

**SEMESTER S8**  
**COMPUTER VISION**

<b>Course Code</b>	<b>OEEVT833</b>	<b>CIE Marks</b>	40
<b>Teaching Hours/Week (L: T:P: R)</b>	3:0:0:0	<b>ESE Marks</b>	60
<b>Credits</b>	3	<b>Exam Hours</b>	2 Hrs. 30 Min.
<b>Prerequisites (if any)</b>	None	<b>Course Type</b>	Theory

**Course Objectives:**

1. To develop the knowledge of various methods, algorithms and applications of Computer Vision.

**SYLLABUS**

<b>Module No.</b>	<b>Syllabus Description</b>	<b>Contact Hours</b>
<b>1</b>	Review of image processing techniques: Digital filters, linear filters- Homomorphic filtering, Point operators- Histogram, neighbourhood operators, thresholding Mathematical morphology, Binary shape analysis, Binary shape analysis, Erosion, Dilation, Opening and Closing, Hit-or-Miss Transform ,connectedness, object labelling and counting, Boundary descriptors – Chain codes. Properties of Binary Regions, Geometric Features, Statistical Shape Properties	9
<b>2</b>	Feature Detection and Image Synthesis, Edge detection – edges, lines, active contours, Split and merge, Mean shift and mode finding, Normalized cuts, Graph cuts, energy- based methods- Cranny’s Algorithm, Corner detection, Harris corner detection algorithm. Hough transform-Line and curve detection.	9
<b>3</b>	Shape from X - Shape from shading, Photometric stereo, Texture Occluding contour detection. Motion Analysis- Regularization theory, Optical Flow: brightness constancy equation, aperture problem, Horn-Shunck method,	9

	Lucas-Kanade method. Structure from motion	
4	Object recognition-Shape correspondence and shape matching PCA,SVM, LDA, Bayes rule and ML methods. Eigen faces, Face detection, Face recognition, Application: Scene analysis Examples of real time applications: In-vehicle vision system.	9

**Course Assessment Method**  
(CIE: 40 marks, ESE: 60 marks)

**Continuous Internal Evaluation Marks (CIE):**

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written )	Total
5	15	10	10	40

**End Semester Examination Marks (ESE)**

*In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions*

Part A	Part B	Total
<ul style="list-style-type: none"> <li>• 2 Questions from each module.</li> <li>• Total of 8 Questions, each carrying 3 marks</li> </ul> <p style="text-align: center;"><b>(8x3 =24marks)</b></p>	<ul style="list-style-type: none"> <li>• Each question carries 9 marks.</li> <li>• Two questions will be given from each module, out of which 1 question should be answered.</li> <li>• Each question can have a maximum of 3 sub divisions.</li> </ul> <p style="text-align: center;"><b>(4x9 = 36 marks)</b></p>	<b>60</b>

## Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
<b>CO1</b>	Understand digital filtering operations for CV applications.	<b>K2</b>
<b>CO2</b>	Apply basic morphological and boundary operators for Computer vision applications	<b>K3</b>
<b>CO3</b>	Apply edge, corner detection algorithms to locate objects in an image.	<b>K3</b>
<b>CO4</b>	Apply optical flow algorithms to detect moving objects in a video.	<b>K3</b>
<b>CO5</b>	Analyse a given scene using appropriate computer vision algorithms to detect/recognize objects and to implement it in real time practical applications.	<b>K4</b>

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

### CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO1</b>	3	3	2		2						2	3
<b>CO2</b>	3	3	2		2						2	3
<b>CO3</b>	3	3	3		2						2	3
<b>CO4</b>	3	3	3		2						2	3
<b>CO5</b>	3	3	3		2						2	3

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Computer and Machine Vision -Theory Algorithm and Practicalities	E. R .Davies	Academic Press,	2012.
2	Computer Vision: Algorithms and Applications	Richard Szeliski	ISBN 978-1- 84882-935-0, Springer	2011
3	Computer Vision: A Modern Approach	David Forsyth and Jean Ponce	Pearson India	2002

<b>Reference Books</b>				
<b>Sl. No</b>	<b>Title of the Book</b>	<b>Name of the Author/s</b>	<b>Name of the Publisher</b>	<b>Edition and Year</b>
1	Deep Learning,	Goodfellow, Bengio, and Courville,	MIT Press,.	2006
2	Mastering OpenCV with Practical Computer Vision Projects	Daniel Lelis Baggio, et al	Packt Publishing Limited,	2012
3	Computer Vision: Models, Learning, and Inference,	Simon J D Prince	Cambridge University Press	2012
4	Digital Image Processing and Computer Vision,	R. J. Schalkoff	John Wiley,	2004
5	Programming Computer Vision with Python: Tools and algorithms for analyzing images	Jan Erik Solem,	O'Reilly Media,	2012

<b>Video Links (NPTEL, SWAYAM...)</b>	
<b>Module No.</b>	<b>Link ID</b>
<b>1</b>	<a href="https://onlinecourses.nptel.ac.in/noc19_cs58/preview">https://onlinecourses.nptel.ac.in/noc19_cs58/preview</a>
<b>2</b>	<a href="https://onlinecourses.nptel.ac.in/noc21_cs93/preview">https://onlinecourses.nptel.ac.in/noc21_cs93/preview</a>
<b>3</b>	<a href="https://onlinecourses.nptel.ac.in/noc24_ee38/preview">https://onlinecourses.nptel.ac.in/noc24_ee38/preview</a>