



**SOMAIYA**  
VIDYAVIHAR UNIVERSITY

K J Somaiya Institute of Management



<b>Course Details</b>	<b>Program</b>	MCA	<b>Faculty Email ID</b>	sindhusingh@somaiya.edu
	<b>Semester / Trimester</b>	V Trimester	<b>Faculty Contact Number</b>	9769614284
	<b>Faculty Name</b>	Dr. Sindhu Singh	<b>Students Contact Hours</b>	Mon-Fri
				2pm -4 pm
	<b>Course Name</b>	Computer Vision	<b>Course Code</b>	117P09C502
	<b>Max Marks</b>	100	<b>Credits</b>	3
<b>Course Objectives and Outcomes</b>	<p><b>Course Objectives:</b> This course also provides an introduction to computer vision, including fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification and scene understanding.</p> <p><b>Student learning outcomes from the course:</b> The outcome of the course is upon completion of this course, students should be able to:</p> <ul style="list-style-type: none"><li>• Recognize and describe both the theoretical and practical aspects of image processing.</li><li>• Describe the foundation of image formation and image analysis. Understand the basics of Computer Vision.</li><li>• Become familiar with the major technical approaches involved in computer vision.</li><li>• Get an exposure to advanced concepts leading to object and scene categorization from images.</li><li>• Build computer vision applications.</li></ul>			
<b>Pedagogy/ Learning</b>	Two lecture sessions of 1 hr 20 min duration in a week. Students are required to do projects, assignments, hands-on sessions and			

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**Methodology** presentations which are given from the syllabus.

Session Plan	Session No.	Topics to be Covered	Resources/Pre Readings/ Suggested Readings / Cases	Hrs
	1	The Human Vision System ,Practical Applications of Computer Vision The Future of Computer Vision	Chapter 1*	1.5
	2	Cameras ,The Simple Pinhole Camera Model	Chapter 2*	
	3	Images: Sampling, Quantisation, Colour Images :Red–Green–Blue (RGB) Images , Cyan–Magenta–Yellow (CMY) Images ,YUV Images	Chapter 2*	
	4	Hue Luminance Saturation (HLS) Images ,Other Colour Spaces, Some Colour Applications	Chapter 2*	
	5	Noise: Types of Noise, Noise Models ,Noise Generation, Noise Evaluation	Chapter 3*	
	6	Smoothing: Image Averaging, Local Averaging and Gaussian Smoothing, Rotating Mask, Median Filter	Chapter 3*	
	7	<b>Histograms:</b> 1D Histograms, Histogram Smoothing , Colour Histograms 3D Histograms, Histogram/Image Equalisation , Histogram Comparison , Back-projection, k-means Clustering	Chapter 3*	
	8	Binary Vision: Thresholding: Thresholding Problems, Threshold Detection Methods, Optimal Thresholding , Variations on Thresholding : Adaptive Thresholding , Band Thresholding, Semi-thresholding, Multispectral Thresholding	Chapter 4**	
	9	Mathematical Morphology: Dilation, Erosion, Opening and Closing	Chapter 4**	

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	10	<b>Geometric Transformations:</b> Problem Specification and Algorithm, Affine Transformations: Known Affine Transformations, Unknown Affine Transformations, Perspective Transformations	Chapter 3*	
	11	<b>Edges:</b> Edge Detection: First Derivative Edge Detectors, Second Derivative Edge Detectors, Multispectral Edge Detection	Chapter 4*	
	12	Image Sharpening		
	13	Contour Segmentation: Basic Representations of Edge Data, Border Detection, Extracting Line Segment Representations of Edge Contours	Chapter 4*	
	14	Hough Transform: Hough for Lines, Hough for Circles, Generalised Hough	Chapter 4*	
	15	<b>Features :</b> Harris Corner Detection, FAST Corner Detection, SIFT: Scale Space Extrema Detection	Chapter 4*	
	16	Accurate Keypoint Location, Keypoint Orientation Assignment, Keypoint Descriptor, Matching Keypoints ,Recognition, Other Detectors	Chapter 4*	
	17	Template Matching: Applications, Template Matching Algorithm, Matching Metrics, Finding Local Maxima or Minima	Chapter 8**	
	18	Cascade of Haar Classifiers: Features, Training , Classifiers, Recognition	Chapter 14*	
	19	Other Recognition Techniques: Support Vector Machines (SVM), Histogram of Oriented Gradients (HoG)	Chapter 14*	
	20	<b>Video :</b> Moving Object Detection : Object of Interest, Common Problems , Difference Images, Background Models, Shadow Detection , Tracking	Chapter 9**	

### Reference Books:

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1. **\*Computer Vision: Algorithms and Applications (CVAA)-Richard Szeliski, Springer.**
2. **\*\*A Practical Introduction to Computer Vision with OpenCV- Kenneth Dawson-Howe, Wiley**
3. **Digital Image Processing- S Jayaraman, S Essakkirajan, T Veerakumar, McGrawHill Education**
4. **Digital Image Processing- Rafael C. Gonzalez, Richard E. Woods, Pearson, Third Edition.**
5. **Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall**
6. **Introduction to Computer Vision course by UDACITY**  
<https://in.udacity.com/course/introduction-to-computer-vision--ud810>

#### Assessment Criteria:

Component	Weightage	Description
Test	15%	
Project	15%	
Presentation	10%	
Attendance	10%	
End-Term Exam	50%	
Total	100%	

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