

COURSE TITLE	DIGITAL IMAGE PROCESSING
COURSE CODE	01AI0504
COURSE CREDITS	4

Objective:

- 1 To study fundamental concepts of digital image processing. To understand and learn image processing operations and algorithms. To expose students to current trends in field of digital image processing.
- 2 To study fundamental concepts of digital image processing. To understand and learn image processing operations and algorithms. To expose students to current trends in field of digital image processing.
- 3 To study fundamental concepts of digital image processing. To understand and learn image processing operations and algorithms. To expose students to current trends in field of digital image processing.

Course Outcomes: After completion of this course, student will be able to:

- 1 Ascertain and describe the basics of image processing concepts through mathematical interpretation.
- 2 •Compare various filtering techniques in spatial domain and frequency domain.
- 3 Implement various algorithms on core image processing on MATLAB software.
- 4 Correlate color domain image processing technique with gray level.
- 5 Create MATLAB program to apply various image segmentation and morphological operations.

Pre-requisite of course: Knowledge of Mathematics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Introduction To Digital Image Processing Fundamentals of Elements of Digital Image, Image as Data, Pixels, Components of Digital Image, Types of Image Representation, Measures of Image, Application of Digital Image Processing	6

Contents : Unit	Topics	Contact Hours
2	MATLAB basicS & Digital Image Properties- Operations on Digital Image Data Types, Operators, Matrices, File, I/O, Image Processing Toolbox, Topological Properties of Digital Images-Histograms, Entropy, Eigen Values-Image Quality Metrics Noise in Images Sources, Arithmetic operations - Addition, Subtraction, Multiplication, Division, Logical operations NOT, OR, AND, XOR-Set Operators	10
3	Image Enhancement Spatial Domain: Gray level transformation - Histogram processing, Frequency Domain: Basics of filtering – smoothening and sharpening frequency domain filters	6
4	Image Filtering Techniques Low Pass Filters – Smoothing, High Pass Filters - Edge Detection, Sharpening	5
5	Image Degradation/Restoration Noise Models, Model of Image Degradation/Restoration Process, Noise Reduction, Inverse Filtering, M Minimum Mean Square Error (Weiner) Filtering.	6
6	Color Image Fundamentals Color Models, Representation of Color in Images, Color Image Processing, Basics of Color Image Processing Smoothing and Sharpening	5
7	Image Segmentation & Image Morphology Thresholding, Histogram Based Segmentation, Clustering, Region Growing Method, Point, Line and Edge Detection, Different Morphological Algorithm, Morphological Measures	7
Total Hours		45

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Lab 1 Study of MATLAB image processing toolkit and various commands on MATLAB.	2
2	Lab 2 Point processing in spatial domain	2
3	Lab 3 program for histogram equalization.	2
4	Lab 4 program to apply various filtering techniques in MATLAB	2
5	Lab 5 program for image segmentation	2
6	Lab 6 program for color image processing	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
7	Lab 7 Program for Image restoration	2
8	Lab 8 Program for edge detection	2
9	Lab 9 Program for smoothening and sharpening for 8-bit color image	2
10	Lab 10 Program to implement morphological operations	2
Total Hours		20

Textbook :

- 1 Digital Image Processing, Third edition, Rafael C. Gonzalez and Richard E. Woods, Pearson Education, 2010

References:

- 1 Digital Image Processing Using MATLAB, Digital Image Processing Using MATLAB, Gonzalez & Woods , Tata McGraw Hill Pvt. Ltd, 2011
- 2 Digital Image Processing, Digital Image Processing, Jayaraman S, Esaki Rajan S, T. Veera Kumar, Tata McGraw Hill Pvt. Ltd, 2010

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	25.00	30.00	25.00	0.00	10.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, also need to use ICT tools and facilities.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Supplementary Resources:

- 1 <https://nptel.ac.in/courses/117105079>

Supplementary Resources:

- 2 <https://spoken-tutorial.org/scilab>
- 3 <https://in.mathworks.com>
- 4 <https://www.tutorialspoint.com/dip/>
- 5 [https://www.coursera.org/learn/introduction-image-processing?
utm_source=mobile&utm_source=link&utm_medium=page_share&utm_content=lih&utm
_campaign=card_button](https://www.coursera.org/learn/introduction-image-processing?utm_source=mobile&utm_source=link&utm_medium=page_share&utm_content=lih&utm_campaign=card_button)