Banasthali Vidyapith
Department of Computer Science
Course Handout: M.Tech. (AI)/ M.Tech. (CS) I Semester
July –December 2025

Date: **9 July 2025**

Course Code: AI 505L **Course Name: Computer Vision Lab**

Credit Points: 2 **Max. Marks: 100 (CA: 40 + ESA: 60)**

Course Instructor:

Ms. Aishvarya Garg, Research Associate, Computer Science

Course Outcomes:

On completion of the course, students will be able to:

CO 1 To understand and apply the image fundamentals and mathematical transforms necessary for computer vision.
CO 2 To apply the image enhancement techniques and image restoration procedures.
CO 3 To apply the image segmentation and representation techniques.
CO 4 To comprehend the practical aspects of analysis of images with computers.
CO 5 To implement classification and machine learning techniques in computer vision.

Suggested Books:

R1. Sonka, M., Hlavac, V., & Boyle, R. (2014). Image processing, analysis, and machine vision. Cengage Learning.
R2. Szeliski, R. (2010). Computer vision: algorithms and applications. Springer Science & Business Media.
R3. Forsyth David, A., & Jean, P. (2002). Computer Vision: a modern approach. PHI
R4. Cipolla, R., Battiato, S., & Farinella, G. M. (Eds.). (2010). Computer Vision: Detection, recognition and reconstruction (Vol. 285). Springer.
R5. Ikeuchi, K. (2014). Computer vision: A reference guide. Springer Publishing Company, Incorporated.
R6. Nixon, M., & Aguado, A. (2019) Feature extraction and image processing for computer vision. Academic press.

Suggested E-Learning Material:

E1. Computer Vision: Foundations and Applications
http://vision.stanford.edu/teaching/cs131_fall1415/schedule.html
E2. Deep Learning in Computer Vision https://www.coursera.org/learn/deep-learning-in-computer-vision

Assessment Schedule:

Component	Marks	Submission/ Examination Date(s)	Allotment/ Syllabus
Continuous Assessment**	40	---	Course related topics
End-Semester Examination	60	1 December – 19 December, 2025*	Lab No. 01 to 25 (Entire Syllabus)

* Subject to change, if required.
**Continuous assessment will be based on practical test(s)/ viva-voce/ minor project(s)/ any other component(s) as decided by the instructor(s) on regular basis.

Laboratory-Wise Schedule: (02 hours/ laboratory)

Laboratory Number	Topics to be Covered
1	Introduction to MATLAB: To read and display an image.
2-3	**Geometric transformations of image:** (i) Translation (ii) Scaling (iii) Rotation (iv) Shrinking (v) Zooming
4-5	**Histogram Equalization:** Histogram mapping and equalization of an input image (grayscale and color).
6-7	**Image Denoising:** To add noise in the image and apply image restoration techniques using (i) Average filter (ii) Median filter (iii) Gaussian filter (iv) Wiener filter
8-9	**Edge Detection**: Edge detection using following operators: (i) Canny (ii) Prewitt (iii) Sobel (iv) Log
10-11	**Segmentation:** Segmentation of an image using (i) Thresholding (ii) Clustering (iii) Graph based segmentation (iv) Region growing (v) Watershed segmentation
12-13	**Frequency Domain:** To apply following transforms on an input image and perform inverse transforms to reconstruct the image: (i) Discrete Fourier Transform (ii) Discrete Cosine Transform (iii) Discrete Wavelet Transform
14	**Filtering:** To perform low pass and high pass filtering in frequency domain.
15-16	**Feature Extraction:** LBP, HOG, SIFT, SURF, Moment, Invariant moments
17-18	**Classification**: Binary and multiclass classification using Support Vector Machine (SVM)
19-20	**Object Detection:** Real time object detection, Real- time face detection in multi-scale images with an attentional cascade of boosted classifiers.
21-22	**Tracking:** Color object tracking, moving object tracking based on background subtraction.
23	**Application:** Activity recognition.
24	**Application:** Emotion recognition
25	Optical flow in any image processing application

Ms. Aishvarya Garg