expected to treat each other with mutual regard and civility. Communication, written, oral and behavioral, between faculty and students must remain respectful. Within and outside of the classroom, students must refrain from derogatory comments toward the faculty member and their fellow students, and faculty as well must refrain from derogatory comments toward their students. Faculty and students should address each other with respect, in accordance with the wishes of the faculty and the students: for example, no one should be addressed by their last name alone.

Faculty from the outset of a course can and should specify what constitutes activities and behavior that take away from, that diminish, the educational environment. An individual student's distracting behavior impedes the education of fellow students, which itself is a form of disrespect. Civility and collegiality also include respecting each other's time: for example, neither students nor faculty should arrive late to class (unless unforeseen, pressing circumstances prevail); faculty should be present at the posted office hours; and students and faculty should be punctual when meeting times are scheduled. In more general terms, collegiality means respecting the right of both faculty and students to participate fully and fairly in the educational enterprise.