TEDU COURSE SYLLABUS

Faculty	Engineering and Architecture	**Department**	Computer Engineering

Course Code & Number	CMPE 565	**Course Title**	Computer Vision
Level of Course	MS	**Year of Study**	○ Freshman ○ Sophomore ○ Junior ○ Senior ◉ Masters ○ PhD
Type of Course	○ Compulsory ◉ Elective	**Semester**	◉ Fall ○ Spring ○ Both
Course Credit Hours	(3 + 0 + 0) 3	**ECTS Credits**	7.5
Pre-requisite	None	**Co-requisite**	None
Mode of Delivery	◉ Face-to-face ○ Online	**Language of Instruction**	◉ English ○ Turkish ○ Eng/Tur
Design Content		**Computer Usage**	Matlab, OpenCV
Coordinator		**Lecturers**	
Assistants		**Evaluation Survey Date**	To be declared
Required Reading	1. Computer Vision: Algorithms and Applications, R. Szeliski, Springer 2. 3.	**Recommended Reading**	1. Computer Vision: A Modern Approach, D.A. Forsyth ve J. Ponce, Prentice Hall. 2. Computer Vision, L. G. Shapiro and G. C. Stockman, Prentice Hall. 3. Multiple View Geometry in Computer Vision, R. Hartley, A.Zisserman, Cambridge University Press. 4. 5.
Work Placement			

Catalog Description	The basic concepts of Computer Vision and its relation to human visual perception. The analysis of image and video data. Image formation and representation, segmentation, texture analysis and synthesis, edge, corner and boundary extraction, feature extraction, contour and region analysis, camera geometry and calibration, stereo image analysis, three-dimensional reconstruction, object and scene recognition, tracking, human activity recognition and inference.
Objectives	The objective of this course is to introduce the basics of computer vision, mathematical foundations of computer vision, various computer vision techniques for images and videos, and implementation tools used in generating computer vision applications. Another objective of this course is to develop a computer vision system.
Learning Outcomes	Upon successful completion of this course, a student will be able to 1. Describe the basic terminology, theories, models and methods of computer vision and image analysis 2. Examine various image formats using computer vision tools 3. Describe basic methods of computer vision related to multi-scale representation, detection of primitives such as edges and interest points, and stereo 4. Analyze and apply image segmentation methods 5. Describe basic methods related to high-level vision such as scene understanding, object recognition and activity understanding 6. Describe known principles of human visual system 7. Systematically apply and test different basic methods of computer vision 8. Suggest a computer vision system for a specific problem using the state of the art 9. Design and develop a cutting-edge computer vision system for a real-world application 10. 11. 12. 13. 14. 15.
Extended Description	The basic concepts of Computer Vision and its relation to human visual perception. The analysis of image and video data. Image formation and representation, segmentation, texture analysis and synthesis, edge, corner and boundary extraction, feature extraction, contour and region analysis, camera geometry and calibration, stereo image analysis, three-dimensional reconstruction, object and scene recognition, tracking, human activity recognition and inference.

Teaching Methods & Learning Activities	☑ Telling/Explaining ☑ Discussion/Debate ☑ Questioning ☑ Reading ☐ Peer Teaching ☐ Scaffolding/Coaching ☑ Demonstrating ☑ Problem Solving ☐ Inquiry ☐ Collaborative Learning ☐ Think-Pair-Share ☐ Predict-Observe-Explaing ☐ Microteaching ☐ Case Study / Scenario Analysis	☐ Simulation & Games ☐ Video Presentations ☐ Oral Presentation ☐ Concept Mapping ☐ Brainstorming ☐ Drama / Roleplaying ☐ Seminars ☐ Field Trips ☐ Guest Speakers ☐ Hands-on Activities ☐ Service Learning ☐ Web Searching ☐ Experiments ☑ Others Programming
Assessment Methods (Formal & Informal)	☐ Test / Exam ☑ Quiz / Homework ☑ Oral Questioning ☐ Laboratory Work ☑ Written Project ☐ Oral Project	☐ Observation ☐ Self Evaluation ☐ Peer Evaluation ☐ Portfolio ☑ Presentation (Oral / Poster) ☑ Others Programming Assignments

Student Workload (Total 208 Hrs)			
Lectures	42 hrs	Field Trips / Visits	0 hrs
Course Readings	28 hrs	Resource Review	0 hrs
Workshop	0 hrs	Research Review	20 hrs
Online Discussion	0 hrs	Report on a Topic	10 hrs
Debate	0 hrs	Case Study Analysis	0 hrs
Work Placement	0 hrs	Oral Presentation	10 hrs
Observation	0 hrs	Poster Presentation	0 hrs
Lab Application	0 hrs	Demonstration	0 hrs
Hands-on Work	0 hrs	Web Designs	0 hrs
Quizzes / Homeworks	90 hrs	Mock Designs	0 hrs
Midterm Exam I	0 hrs	Team Meetings	0 hrs
Midterm Exam II	0 hrs	Others	0 hrs
Final Exam	8 hrs		

COURSE ASSIGNMENTS

A. Three Programming Assignments	[30 %]
There will be 3 assignments.	
B. Technical Paper Presentations	[20 %]
There will be two academic paper presentations.	
C. Final Exam	[15 %]
D. Project (with research-level final paper and project presentation)	[35 %]
E.	[0 %]
F.	[0 %]

COURSE POLICIES

I. Attendance

Attendance to the course is necessary but not mandatory.

II. Missed Work

Make-ups for midterm and final exams will be provided if the student can provide a legal document confirming a life threatening health issue at the time of the exam, or with the consensus of the CMPE faculty.

III. Late Submission Policy

For each late day, you will use loose 2 points over the total points of each assignment. Late submissions more than 3 late days will not be accepted.

IV. Extra Credit

Extra credits will not be offered.

V. Assignment Rules

One student can submit only one work. In case of multiple submissions, only the latest submission will be considered. Students cannot submit work on other students' behalf.

VI. Plagiarism

"All of the following are considered plagiarism:
- Turning in someone else's work as your own
- Copying words or ideas from someone else without giving credit
- Failing to put a quotation in quotation marks
- Giving incorrect information about the source of a quotation
- Changing words but copying the sentence structure of a source without giving credit
- Copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not" (www.plagiarism.org)

Plagiarism is a very serious offense and will be penalized accordingly by the university disciplinary committee. The best way to avoid accidentally plagiarising is to work on your own before you ask for the help of other resources.

VII. Cheating

Cheating has a very broad description which can be summarized as "acting dishonestly". Some of the things that can be considered as cheating are the following:
- Copying answers on exams, homeworks and lab works,
- Using prohibited material on exams,
- Lying to gain any type of advantage in class
- Providing false, modified or forged data in a report
- Plagiarising
- Modifying graded material to be re-graded.
- Causing harm to colleagues by distributing false information about an exam, homework or lab.

Cheating is a very serious offense and will be penalized accordingly by the university disciplinary committee.

VIII. Class Participation

Participation in class is necessary but not mandatory. By actively participating in class, you can improve your learning process and immediately confirm what you have learned and what you have not. Do not forget that you are not expected to know the material being discussed in class. Actually, you are expected not to know it. Therefore, there is no point in being hesitant to join a conversation or ask a question.

IX. Reading

Class readings are necessary but not mandatory. The material covered in class by your instructor will only provide a fundamental understanding of the general context. If you are willing to effectively learn something, you must actively work on it yourself. Reading is one of the most successful ways of learning on a topic.

TENTATIVE COURSE OUTLINE

WK	DAY	TOPIC	READING	ASSIGNMENT
1		Introduction: What is Computer Vision?	RS	
2		Introduction: What is Computer Vision? Image Processing Methods and low-level vision	RS	P01
3		Image Processing Methods and low-level vision	RS	
4		Feature Detection and Matching	RS	
5		Grouping and fitting, Hough transform	RS	P02
6		Grouping and fitting, RANSAC, Alignment	RS	
7		Epipolar geometry, Camera Models	RS	
8		Epipolar geometry, Camera Models	RS	P03
9		Segmentation	RS	
10		Recognition I, classifiers		
11		Recognition II, detection, classification		
12		Recognition III, detection, classification		
13		Object Tracking		
14		Action Recognition		

COURSE ASSESSMENTS & LEARNING OUTCOMES MATRIX

Course Learning Outcomes	Assessment Methods
LO 1	
LO 2	
LO 3	
LO 4	
LO 5	
LO 6	
LO 7	
LO 8	
LO 9	
LO 10	
LO 11	
LO 12	
LO 13	
LO 14	
LO 15	

TED UNIVERSITY CODE OF ACADEMIC INTEGRITY

TED University takes academic integrity seriously. "We, the students and faculty of the TED University, dedicate ourselves to upholding the highest standards of academic integrity. Academic integrity means that one's work is the product of one's own effort, and one neither receives nor gives unauthorized assistance in any assignment. Because advanced academic work depends on the sharing of information and ideas, academic integrity at the college level includes rigorous adherence to the conventions for acknowledging one's use of the words and ideas of other people, and instruction in this fundamental skill of college life is available to all TED University students."

Prepared By & Date	Asst. Prof. Dr. Selen Pehlivan 28/05/2015	**Revised By & Date**	Asst. Prof. Dr. Selen Pehlivan 18/09/2016