



Model Institute of Engineering
& Technology (Autonomous)
Course Handout

Kot, Bhalwal, Jammu

COURSE HANDOUT

DIGITAL IMAGE PROCESSING (ECE-801B)

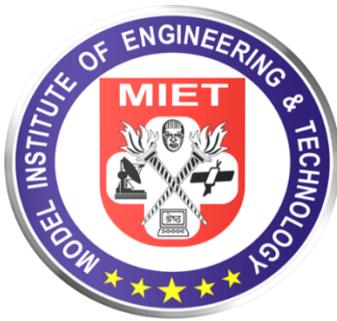
ECE-8TH SEMESTER

ACADEMIC YEAR (2023-24)

Dr Suhaib Ahmed Batt

Assistant Professor

Department of Electronics and Communication Engineering



Department of Electronics and Communication Engineering

Model Institute of Engineering & Technology (Autonomous)

Kot Bhalwal, Jammu - 181122

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Dr. Arun K. Gupta Teaching-Learning Centre

Version 1.1

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Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
ECE-801B	Digital Image Processing	Professional Elective	3	2	1	0	50	100	150

COURSE OUTCOMES

At the end of the course the student will be able to:	
CO1	Explain the fundamentals of digital image processing, including image representation in spatial and transform domain.
CO2	Perform image enhancement and filtering techniques in spatial and frequency domain
CO3	Evaluate the image restoration and filtering techniques for image analysis.
CO4	Describe image segmentation and morphological image processing techniques for image analysis.
CO5	Apply image compression and recognition techniques for image processing

Section - A

Unit-I

Digital Image Fundamentals: Steps in Digital Image Processing, Components, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms, DFT, DCT.

(7 Hrs)

Unit-II

Image Enhancement, Spatial Domain: Gray level transformations, Histogram processing, Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform, Smoothing and Sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

(8 Hrs)

Unit-III

Image Restoration, degradation model, Properties, Noise models, Mean Filters, Order Statistics, Adaptive filters, Band reject Filters, Band pass Filters, Notch Filters, Optimum Notch Filtering, Inverse Filtering, Wiener filtering.

(6 Hrs)

Section-B

Unit-IV

Image Segmentation: Edge detection, Edge linking via Hough transform, Thresholding, Region based segmentation, Region growing, Region splitting and merging, Morphological processing, erosion and dilation.

(6 Hrs)

Unit-V

Image Compression and Recognition: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Regional Descriptors, Topological feature, Texture, Recognition based on matching.

(8 Hrs)

Textbooks

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Digital Image Processing	Rafael C. Gonzalez, Richard E. Woods	Pearson	4th (2018)
2.	Digital Image Processing	William K. Pratt	John Wiley	4th (2010)



Reference Books

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Digital Image Processing	Kenneth R. Castleman	Pearson	2nd (2008)
2	Digital Image Processing using MATLAB	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins	Pearson	5th (2009)

COURSE PLAN		
Unit-I Digital Image Fundamentals		
S.No	Topics	Recommended Books
1	Steps in Digital Image Processing, Components	Book 1, Ch.1
2	Elements of Visual Perception	Book 1, Ch. 2
3	Image Sensing and Acquisition	Book 1, Ch. 2
4	Image Sampling and Quantization	Book 1, Ch. 2
5	RGB, HSI models	Book 1, Ch. 6
6	Two-dimensional mathematical preliminaries	Book 1, Ch. 2 & Ch. 4
7	2D transforms, DFT, DCT	Book 1, Ch. 4 & Book 2, Ch. 1
Unit-II Image Enhancement, Spatial Domain		
8	Gray level transformations	Book 1, Ch. 3
9	Histogram processing	Book 1, Ch. 3
10	Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering	Book 1, Ch. 3
11	Frequency Domain: Introduction to Fourier Transform	Book 1, Ch. 4
12	Smoothing and Sharpening frequency domain filters	Book 1, Ch. 4
13	Ideal, Butterworth and Gaussian filters	Book 1, Ch. 4
14	Homomorphic filtering	Book 1, Ch. 4
15	Color image enhancement	Book 1, Ch. 6
Unit-III		
16	Image Restoration, degradation model, Properties	Book 1, Ch. 5
17	Noise models	Book 1, Ch. 5
18	Mean Filters, Order Statistics	Book 1, Ch. 5
19	Adaptive filters, Band reject Filters, Band pass Filters	Book 1, Ch. 5
20	Notch Filters, Optimum Notch Filtering	Book 1, Ch. 5
21	Inverse Filtering, Wiener filtering	Book 1, Ch. 5
Unit-IV Image Segmentation		
22	Edge detection	Book 1, Ch. 10 & Book 2, Ch. 15
23	Edge linking via Hough transform	Book 1, Ch. 10 & Book 2, Ch. 15
24	Thresholding	Book 1, Ch. 10
25	Region based segmentation, Region growing	Book 1, Ch. 10
26	Region splitting and merging	Book 1, Ch. 10
27	Morphological processing, erosion and dilation	Book 1, Ch. 9 & Book 2, Ch. 14
Unit-V Image Compression and Recognition		
28	Need for data compression	Book 1, Ch. 8
29	Huffman, Run Length Encoding	Book 1, Ch. 8



30	Shift codes, Arithmetic coding	Book 1, Ch. 8
31	JPEG standard	https://www.baeldung.com/cs/jpeg-compression https://www.ijltemas.in/DigitalLibrary/Vol.2Issue2/109-113.pdf
32	MPEG	https://www.ecb.torontomu.ca/~courses/ee8205/Data-Sheets/jpeg/mpeg-coding-standards.pdf
33	Boundary representation, Regional Descriptors	Book 1, Ch. 11
34	Topological feature, Texture	Book 1, Ch. 11
35	Recognition based on matching	Book 1, Ch. 12

ADDITIONAL WEB RESOURCES

1.	MOOC: Fundamentals of Digital Image and Video Processing https://www.coursera.org/learn/digital
2.	NPTEL: Video lectures on Digital Image Processing by Prof. P.K. Biswas, IIT Kharagpur https://archive.nptel.ac.in/courses/117/105/117105135/

GRADING AND ASSESSMENT

- **Sessional Test:** 20 marks
- **Assignment:** 20 marks
- **Attendance:** 10 marks
- **Final Examination:** 100 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.

FACULTY INFORMATION

- **Office Hours**
Monday (12:05 PM - 12:55 PM)
Friday (12:05 PM - 12:55 PM)
- **Contact Information**
suhaib.ece@mietjammu.in