CSE3031: Digital Image Processing

Program: B.Tech. (CSE)	Year: 2	Semester: 4
Course: Program Elective	Credits: 3	Hours: 40

Course Context and Overview:

The course aims to provide the students an introduction to the fundamentals of image processing. Concepts of a typical image processing system will be covered including image enhancement, representation and recognition for application in principal areas. The course aims to develop a foundation for further study and research in this area. The course will augment theory with assignments in MATLAB and OpenCV.

Prerequisites Courses: NIL

Course Outcomes (COs):

On completion of this course, the students will have the ability to:	
CO1:	Understand fundamental concepts of digital image processing
CO2:	Apply image enhancement transformations
CO3:	Explain colour image processing
CO4:	Describe image morphology
CO5:	Understand basic concepts of image segmentation and image representation

Course Topics:

Topic	Lecture Hours	
UNIT – I **1. Introduction to digital image fundamentals**		
1.1 Introduction to digital image processing, applications, Components of an image processing system	1	4
1.2 Image sensing and acquisition, Sampling and quantization	1	
1.3 Pixel relationships	1	
1.4 Image operations	1	
UNIT – II **2. Image Enhancement**		11
2.1 Gray level transformations	1	
2.2 Histogram processing	3	
2.3 Spatial filtering, Convolution	3	

2.5 Frequency-domain filtering	4	
UNIT – III **3. Color Image Processing**		4
3.1 Color models	1	
3.2 Pseudocolor image processing	1	
3.3 Colour transformations	1	
3.4 Using color in image segmentation	1	
UNIT – IV **4. Morphological Image Processing**		7
4.1 Dilation, erosion, opening, closing	3	
4.2 Hit-or-miss transformation	1	
4.3 Basic morphological algorithms: Extraction of connected components, convex hull, skeletons	3	
UNIT-V **5. Image Segmentation**		7
5.1 Point/line/edge detection, Hough transform	3	
5.2 Thresholding, region-based segmentation	4	
UNIT-VI **6. Image Pattern Classification**		7
6.1 Patterns and Pattern Classes	2	
6.2 Pattern Classification: Prototype matching, deep learning	5	

Textbook references:
Text Book:

1. Rafael C. Gonzalez and Richard E. Woods, "*Digital Image Processing",* 4th Edition, Pearson, 2018.

Reference books:

2. Anil K. Jain, "*Fundamentals of Digital Image Processing",* Prentice Hall.
3. Bernd Janhe, "*Digital Image Processing",* 6th edition, Springer 2005
4. Kenneth R. Castleman, "*Digital Image Processing"*, 2nd edition, Prentice Hall, 1995.

Evaluation Methods:

Component	Weightage
Continuous evaluation (quizzes, assignments, Projects)	30%
Midterm	25%
Final Examination	45%

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