

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2020-21

Programme:	Bachelor of Engineering (Computer Engineering)
Semester:	VII
Course Code:	102046705
Course Title:	Computer Vision and Image Processing
Course Group:	Professional Elective Course - III

Course Objectives: This subject emphasis on fundamentals of Image processing and Computer vision. Students will gain the knowledge of Image Formation, Image Enhancement and Segmentation. Students will also learn various feature extraction techniques. This subject has more emphasis on core vision tasks through Motion estimation and Object as well as pattern recognition. Students shall explore the areas where automation can be possible through Image processing and Computer Vision.

Teaching & Examination Scheme:

Contact hours per week			Course Examination Marks (Maximum / Passi					ssing)
Locturo	Tutorial	Dractical	Credits	The	eory	J/V	/P*	Total
Lecture	Tutorial	Flattical	L.	Internal	External	Internal	External	TULAI
3	0	2	4	40 / 14	60 / 21	20 / 7	30 / 10	150 / 52

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours		
1	Introduction:	04		
	Digital Image fundamentals, Image Sensing and acquisition, Sampling and			
	Quantization, Image formation models, Overview of Computer Vision, Applications			
	of Image processing and Computer Vision			
2	Image Enhancement:	10		
\leq	Image enhancement in spatial domain, Basic grey level Transformations, Histogram			
~	Processing Techniques, Spatial Filtering, Image smoothing and Image Sharpening,			
	Image enhancement process in frequency domain, Low pass filtering, High pass			
	filtering			
3	Image Segmentation:	05		
	point, line and edge detection, Thresholding, Regions Based segmentation, Edge			
	linking and boundary detection			

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4	Feature Extraction:	08
	Importance of Features, Feature extraction techniques, Histogram of Oriented	
	Gradient (HOG), Scale Invariant Feature Transform (SIFT), Background subtraction	
	techniques, Image Matching, Principal Component Analysis (PCA)	
5	Object Recognition and Motion Estimation:	10
	Object Recognition techniques: Viola-Jones, Yolo, Deep learning algorithms for	
	Object Recognition. Optical Flow, Gaussian Mixture Model (GMM), Structure of	
18	Motion, Motion Estimation.	
6	Applications of Image Processing and Computer vision:	04
	Face Recognition, Facial Expression Recognition, Optical Character Recognition,	
	Automated Video Surveillance	
	Total	41

List of Practicals / Tutorials:

1	Implement various grey level transformations for Image Enhancement.
2	Implement Histogram Equalization technique.
3	Write a Program to apply convolution processes on an input image for image smoothing.
4	Implement Histogram of Oriented Gradient (HOG) for Feature extraction.
5	Write a Program to apply Scale Invariant Feature Transform on input image.
6	Implement frame differencing technique for background subtraction from video.
7	Implement Principal Component Analysis for the computation of Eigenvector to reduce the
	dimensionality.
8	Implement object detection algorithm YOLO.
9	Implement R-CNN algorithms for object detection.
10	Implement motion estimation using optical flow technique.
11	Implement Object recognition.
12	Implement Facial Expression Recognition

12 Implement Facial Expression Recognition.

Reference Books:

1 Digital Image Processing- Refael C. Gonzalez and Richard E. Woods, Wesley

2	Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision,
	by B. K. P. Horn, McGraw-Hill.

- **3** Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.
- 4 Computer Vision, D. H. Ballard, C. M. Brown, Prentice-Hall, Englewood Cliffs, 1982.

Sup	Supplementary learning material:				
1	NPTEL Courses:				
	https://onlinecourses.nptel.ac.in/noc19_cs58/preview				
	https://onlinecourses.nptel.ac.in/noc19_ee55/preview				
2	Coursera Courses on Image Processing, Computer Vision				

Pedagogy:

• Direct classroom teaching

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- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %				rks in ⁽	R: Remembering; U: Understanding;	
R	U	Α	Ν	Ε	C	A: Applying;
15%	25%	25%	15%	15%	05%	N: Analyzing; E: Evaluating; C: Creating

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand fundamentals of image processing and computer vision.	15
CO-2	Understand and apply concepts of Image formation and Image	25
1	Enhancement.	
CO-3	Understand and apply image segmentation and feature extraction	20
	methods.	
CO-4	Acquire knowledge about various Object Detection, Object Recognition,	25
	Motion estimation techniques and their applications.	
CO-5	Ability to apply various Image processing and Computer vision	15
	algorithms to solve real time problems.	

Curriculum Revision:					
Version:	1.0				
Drafted on (Month-Year):	June-2020				
Last Reviewed on (Month-Year):	-				
Next Review on (Month-Year):	June-2025				

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