AING / CMPE / CMSE 425 – Fundamentals of Computer Vision

Department:
Computer Engineering

Program Name: Artificial Intelligence Engineering, Computer Engineering, Software Engineering		**Program Code:** 2L, 25, 29
Course Number: AING425, CMPE425, CMSE425	**Credits:** 4 Cr	**Year/Semester:** 2026-2027 Fall

☒ Required Course (for AING) ☒ Elective Course (for CMPE, CMSE) ☐ Service Course

Prerequisite(s): MATH152, MATH 241

Catalog Description:
Fundamentals of computer vision, image processing concepts, photometry and color theory, basic image manipulation, preprocessing, feature extraction, image understanding, motion, tracking, recognition, shape and scene analysis, computer vision applications

Course Web Page:
https://staff.emu.edu.tr/onsentoygar/en/teaching/aingcmpecmse-425

Reference books:
1. David A. Forsyth and Jean Ponce, "Computer Vision: A Modern Approach" (2nd edition), Pearson Higher Education, ISBN: 978-0273764144, 2012.
2. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer, 2010.
3. Simon J.D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.

Topics Covered and Class Schedule:
(4 hours of lectures per week)

Week 1	Introduction to computer vision concepts
Weeks 2-3	Image processing concepts and image formation, Geometric camera models
Weeks 4-5	Photometry and color theory, Basic image manipulation with linear filters
Weeks 6-7	(Midterm Exams)
Weeks 8-9	Image pre-processing techniques, Local image features and texture extraction
Weeks 10-11	Image understanding: Detecting objects in images
Weeks 12-13	Structure from motion, Tracking and object recognition, Shape and scene analysis
Weeks 14-15	Project presentations related to computer vision applications
Weeks 16-17	(Final Exams)

Laboratory Schedule:
(2 hours of laboratory per week)

Week 3	Introduction to OpenCV With Python
Week 5	Image Manipulation With Linear And Nonlinear Filters
Week 9	Image Preprocessing
Week 11	Object Detection
Week 13	Tracking And Object Recognition

Course Learning Outcomes:
On successful completion of the course, the student is expected to be able to:
1. Understand the fundamentals of computer vision.
2. Gain information about the image processing concepts related to computer vision.
3. Learn the topics related to low-level image perception such as image formation, cameras and color.
4. Study structure from motion, tracking, object recognition, shape and scene analysis topics.
5. Prepare a research project related to computer vision applications with a team.
6. Present a research project related to computer vision applications with a team.

	Method	No	Percentage
Assessment	Midterm Exam(s)	1	30 %
	Labs	5	10 %
	Term Project	1	20 %
	Final Examination	1	40 %
	Attendance	--	--

Relationship of the course to Student Outcomes:

The course has been designed to contribute to the following student outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

Notes and Policies

Attendance Policy in EMU:

"Eastern Mediterranean University Rules and Regulations for Undergraduate Studies and Examinations" regarding the Course Attendance Requirements (NG):

• "NG" Nil Grade / Failure Due to Non-Attendance:

The "NG" grade is awarded to a student who fails to meet the course attendance requirements and the conditions essential for course assessment. This grade is assigned by the Academic Staff of the relevant course based on the criteria set by the Faculty/School Boards. Students who receive an "NG" grade are not eligible to take the make-up examination for that course. If it is determined in advance that a student will receive an "NG" grade, they may also be barred from sitting for the final exam.

• Students' Course Attendance Obligation:

A student who exceeds the absenteeism limits set by the Faculty/School Boards or fails to fulfill the essential assessment requirements for the course is deemed to have failed that course. However, in courses that are being repeated due to other academic reasons (excluding the NG grade), attendance is not mandatory. Courses repeated due to receiving an "NG" grade are not included in this exemption and are subject to attendance requirements.

NG Grade Policy in This Course:

- If you are taking the course for the first time and if you do not have any attendance for the lectures, you will get an “NG” grade.
- If you are taking the course for the first time and if you miss both the midterm and the final exam, you will get an “NG” grade.
- If you are not taking the course for the first time and if you miss the midterm and the final exam, you will get an “NG” grade.

Exams:

- If you miss midterm or final exam and submit a written report to your instructor stating your excuse within 3 days of that examination, you will be able to enter makeup exam.
- If you miss both midterm and final exams and do not submit any written report, you will get an “NG” grade. In that case, if you submit a report for both missed exams, you may take a makeup for only one of them.

Labs:

- There will be 1 makeup for the missed lab experiments.

PLAGIARISM

- Plagiarism (which also includes any kind of cheating in exams, projects and lab work) is a disciplinary offence and will be dealt with accordingly. Furthermore, the penalty for plagiarism is a grade of zero for the corresponding exam, project or lab work.

IMPORTANT REMARKS

- You should have regular attendance at the lectures to be successful in the course. Course-related materials will be published on the course website and you will be responsible for all. Note that the course website will be updated during the semester. Therefore, please check it regularly.

Prepared by: Prof. Dr. Önsen Toygar	**Date Prepared:** 20 September, 2026