FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Technology

Semester II

Course Code: 102310203

Course Title: Image Processing and Computer Vision

Type of Course: Core Course V

Course Objectives: This course will provide students with more techniques in the digital image processing for image enhancement, restoration of noisy images, Segmentation and various machine learning techniques. Emphasis is given more on implementation of various algorithms so that students will able to develop their own algorithm. The techniques covered in the syllabus have wide applicability in any field which needs to handle the image data.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	30 / 15	20 / 10	70 / 35	30 / 15	150 / 75

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

Detailed Syllabus:

Sr.	Contents	Hours
1	Digital Image Fundamentals: Light and Electromagnetic spectrum, Components of Image processing system, Image formation and digitization concepts, Neighbours of pixel adjacency connectivity, regions and boundaries, Distance measures, Applications.	06
2	Image Enhancements: In spatial domain: Basic gray level transformations, Histogram processing, Using arithmetic/Logic operations, smoothing spatial filters, Sharpening spatial filters. In Frequency domain: Introduction to the Fourier transform and frequency domain concepts, smoothing frequency-domain filters, Sharpening frequency domain filters.	07
3	Image Restoration: Various noise models, image restoration using spatial domain filtering, image restoration using frequency domain filtering, Estimating the degradation function, Inverse filtering.	06
4	Color Image Processing Color fundamentals, Color models, Color transformation	04
5	Image Segmentation: Detection of discontinuities, Edge linking and boundary detection, thresholding.	05

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6	Computer Vision: Feature descriptors: HOG – SIFT - SURF, Object detection and tracking, Object recognition, Motion detection, Principal Component analysis, Intelligent video surveillance	**07**
7	Applications: Face detection, Vehicle detection, pedestrian detection, Suspicious activity detection and recognition, Crowd detection, Medical imaging for disease detection	**06**
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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
20%	30%	20%	10%	15%	05%	

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.

Reference Books:

1	Digital Image Processing Author: Rafel C. Gonzalez and Richard E. Woods, Publisher: Pearson Education
2	Digital Image Processing, Author: Bhabatosh Chanda and Dwijesh Majumder, Publisher: PHI
3	Computer Vision - A modern approach, Author: D. Forsyth and J. Ponce, Publisher: Prentice Hall
4	Feature Extraction & Image Processing for Computer Vision, Author: Mark Nixon and Alberto S. Aquado, Third Edition, Academic Press, 2012
5	John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
6	Adrian Rosebrock Deep learning with Computer Vision with Python, pyimagesearch
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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the basic image enhancement techniques in spatial & frequency domains.	**20**
CO-2	Understand the various kind of noise present in the image and how to restore the noisy image.	**15**
CO-3	Understand various segmentation methods and to apply this concept for image handling in various fields.	**20**
CO-4	To develop applications using computer vision techniques	**25**
CO-5	Understand video processing, motion computation and 3D vision and geometry	**20**
CO-6	Click or tap here to enter text.	Click
CO-7	Click or tap here to enter text.	Click
CO-8	Click or tap here to enter text.	Click
CO-9	Click or tap here to enter text.	Click

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CO-10	Click or tap here to enter text.	Click

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List of Practicals / Tutorials:

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1	Understand various functionalities of python and OpenCV: Read, Write, and display an image using OpenCV
2	Write and Execute various Image transformations for Image enhancement: Image Negative, Contrast Stretching, Bit plane slicing, Gray level slicing
3	Enhance the image using Histogram equalization.
4	Study various Noise Models and Restore the degraded image using following filters: Arithmetic mean, Midpoint, Alpha trimmed mean
5	Write a program to detect the Edges of the given input image using following Edge detection algorithms: Canny Edge Detection, Sobel Edge Detection
6	Implement Image Forging Detect and Classify forged images using OpenCV and Python. Use Machine learning technique.
7	Implement Face detection and recognition using OpenCV and python.
8	Recognize and classify various facial expressions using Neural Network and Support Vector Machine and Compare the results.
9	Implement Number Plate Recognition using Deep learning.
10	Impalement Image inpainting using Deep learning and Keras library.
11	Implement a miniproject.
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Supplementary learning Material:	
1	NPTEL Computer Vision https://nptel.ac.in/courses/106/105/106105216/
2	NPTEL Digital Image Processing https://nptel.ac.in/courses/117/105/117105079/
3	pyimagesearch.com
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Curriculum Revision:	
Version:	**1**
Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22

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