



Kot Bhalwal, Jammu



Model Institute of Engineering
& Technology (Autonomous)
Course Handout

COURSEHANDOUT

Digital Image Processing, MCSE31B

Mtech-3rd SEMESTER

ACADEMIC YEAR(2024-25)

Mr. Anil Gupta

Sr.Assistant Professor

School of Computing



School of Computing

Model Institute of Engineering & Technology(Autonomous)

KotBhalwal, Jammu – 181122

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Dr. Arun K. Gupta Teaching-Learning Centre

Version 1.1



Please Do Not Print Unless Necessary



Detailed Syllabus:

Course Code	CourseName	CourseType	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
COM-503	MCSE31B	PCC	4	3	1	0	50	100	150

CourseOutcomes:

At the end of the course the student will be able to:	
CO1	Understanding Image Representation and Processing
CO2	Application of Image Enhancement and Restoration Techniques
CO3	Analysis and Interpretation of Image Content
CO4	Implementation of Image Compression and Coding Methods
CO5	Application of Image Processing in Practical Scenarios

Unit 1: Introduction and Digital Image Fundamentals: Application of Image Processing, Image Processing definition, steps in Image Processing, Image Sensing and Acquisition, Image Sampling and Quantization, Spatial and Intensity, resolution-Effect of reducing spatial resolution, DPI, Effect of reducing image gray levels; Basic relationships between pixels and adjacency. (08 hrs)

Unit 2 Intensity Transformation and Spatial Filtering: Basics of intensity transformation and spatial filtering, intensity transformation functions-image negative, log transformation, power law; Piecewise-linear transformation functions-contrast stretching, intensity level slicing, bit plane slicing; Histogram Processing-histogram stretching, histogram equalization, Spatial Filtering, Spatial Correlation and Convolution, Smoothing Spatial Filters, order statistic filters, Sharpening Spatial Filters- The Laplacian, The Gradient-Robert cross gradient operator, Sobel operators. (10 hrs)

Unit 3 Image Restoration: Model of the image degradation/restoration process, Noise Models, Periodic Noise, Estimation of noise parameters, Restoration in the presence of noise-spatial filtering- Mean filters, Order-statistics filters, Median filter, Max and Min filters, Mid-point filter, Alpha-trimmed mean filter, adaptive filters..(07 hrs)

Unit 4 Color Image Processing: Introduction to the color image processing, color models: RGB, HSI, CMY/ CMYK; Conversion of color models: converting colors from RGB to HSI, HSI to RGB, RGB to CMY and CMY to RGB ; Pseudo coloring of images. (08 hrs)

Unit 5: Image Compression: Introduction to image compression, need of compression, methods of image compression: coding redundancy, spatial and temporal redundancy, irrelevant information, models of image compression, Huffman coding, Arithmetic coding, LZW coding, run-length coding, block transform coding, JPEG compression, predictive coding. (06 hrs)



TextBooks

S.No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1.	"Fundamentals of Digital Image Processing"	Anil K. Jain	Prentice Hall	1st (1989)
2.	"Introduction to Digital Image Processing"	Alasdair McAndrew	Chapman and Hall/CRC	1st (2018)
3.	"Digital Image Processing and Analysis"	Bhabatosh Chanda, D.Dutta Majumder	CRC Press	1st (2018)

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Unit-I: Introduction and Digital Image Fundamentals



S.No	Topics: Introduction and Digital Image Fundamentals	RecommendedBooks
1	Real-world applications	Book 1, Ch.1
2	Definition and scope	Book 1,Ch.1
3	Sequential stages in processing	Book 1,Ch.1
4	Process of capturing images	Book 2,Ch.2
5	Sampling theorem, Quantization process	Book 2,Ch.2
6	Real-world applications	Book 2,Ch.2
7	Definition and scope	Book 2,Ch.2
Unit-II : 2Intensity Transformation and Spatial Filtering		
8	Introduction to intensity transformation concepts	Book 1, Ch.2
9	Image negative, Log transformation, Power law	Book 1,Ch.2
10	Contrast stretching, Intensity level slicing, Bit plane slicing	Book 1,Ch.1
11	Histogram stretching, Histogram equalization	Book 2,Ch.2
12	Understanding spatial correlation and convolution	Book 2,Ch.2
13	Different types of smoothing filters	Book 2,Ch.2
14	Exploring order statistic filtering techniques	Book 2,Ch.2
15	The Laplacian, Gradient operators, Sobel operators	Book 2,Ch.2
Unit-III Image Restoration		
16	Understanding image degradation and restoration models	Book 2,Ch.2
17	Overview of noise models in image restoration	Book 2,Ch.2
18	Understanding periodic noise and its impact	Book 2,Ch.2
19	Techniques for estimating noise parameters	Book 2,Ch.2
20	Spatial filtering for noise reduction	Book 2,Ch.2
21		Book 2,Ch.2
Unit-IV : Color Image Processing		
22	Understanding RGB, HSI, CMY/CMYK color models	Book 2,Ch.5
23	RGB to HSI, HSI to RGB, RGB to CMY, CMY to RGB	Book 1,Ch.4
24	Application and significance of pseudo-coloring	Book 1,Ch.4
25	Understanding RGB, HSI, CMY/CMYK color models	Book 2,Ch.5
26	RGB to HSI, HSI to RGB, RGB to CMY, CMY to RGB	Book 1,Ch.4
27		Book 2,Ch.5
28		Book 1,Ch.4
Unit V:- Image Compression		
29	Introduction to Image Compression	Book 2,Ch.8
30	Need for Compression	Book 1,Ch.8
31	Methods of Image Compression	Book 2,Ch.8
32	Models of Image Compression	Book 1,Ch.8
33	Huffman Coding	Book 2,Ch.8
34	Arithmetic Coding	Book2,Ch. 8

ADDITIONAL WEB RESOURCES:

1	Digital Image Processing by Prof. P.K. Biswas (IIT Kharagpur): This course covers various aspects of digital image processing including image enhancement, restoration, color image processing, image segmentation, and mathematical morphology. NPTEL :: Electronics & Communication Engineering - Digital Image Processing
2.	CASESTUDY: (PDF) Pedological and some other soil-related activities within the Earth sciences discipline at the University of Waikato, Hamilton, New Zealand – the first 50 years (1969-2018)



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	researchgate.net : Case study focuses on the application of digital image processing techniques in the medical field, specifically for the early detection of diseases. It explores various algorithms and methods used to enhance, segment, and analyze medical images to assist in accurate diagnosis and treatment planning.
2	TUTORIAL LINK: Digital Image Processing (tutorialspoint.com) This tutorial provides a detailed introduction to the fundamental concepts of digital image processing, including image transformation, enhancement, and restoration techniques..
3	PREVIOUS YEAR PAPERS: Digital Image Processing CS463 Question Papers (2015 batch) KtuQbank List of expected questions from various universities.
4	SOFTWARE LINK: <ul style="list-style-type: none"> • MATLAB for Image Processing: <ul style="list-style-type: none"> ○ Get Started with Image Processing Toolbox (mathworks.com) ○ MATLAB Tutorials for Digital Image Processing ○ Digital Image Processing Algorithms using MATLAB - GeeksforGeeks ○ MATLAB is widely used for implementing various image processing algorithms, providing an interactive environment for data analysis and visualization.

GRADING AND ASSESSMENT

- **Sessional Test:** 10 marks
- **Assignment:** 10 marks
- **Attendance:** 5 marks
- **Final Examination:** 75 marks

COURSE POLICIES

- **Attendance:** Minimum 75% attendance is mandatory to appear in the final examination of the course.
- **Academic Integrity:** MIET's academic integrity policies apply. Plagiarism will not be tolerated.
- **Late Submissions:** Assignments and projects must be submitted by the specified timelines.
- **Office Hours**
 - Monday (12:05 PM - 12:55 PM)
 - Friday (12:05 PM - 12:55 PM)
- **Contact Information**
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