FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **BACHELOR OF TECHNOLOGY (Electronics and Communication)**

Semester: **VI**

Course Code: **202060604**

Course Title: **Digital Image Processing**

Course Group: **Professional Elective Course**

Course Objectives: The main objective of the course is to learn image processing and coding, along with the introduction to computer vision. The filters for image processing, image enhancement, image compression, morphology and image segmentation are covered. This course is used in almost all engineering areas and wide range of applications in various fields such as medical, security, automation, entertainment, agriculture etc.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	50/18	50/17	25/9	25/9	150/53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Digital Image Fundamentals**: Human visual system, Image as a 2D data, Image representation – Gray scale and Color images, Image sampling and quantization	04
2	**Image enhancement in Spatial domain**: Basic gray level Transformations, Histogram Processing, Spatial Filtering	07
3	**Filtering in the Frequency Domain**: Preliminary Concepts, Extension to functions of two variables, Image Smoothing, Image Sharpening, Homomorphic filtering	07
4	**Image Restoration and Reconstruction**: Noise Models, Noise Reduction, Inverse Filtering, MMSE (Wiener) Filtering.	07
5	**Image Compression:** Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, LZW coding, JPEG Compression, Wavelet based image compression	07

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6	**Image Segmentation**: Edge based segmentation, Region based segmentation, Region split and merge techniques, Region growing by pixel aggregation, optimal thresholding.	**06**
7	**Morphological Image Processing**: Erosion, Dilation, Opening, Closing, Basic Morphological Algorithms: hole filling, connected components, thinning, skeletons	**07**
		45

List of Practicals / Tutorials:

1	Introduction to image processing & image processing Toolbox.
2	Study of Brightness, Contrast manipulation and Histogram equalization of an image.
3	Implement Bit plane slicing of an image.
4	Study of 2D convolution using Low pass filtering and High pass filtering in spatial domain.
5	Implement image smoothing and image sharpening in frequency domain.
6	Study the Effect of Addition, Subtraction and logical operation on two images.
7	Study the effect of Median, Max and Min filter on an image to remove noise.
8	Image restoration using geometric mean, harmonic mean and contra-harmonic mean.
9	Calculate the Compression Ratio (CR) using Huffman coding method for the given image.
10	Implement edge detection and region-based image segmentation.
11	Perform basic morphological operations on binary image.

Reference Books:

1	Gonzaleze and Woods, **Digital Image Processing**, 3rd edition, Pearson Education
2	S Jayaraman, S Esakkirajan, T Veerakumar, **Digital Image Processing**, Tata McGraw Hill Publication.
3	Relf, Christopher G., **Image acquisition and processing with LabVIEW**, CRC press.
4	S Sridhar, **Digital Image Processing**, Oxford University Press.

Supplementary learning Material:	
1	NPTEL and Coursera Video lectures

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

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Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
15	15	20	15	15	20	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Enhance digital image quality by spatial and frequency domain filtering and histogram equalization techniques	**25**
CO-2	Apply suitable image restoration technique to minimize effect of degradation and noise for digital image	**25**
CO-3	Compress digital image by applying digital image compression algorithms	**20**
CO-4	Analyze given digital image by segmentation and morphological processing	**30**

Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	June -2022
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025

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