AMITY UNIVERSITY
UTTAR PRADESH

FORMAT FOR COURSE CURRICULUM

Annexure **AAB-CDF-01b**

Course Title: Digital Image Processing

Course Code: ECE404
Credit Units: 4
Level: UG

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
3	0	2	0	4

#	Course Title	AAB Comments
1	**Course Objectives:** It is an introductory course to the fundamentals of digital image processing. It emphasizes general principles of image processing, rather than specific applications. The objectives of this course are for students to learn the fundamental theories and techniques of digital image processing. This will be achieved through the mathematical derivation and treatment of the topics. We expect to cover the following topics: image acquisition and display, color representations, image enhancement and restoration, image compression and representation and description.	
2	**Prerequisites:** Digital Signal Processing and signal and system.	
3	**Student Learning Outcomes:** • To define image formation and the role human visual system plays in perception of gray and color image data. • Explain the fundamental concepts of a digital image processing.. • Ability to apply image processing techniques in spatial and frequency domain. • Develop hands-on experience in using computers to process images. • Apply with MATLAB Image Processing Toolbox.	
Course Contents / Syllabus:		
4	**Module I: Introduction and Digital Image Fundamentals**	**25% Weightage**

	The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations, Image File formats, Fundamental of color image processing: color models, RGB, CMY, YIQ, HIS. Pseudo Color Image processing •	.
5	**Module II: Image Enhancement in the Spatial Domain & Frequency Domain**	**25% Weightage**
	Image Enhancement in the Spatial Domain: Gray Level Transformations (Point Operations), Histogram Modelling, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters Image Enhancement in the Frequency Domain: Introduction to Fourier Transform, Smoothing and Sharpening Frequency Domain Filters, Homomorphic Filtering. High Emphasis Filtering	
6	**Module III: Image Restoration and Compression**	**20% Weightage**
	A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only, Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering , Linear Position-Invariant Degradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Filters, Geometric Transformations	
7.	**Module IV: Image Compression** Types of Data redundancies, Fidelity Criteria, Elements of information, Entropy, Lossless Coding Techniques: Runlength coding, Arithmetic coding, LZW Coding, Huffman Coding.Lossy Compression techniques: Image compression using DCT ,Compression Standards: JPEG	20% Wreihtage
7	**Module V: Image Segmentation and Morphological Operations**	**20% Weightage**
	Image Segmentation: Point Detections, Line detection, Edge Detection-First order derivatives,Second order derivative – LoG, DoG, Canny. Edge linking, Thresholding – Global, Adaptive. Otsu's Method.Region Growing, Region Splitting and Merging. Morphological Operations: Dilation, Erosion, Opening, Closing, Boundary	

	Detection, Thinning, Thickening, Skeleton. •	
8	List of Experiments: 1. To perform Basic image Processing Operations 2. To write program for Histogram Modelling 3. To write program for Gray level transformations: Contrast stretching, log transformation, power law transformation, Gamma correction. 4. To write program for Image enhancement using Smoothing and sharpening spatial filters (All types) 5. To write program for Image enhancement using frequency domain filters 6. To write program for Image enhancement using Homomorphic Filtering 7. To write program for Image segmentation using Edge Detectors: Sobel, Prewitt, Roberts without using Matlab built-in function 8. To write program for Image segmentation using Canny edge detector algorithm 9. To write program for Image segmentation using Watershed Technique 10. To write program for different morphology operations. 11. To write program for Image restoration using Inverse filtering and Wiener Filtering. 12. To write a program for image compression using DCT and recover the image using IDCT	
	Pedagogy for Course Delivery: The course would be covered under theory and laboratory. In addition to assigning project–based learning, early exposure to hands-on design to enhance the motivation among the students. It incorporates designing of problems, analysis of solutions submitted by the students groups and how learning objectives were achieved. Continuous evaluation of the students would be covered under quiz, viva etc.	
11	**Assessment/ Examination Scheme:**	

Theory L/T (%)	**Lab/Practical (%)**	**Total**

75%	25%	100%

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	Mid-Term Exam(CT)	**S/V/Q**	**HA**	Attendance(A)	
Weightage (%)	10%	8%	7%	5%	70%

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Lab Assessment (P):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	A	**PR**	**LR**	V	
Weightage (%)	5%	10%	10%	5%	70%

A: Attendance, PR- Performance, LR – Lab Record, V – Viva. EE- External Exam,

Text & References:

- Gonzales, woods and Eddins, Digital Image Processing using MATLAB, 2nd edition, Gatesmark Publishing, ISBN 9780982085400.
- N. Efford, Digital Image Processing, Addison Wesley 2000, ISBN 0-201-59623-7.
- M. Sonka, V Hlavac and R Boyle, Image Processing, Analysis and Machine Vision, PWS 1999, ISBN 0-534-95393-X.
- W K Pratt, Digital Image Processing, John Wiley and Sons, 1991, ISBN 0-471-85766-1.
- R Jain, R Kasturi and B G Schunck, Machine Vision, McGraw-Hill, 1995, ISBN 0-07-113407-7.