LNMIIT, Jaipur
Department of Computer Science & Engineering

LNMIIT
The LNM Institute of
Information Technology

Programme: M. Tech. (CSE)	Course Title: **Digital Image Analysis**			Course Code: **CSE--**
Type of Course: **Program** **Elective**	**Prerequisites:** **NIL**			**Total Contact Hours:** **40**
Year/Semester: **I/Even**	**Lecture Hrs/Week:** **3**	**Tutorial Hrs/Week:** **0**	**Practical Hrs/Week:** **0**	**Credits:** **3**

Learning Objectives:

The course aims to introduce digital image analysis by presenting techniques such as filtering, multiresolution and texture analysis, and object recognition. The focus of the course is for students to have a broad understanding of theory, algorithms and techniques behind image analysis methods which can be used in numerous applications viz. medicine, computer vision, surveillance, biometrics, etc. Introduction to explainable AI and interpretability will also be covered. Hands-on assignments will teach a broad functionality of OpenCV, Tensorflow, and Keras as an integral part of the course.

Course outcomes (COs):

On completion of this course, the students will have the ability to:		Bloom's Level
CO-1	**Explain** basic concepts in digital images and analysis, such as discretization, image enhancement, segmentation and recognition	2
CO-2	**Implement** feature extraction and object recognition	3
CO-3	**Analyze** and **design** solution to solve a real-world image analysis problem	4,5
CO-4	**Understand** explainable AI in perspective of digital image analysis	2

Course Topics		Lecture Hours	
UNIT – I Introduction to digital images			
1.1	Basics of image processing	1	
1.2	Image enhancement	2	**8**
1.3	Image morphology	2	
1.4	Image segmentation	2	
1.5	Colour models	1	
UNIT – II Image Transformations			
2.1	Intensity transformations and spatial filtering	3	**6**

2.2	Frequency domain transformations	3	
UNIT – III Multiresolution, Wavelet, Texture, Appearance, Edge Features			
3.1	Image Pyramids, Binary Gabor Pattern	3	
3.2	Haar Transform, Discrete Wavelet Transform	3	**12**
3.3	Histograms, Gray Level Co-occurrence Matrix (GLCM), Local Binary Pattern (LBP)	3	
3.4	SIFT, HoG	3	
UNIT – IV Object Recognition			
4.1	Patterns and Pattern Classes	2	
4.2	Recognition based on Decision Theoretic Methods	4	**12**
4.3	Structural methods	2	
4.4	Applications – Medical image analysis, surveillance, biometrics	4	
UNIT – V Explainable AI			
5.1	Explainable AI, Interpretability, Understanding model predications	2	**2**

Textbook references (IEEE format):

Text Books:

1. R. Szeliski, *Computer Vision: Algorithms and Applications, second edition,* Springer, 2021

Reference books:

1. Rafael C. Gonzalez, and Richard E. Woods, *Digital Image Processing,* 4rd edition, Pearson/Prentice Hall, 2018.

Evaluation Method	
Item	**Weightage (%)**
Quizzes/Assignments	25
Seminar	10
Mid-Term	25
End-Term	40

*Please note, as per the existing institute's attendance policy the student should have a minimum of 75% attendance. Students who fail to attend a minimum of 75% lectures will be debarred from the End Term/Final/Comprehensive examination.

CO and PO Correlation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3			3							3		
CO2		3									3	3	
CO3		3	3	2								3	
CO4							3			3		1	

Last Updated On: November 18, 2022

Updated By: Dr. Preety Singh

Approved By: