

<b>Devi Ahilya University, Indore, India Institute of Engineering &amp; Technology</b>				<b>IV Year B.E. (Electronics and Telecommunication)</b>			
<b>Subject Code &amp; Name</b>	<b>Instructions Hours per Week</b>			<b>Credits</b>			
<b>ETR7E5 SPEECH AND IMAGE PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>
<b>Duration of Theory Paper: 3 Hours</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>

**Learning Objectives:** Student will learn the basic principles and tools used to process speech, images and videos, and how to apply them in solving practical problems of commercial and scientific interests.

**Prerequisites:** Signals and systems, Digital signal processing

## **COURSE CONTENTS**

### **UNIT I- Digital Speech Processing**

The Fundamentals of Digital Speech Processing. A Review of Discrete -Time Signal & Systems , the Z-transform, the DFT, Fundamental of Digital Filters, FIR system, IIR Systems. Time–Domain Methods for Speech Processing. Time-Dependent Processing of speech, short -time energy and Average Magnitude, Short time Average Zero-Crossing Rate. Digital Representation of speech Waveform Sampling speech signals, statistical model, Instantaneous quantization, Instantaneous companding, quantization for optimum SNR, Adaptive quantization, Feed-forward Feedback adaptations.

### **UNIT II- Linear Predictive Coding of Speech**

Block diagram of Simplified Model for Speech Production. Basic Principles of Linear Predictive Analysis-The Auto Correlation Method. The Prediction Error Signal. Digital Speech Processing for Man-Machine Communication by voice. Speaker Recognition Systems-Speaker verification and Speaker Identification Systems

### **UNIT III-Digital Image**

Different stages of Image processing & Analysis Scheme. Components of Image Processing system, Multiprocessor Interconnections. A review of various Mathematical Transforms. Image Formation: Geometric Model, Photometric Model. Image Digitization: A review of Sampling and quantization processes. A digital image.

### **UNIT IV- Image Processing**

Image Enhancement: Contrast Intensification, Smoothing, Image sharpening. Restoration: Minimum Mean –Square Error Restoration by Homomorphic Filtering. Image Compression: Schematic diagram of Data Compression Procedure, Lossless compression–coding. Multivalued Image Processing, Multispectral Image Processing, Processing of colour images

## **UNIT V- Case study on Speech and Image Processing**

### **Learning Outcomes:**

Upon Completing the Course, Student will able to:

- learn the theory behind fundamental processing tasks including image/video enhancement, recovery, and compression.
- learn how to perform these key processing tasks in practice using state-of-the-art techniques and tools like optimization toolboxes to statistical techniques.

### **BOOKS RECOMMENDED:**

- [1].Milan Sonya, Vaclav Hlavac & Roger Boyle, “Image Processing Analysis and Machine Vision”, Vikas Publishing House  
[2].A.K. Jain, “Digital Image Processing”, Pearson Education  
[3].Chanda, B. & Majumder, D. D, “Digital Image Processing & Analysis” , Prentice Hall (India)

### **List of Practical Assignments:**

Practical based on Texas Instruments DSP Processor kit, it's interfacing with different peripherals and communication to other systems.