

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC474	COMPUTER VISION	3-0-0-3	2016
Prerequisite: EC301 Digital Signal Processing			
Course objectives: <ul style="list-style-type: none"> To review image processing techniques for computer vision To understand shape and region analysis To understand three-dimensional image analysis techniques and motion analysis To study some applications of computer vision algorithms To introduce methods and concepts which will enable the student to implement computer vision systems with emphasis on applications and problem solving 			
Syllabus:			
Review of Image processing operations, Image formation models, Image processing and feature extraction, Motion Estimation, Shape representation and Object recognition.			
Expected outcome:			
The students will be able to: <ol style="list-style-type: none"> Implement fundamental image processing techniques required for computer vision Perform shape analysis and boundary tracking techniques Implement motion related techniques To develop applications using computer vision techniques 			
Text Books: <ol style="list-style-type: none"> B K P Horn , Robot Vision, McGraw-Hill,1986 D Forsyth and J Ponce, Computer Vision - A modern approach, Prentice Hall of India, 2002 			
References: <ol style="list-style-type: none"> E R Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012. R. Szeliski, Computer Vision: Algorithms and Applications, Springer 2011 Simon J D Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012. 			
Course Plan			
Module	Course content	Hours	End Sem. Exam Marks
I	Review of image processing techniques : filtering, thresholding	1	15
	Mathematical morphology, Texture	1	
	Binary shape analysis, connectedness, object labelling and counting	2	
	Boundary descriptors	1	
II	Monocular and binocular imaging system	2	15
	Orthographic & Perspective Projection	2	
	Camera models	2	

	Camera Calibration, Stereo vision: introduction; concept of disparity and its relationship with depth	3	
FIRST INTERNAL EXAM			
III	Image Processing for Feature Detection and Image Synthesis, Edge detection	1	15
	Corner detection, Harris corner detection algorithm, Line and curve detection, Hough transform	3	
	SIFT operator, Mosaics, snakes	2	
IV	Shape from X - Shape from shading, Photometric stereo, Texture, Occluding contour detection.	3	15
	Motion Analysis- Regularization theory, Optical Flow: brightness constancy equation, aperture problem, Horn-Shunck method, Lucas-Kanade method	4	
	Structure from motion.	2	
SECOND INTERNAL EXAM			
V	Object recognition: Hough transforms and other simple object recognition methods	3	20
	Shape correspondence and shape matching, Principal Component Analysis	3	
	Shape priors for recognition	1	
VI	Application: Photo album, Face detection, Face recognition, Eigen faces, Active appearance and 3D shape models of faces	3	20
	Application: In-vehicle vision system: locating roadway, road markings, identifying road signs, locating pedestrians	3	
END SEMESTER EXAM			

Question Paper Pattern (End semester exam)

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with 70% for theory and 30% for logical/numerical problems, derivation and proof.