

**RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA,
BHOPAL**

New Scheme Based On AICTE Flexible Curricula

CSE-Artificial Intelligence and Machine Learning/ Artificial Intelligence and Machine Learning, VII-Semester

AL701 Computer Vision

Course Objectives: Students should be able to

Understand practice and theory of computer vision. Elaborate computer vision algorithms, methods and concepts

Implement computer vision systems with emphasis on applications and problem solving

Apply skills for automatic analysis of digital images to construct representations of physical objects and scenes.

Design and implement real-life problems using Image processing and computer vision.

Unit I: Introduction to computer vision, Introduction to images, Image Processing VS Computer Vision, Problems in Computer Vision, Basic image operations, Mathematical operations on images: Datatype Conversion, Contrast Enhancement, Brightness Enhancement, Bitwise operations: Different Bitwise Operations

Unit II: Binary Image Processing, thresholding, Erosion / Dilation, Overview on Opening and Closing, Connected Component Analysis, Contour Analysis

Unit III: Image Enhancement and Filtering, Color Spaces, Color Transforms, Histogram Equalization, Advanced Histogram Equalization (CLAHE), Color Adjustment using Curves, Image Filtering: Introduction to Image Filtering, What is Convolution, Image Smoothing: - Box Blur, Gaussian Blur, Median Blur

Unit IV: Introduction to Image Gradients: - First Order Derivative Filters, Second Order Derivative Filters, Edge Detection, Image Segmentation and Recognition, Image Classification, Object detection

Unit V: Applications of Computer Vision: Gesture Recognition, Motion Estimation and Object Tracking, face detection, Deep Learning with OpenCV

Books and references

1. Forsyth & Ponce, "Computer Vision-A Modern Approach", Pearson Education.
2. M.K. Bhuyan, "Computer Vision and Image Processing: Fundamentals and Applications", CRC Press, USA, ISBN 9780815370840 - CAT# K338147.
3. Richard Szeliski, "Computer Vision- Algorithms & Applications", Springer.
4. R.C Gonzalez & Richard E Wood, "Digital Image Processing", Addison Wesley Publishin
5. Bharti Motwani, "Machine Learning for Text and Image Data Analysis", Publishers Wiley, 2023

Online Lectures links

https://onlinecourses.nptel.ac.in/noc23_ee39/preview

https://onlinecourses.nptel.ac.in/noc19_cs58/preview

https://onlinecourses.nptel.ac.in/noc23_ee78/preview

PRACTICAL: Different problems to be framed to enable students to understand the concept learnt and get hands-on on various tools and software related to the subject. Such assignments are to be framed for ten to twelve lab sessions