Adani University, Ahmedabad
Faculty of Engineering Sciences and Technology (FEST)
Department of Computer Science and Engineering (AI-ML)

Course Code   : ECSCI24402
Course Name   : Computer Vision & Applications
Pre-requisites, if any : Calculus, Linear algebra, Probability, Programming
knowledge of Python

Credit Points   : 4 (3-0-2)
Offered   : BTech in CSE
Semester   : VII (Professional Core Course)

Course Coordinator:
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Faculty Room: 4th Floor
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Consultation Times: 10:00-5:00 Monday to Friday

Students will be contacted throughout the Session via email with important information relating to this Course.

Course Objectives:

In this course students will learn basic principles of image formation, image processing algorithms and recognition from single or multiple images (video). This course emphasizes the core vision tasks of scene understanding and recognition. Applications to object recognition, image analysis, and image retrieval and object tracking will be discussed.

Course Outcomes:

CO-1 To comprehend core techniques of computer vision in real-world applications
CO-2 To analyze key methods for image analysis
CO-3 To understand image reconstruction
CO-4 To simulate motion representation and estimation techniques

Course Outline:

Unit	Content	Hrs.
1	**Introduction:** Human Vision System & Computer Vision System, Computation Vision Technologies, Radiometry, Sources, Shadows and Shading, Concepts of Colors **Image formation & Image processing:** Geometric primitives and transformations, Photometric image formation, The Digital Camera Image, Filtering, Fourier Transformations, Pyramids and Wavelets, Geometric Transformations	12
2	**Model Fitting and Optimizations:** Scattered Data Interpolation, Variational Methods and Regularization, Markov Random Field. **Multi-Level Vision (Low, Mid, High):** Edge Detection, Feature Detection and Matching, Instance Recognition, Image Classification, Object Detection, Semantic Segmentation, Video Understanding, Vision and Language, Image Alignment and Feature-Based Methods.	12
3	**Motion Estimation:** Translational Alignment, Parametric Motion, Optical Flow, Layered Motion, Estimating the Motion, Motion Based Segmentation	8
4	**Advanced Topics:** Depth Estimations, Textures, 3-D Reconstruction, Image Based Rendering Data Sets and Benchmarks, Software Packages and Libraries	6
5	**Computer Vision applications:** Computer Vision and its Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing,	5

Method of delivery:
Face-to-face lectures, self-study material, class practice, assignments, quizzes, presentations, etc.

Study time:
3 hrs. lecture, 2 hrs. lab

CO-PO Mapping (Course outcome with Program Outcomes):

PO 1.   Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2.   Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions