INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM

INTRODUCTION OF NEW COURSE

Course Title	Computer Vision	Course No *(to be assigned by Academic Cell)*	COM5XXX				
Specialization	Computer Science and Engineering	Structure (LTPC)	3	0	0	3	
To be offered for	UG, PG and Ph.D with COT	Status	Core ☐		Elective ■		
Faculty Proposing the course	Dr. V. Masilamani	Type	New ■		Modification ☐		
Date of DAC	26-12-2018	Members present in DAC External Member:	All Faculty members of the Dept. Members of the Dept:				
			Prof. Anurag Mittal Mittal, IITM				
Pre-requisite	Digital Image Processing or COT	Submitted for approval	39th Senate				

Learning Objectives	To Solve real world problems with image or video as input, understanding the real world scene is important from the input. Computer Vision makes use of low level image processing, pattern recognition algorithms to provide information about the real word scene. This course on Computer vision focuses on design of algorithms to understand real world scene and provide information about the real world objects. Computer Vision has applications in many areas such as biometric, medical image diagnosis, surveillance etc.
Learning Outcomes	At the end of the course, students are expected to have skills to design their own algorithms to solve real world problems that involve image or video as input. This course will motivate students to take up projects in computer vision domain
Contents of the course *(With approximate break up of hours)*	**Depth estimation and Multi-camera views :** Perspective, Binocular Stereopsis -Camera and Epipolar Geometry, Homography, Rectification, 3-D reconstruction framework, Auto-calibration. (8 hrs.) **Feature Extraction :** Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT. (8 hrs.) **Image Segmentation :** Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection. (8 hrs.) **Lighting and Deformation:** shadows, Lambertian, Harmonic images , deformable part models, fine-grained classification(8 hrs.) **Motion Analysis:** Background Subtraction and Modeling, Optical Flow, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.(8 hrs.) Practice/Tutorial Component: 1) Compute camera matrix and use it to calibrate camera 2) Find fundamental matrix, and then compute point correspondence using fundamental matrix, and also find the depth image using the point correspondence 3) Find Essential matrix, and then compute point correspondence using essential matrix , and also find the depth image using the point correspondence 4) Given two images, find homography between two images, and use the holography for image mosaicking 5) Compute SIFT feature and use it for object detection 6) Compute SURF feature and use it for object detection 7) Do image segmentation using Graph Cut 8) Do image segmentation using MRF 9) Compute shape from shadow 10) Do object detection and tracking using optical flow
Text Books	**1)** Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011. **2)** D. A. Forsyth, J. Ponce: Computer Vision: A Modern Approach, Pearson Education, 2003.
Reference Books	1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004. 2. Marco Alexander Treiber, Optimization for Computer Vision: An Introduction to Core Concepts and Methods, Springer 2013. 3. Alan C. Bovik, Handbook of Image and Video Processing, ISBN- 978-0123885623, ELSEVIER, ACADEMIC PRESS, 2005.