# 22AIE313 Computer Vision & Image Understanding (2-1-3-4)

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# Course Objectives

- Introduces the geometry of image formation and its use for 3D reconstruction and calibration.
- Introduces the analysis of patterns in visual images that are used to reconstruct and understand objects and scenes.

# Course Outcomes

| CO# | Outcome |
|---|---|
| CO1 | Apply image formation and camera calibration for various applications. |
| CO2 | Analyze and select image features and apply for image matching. |
| CO3 | Develop image recognition algorithms. |
| CO4 | Develop stereo vision applications for distance estimation. |

# Syllabus

## Unit 1

Introduction, Image Formation – geometric primitives and transformations, photometric image formation, digital camera, Camera calibration. Edge Detection, Segmentation.

## Unit 2

Feature Detection and Matching – points and patches, edges, lines, Feature-Based Alignment - 2D, 3D feature-based alignment, pose estimation, Image Stitching, Dense motion estimation – Optical flow - layered motion, parametric motion, Structure from Motion.

## Unit 3

Recognition – object detection, face recognition, instance recognition, category recognition, Stereo Correspondence – Epipolar geometry, 3D reconstruction.

# Textbooks/References


1. Szeliski R. Computer Vision: Algorithms and Applications Springer. New York. 2022.
2. Shapiro LG, Stockman GC. Computer Vision: Theory and Applications. 2001.
3. Forsyth DA, Ponce J. Computer Vision: a modern approach;2012.
4. Davies ER. Machine vision: theory, algorithms, practicalities. Elsevier; 2004 Dec 22.
5. Jain R, Kasturi R, Schunck BG. Machine vision. New York: McGraw-Hill; 1995 Mar 1

# Evaluation Policy

| Sl. No. | Exam | Weightage% |
|---|---|---|
| 1 | Mid Term Exam | 20% |
| 2 | Continuous Evaluation (Theory)<br>• Quiz 1 (19th March, 2025)<br>• Quiz 2 (10th June, 2025) | <br>10%<br>10% |
| 3 | Continuous Evaluation (Lab)<br>• Assignment 1 – Written assignment based on labsheets (1 – 3)<br>• Assignment 2 - Written assignment based on labsheets (4 – 6)<br>• Assignment 3 – Written assignment based on tutorial sessions | <br>10%<br>10%<br>10% |
| 4 | End Semester Exam | 30% |
| | Total | 100% |

# Thank you