Course Code	Course Title	L	T	P	C
BCSE407L	Computer Vision	3	0	0	3
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives

1. To solve real world problems with image or video as input.
2. To make use of low level image processing algorithms to provide information about the scene.
3. To emphasize on computer vision applications

Course Outcomes

At the end of the course the student will be able to

1. Analyze image formation using digital camera and its principles
2. Evaluate feature extraction and feature estimation for image or video
3. Apply 3D vision techniques
4. Identify the computer vision applications

Module:1	**Low Level Vision**	**6 hours**
Image Formation – Sampling and Aliazing – Linear Filters and Convolution – Correlation and Patterns – Image Pyramid		
Module:2	**Feature Detection and Matching**	**5 hours**
Points and patches-Feature detectors, Feature descriptors, Feature matching, Feature tracking; Edges: Edge detection and linking; Vanishing points		
Module:3	**Segmentation**	**7 hours**
Active Contours – Split and Merge – Mean Shift and Mode Shift – Normalized cut – Graph cut and Energy based methods – Deep Learning based Segmentation Models for Computer Vision		
Module:4	**Motion Estimation and Recognition**	**7 hours**
Translational alignment – Parametric Motion - Spline-based motion – Optical Flow – Layered Motion- Object Detection – Face Recognition – Scene Understanding		
Module:5	**Stereo Correspondence and 3D Reconstruction**	**6 hours**
Epipolar Geometry – Local Methods – Multi view stereo – Shape from X – Active Range finding – Model based reconstruction		
Module:6	**Image Stitching and Image Rendering**	**6 hours**
Stitching: Motion models, Global alignment, Compositing; Rendering: Layered depth images, Light fields and Lumi graphs, Environment Mattes		
Module:7	**Computer Vision Applications**	**6 hours**
Contour tracking and rotoscoping – Medical Image Segmentation – Video summarization and compression – Stereo based head tracking – Z-keying and background replacement		
Module:8	**Recent Trends**	**2 hours**
Guest lectures from Industry and, Research and Development Organizations		
	Total Lecture hours:	**45 hours**

Text Book(s)

1.	Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011

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
4.	K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.
5	R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison- Wesley, 1992

Mode of Evaluation: CAT, written assignment , Quiz, FAT			
Recommended by Board of Studies	12-05-2023		
Approved by Academic Council	No. 70	Date	24-06-2023