Course Information

Course Code

5710483

Course Section

1

Course Title

INTRODUCTION TO COMPUTER VISION

Course Credit

3

Course ECTS

6.0

Course Catalog Description

Image formation, camera models and parameters, stereo vision, shape from stereo, shape from single image cues, apparent motion, optical flow, introduction to 3D shape representation and recognition.

Prerequisites

No prerequisites

Schedule

Tuesday , 08:40 - 10:30, BMB5
Friday , 08:40 - 10:30, BMB5

Course Website

http://user.ceng.metu.edu.tr/~gcinbis/courses/Fall22/CENG483

Instructor Information

Name/Title

Assist.Prof.Dr RAMAZAN GÖKBERK CİNBİŞ

Office Address

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Email

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Personal Website

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Office Phone

Office Hours

By appointment -- please email.

Course Assistants

Name/Title

Araş.Gör. ORHUN BUĞRA BARAN

Office Address

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Office Hours

Course Objectives

The course introduces the basic problems, common terminology and key methods of computer vision. Main objective is to let students gain necessary skills to apply contemporary computer vision techniques to visual understanding problems in computer science and engineering.

Course Learning Outcomes

At the end of this course, students will be able to:

- **Understand** formation of images, the types of camera models and the camera parameters.
- **Apply** different image processing and feature extraction techniques to images to extract low-level meaningful information.
- **Understand** different mid-level and high-level vision problems such as motion estimation, depth estimation, object recognition, scene understanding and **apply** them on real-world problems.
- **Describe** the different vision theories and the link between visual perception and computer vision.
- Gather **hands-on** experience on implementing contemporary deep learning based approaches for computer vision

Program Outcomes Matrix

Undergraduate

	Program Outcomes	Contribution	
		No	Yes
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics		X
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		X
3	An ability to communicate effectively with a range of audiences	X	
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	X	
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	X	
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	X	
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	X	

Instructional Methods

The following instructional methods will be used to achieve the course objectives: Lecture, questioning, discussion,

group work, simulation.

Online access to face-to-face lectures is planned to provided, but this is not guaranteed and the lectures may or may not be recorded. Video recordings of a previous semester is planned to be provided, but again, this is not guaranteed.

There will be 4 lecture-hours/week, by default, unless announced otherwise. However, some classes will be skipped to maintain an average lecturing load of 3 hours/week at the end of the semester.

Tentative Weekly Outline

Week	Topic	Relevant Reading Assignments
1	Introduction, course logistics	
2	Math basics & Linear Algebra overview	
3	Image formation, cameras and calibration	
4	Filtering	
5	Interest point detectors	
6	Local descriptors	
7	Segmentation, clustering, texture	
8	Recognition: learning-based vision	
9	Recognition: object recognition	
10	Recognition: introduction to deep learning	
11	Deep neural network basics	
12	Recognition: convolutional neural networks	
13	Recognition: deep learning applications in computer vision	
14	Sensing depth: stereo vision, monocular depth cues, structure from motion	

Course Textbook(s)

Optional: Simon J.D. Prince, Computer Vision: Models, Learning, and Inference, http://www.computervisionmodels.com

Optional: R. Szeliski, Computer Vision: Algorithms and Applications, 2010.

Course Material(s) and Reading(s)

Material(s)

None.

Reading(s)

None.

Supplementary Readings / Resources / E-Resources

Readings

Optional: D. Forsyth, J. Ponce, Computer Vision: Modern Approach, 2002.

Optional: B. Jahne, H. Haubecker, Computer Vision and Applications, 2000.

Optional: R. Szeliski, Computer Vision: Algorithms and Applications, 2010.

Assessment of Student Learning

Assessment	Dates or deadlines
Homeworks: there will tentatively be 3 homeworks. The number of homeworks is subject to change. Final grade contribution weights of the homework may vary. Homeworks may be inter-connected, and/or related to the exams. Homeworks will involve programming in Python and utilizing major scientific libraries in Python. Homeworks may also involve major scientific report writing tasks. Some homeworks can be allowed or required to be done in pairs/groups.	
Midterm exam.	
Final exam.	

Course Grading

Deliverable	Grade Points
Homeworks (total)	55
Midterm exam	20
Final exam	25
Total	100

Course Policies

Class Attendance

Attendance does not directly affect the final grade.

Class Participation

Regular active participation in class throughout the semester is strongly suggested.

Final Exam Entrance Conditions

Attending the midterm exam and qualifying to take a midterm grade of 20 or more is required to qualify to take the final exam.

Not qualifying to take the final exam will lead to automatic NA grade.

Having taken none of the mid-term and final examinations will lead to automatic NA grade.

Information for Students with Disabilities

Students who experience difficulties due to their disabilities and wish to obtain academic adjustments and/or auxiliary aids must contact ODTU Disability Support Office and/or course instructor and the advisor of students with disabilities at academic departments (for the list: http://engelsiz.metu.edu.tr/en/advisor-students-disabilities) as soon as possible. For detailed information, please visit the website of Disability Support Office: https://engelsiz.metu.edu.tr/en/

Academic Honesty

The METU Honour Code is as follows: *"Every member of METU community adopts the following honour code as one of the core principles of academic life and strives to develop an academic environment where continuous adherence to this code is promoted. The members of the METU community are reliable, responsible and honourable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents."*