NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
M.Tech. in Electronics and Communication Engineering (Embedded System)
M.Tech. Semester - II
<u>Department Elective III</u>

L	T	P	C
2	-	2	3

Course Code	3EC32D302
Course Title	Speech and Image Processing

Course Outcomes (COs):

At the end of the course, students will be able to -
1. Analyse speech processing feature extraction and speaker recognition methods using Fourier Transform.
2. Analyse and process Images using multi-resolution transform, segmentation, edge detection and colour image processing algorithms.
3. Apply speech and image processing algorithms for voice and object recognition problems.

Syllabus: **Teaching Hours:**

UNIT I: Speech Processing   **04**

Introduction, Anatomy and physiology of speech production, Vocal Tract categorization of speech sounds, Prosody- The melody of speech, Speech Perception

UNIT II: Analysis of Speech Signals   **04**

Analysis and synthesis of Pole Zero speech models, STFT analysis and synthesis, wiener Filter based speech enhancement techniques, Selected methods of speech enhancement, Speech Analysis and Synthesis.

UNIT III: Digital Image Processing   **06**

Introduction to Digital Image Processing, Structure of the Human Eye, Image Formation in the Eye, Brightness Adaptation and Discrimination, Light and the Electromagnetic Spectrum, Image enhancement and filtering in spatial and frequency domain. Image restoration algorithms

UNIT IV: Transform based Image Processing   **05**

DFT, DCT, Singular Value Decomposition, Discrete Wavelet Transform

UNIT V: Image Segmentation   **04**

Detection of Discontinuities, Point Detection, Line Detection, Edge Detection, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation

UNIT VI: Color and Morphological Image Processing   **04**

Color Fundamentals Color Models Pseudo color Image Processing, Morphological Image Processing , Some Basic Concepts from Set Theory Logic Operations Involving Binary Images Dilation and Erosion Dilation Erosion, Opening and Closing, Some Basic Morphological Algorithms

UNIT VII: Object Recognition   **03**

Patterns and pattern class, decision-theoretic methods, structural methods

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings:

1. R. C. Gonzalez, R. E. Woods, Digital Image Processing, Addison-Wesley.
2. Thomos F. Quatieri, Discrete time speech signal Processing principles and practice, Pearson Education
3. Maria Petrou, Costas Petrou, Image Processing-The fundamentals, Wiley
4. Bishop, C., Pattern Recognition and Machine Learning, Springer
5. Rabinar L R, Schafer R W , Digital Processing of Speech Signals, Prentice Hall

L = Lecture, T = Tutorial, P = Practical, C = Credit