

<b>Text Books:</b>			
1. Soft computing : N. P Padhy and S P Simon , Oxford University Press 2015			
<b>Reference Books:</b>			
1. Principles of Soft Computing, Shivanandam, Deepa S. N Wiley India, 2011.			
<b>COMPUTER VISION AND ROBOTICS</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2017 - 2018)</b> <b>SEMESTER – VII</b>			
Subject Code	17CS752	IA Marks	40
Number of Lecture Hours/Week	3	Exam Marks	60
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 03</b>			
<b>Module – 1</b>			<b>Teaching Hours</b>
<b>CAMERAS:</b> Pinhole Cameras, <b>Radiometry – Measuring Light:</b> Light in Space, Light Surfaces, Important Special Cases, <b>Sources, Shadows, And Shading:</b> Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models, <b>Color:</b> The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.			<b>8 Hours</b>
<b>Module – 2</b>			
<b>Linear Filters:</b> Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, <b>Edge Detection:</b> Noise, Estimating Derivatives, Detecting Edges, <b>Texture:</b> Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.			<b>8 Hours</b>
<b>Module – 3</b>			
<b>The Geometry of Multiple Views:</b> Two Views, <b>Stereopsis:</b> Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras, <b>Segmentation by Clustering:</b> What Is Segmentation?, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,			<b>8 Hours</b>
<b>Module – 4</b>			
<b>Segmentation by Fitting a Model:</b> The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, <b>Segmentation and Fitting Using Probabilistic Methods:</b> Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, <b>Tracking With Linear Dynamic Models:</b> Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples.			<b>8 Hours</b>
<b>Module – 5</b>			
<b>Geometric Camera Models:</b> Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, <b>Geometric Camera Calibration:</b> Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, <b>Model- Based Vision:</b> Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration			<b>8 Hours</b>

In Medical Imaging Systems, Curved Surfaces and Alignment.	
<b>Course outcomes:</b> The students should be able to:	
<ul style="list-style-type: none"> <li>• Implement fundamental image processing techniques required for computer vision</li> <li>• Perform shape analysis</li> <li>• Implement boundary tracking techniques</li> <li>• Apply chain codes and other region descriptors</li> <li>• Apply Hough Transform for line, circle, and ellipse detections.</li> <li>• Apply 3D vision techniques.</li> <li>• Implement motion related techniques.</li> <li>• Develop applications using computer vision techniques.</li> </ul>	
<b>Question paper pattern:</b> The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.	
<b>Text Books:</b>	
1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.	
<b>Reference Books:</b>	
2. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4 <sup>th</sup> edition, 2013.	