

Branch Name:	Signal Processing and Communication
Program Code:	ET214
Course Name:	Speech and Video Processing
Course Code:	2ET2140202T
Pre-requisite Course:	Basics of audio and video engineering, Digital signal processing and image processing. Having knowledge of Engineering mathematics is mandatory.

Course Objectives:

1. The goal of this course is to provide the student with a working knowledge of concepts of speech generation and processing.
2. To teach various transforms for speech processing and speech generation.
3. The subject also provides basics of video processing, digital video generation and video format changing and motion estimation.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
4	4	-	-	4	24	60	16	40		-	-	-	100

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Digital Speech Signal Processing: Introduction Speech Signal, Signal Processing, Digital Speech Processing	04	06	
2	Fundamentals of Digital Speech Processing: Transform Representation of Signals and Systems, Fundamentals of Digital Filters, Sampling	04	07	
3	Digital Models for Speech Signal: Process of Speech Production, Acoustic Theory of Speech Production, Digital Model for Speech Signals	04	10	
4	Time Domain Models for Speech Processing: Short Time Energy and Average Magnitude, Short Time Average Zero Crossing Rate, Pitch Period Estimation using Parallel processing Approach, Short Time Autocorrelation Function, Pitch Period Estimation using Autocorrelation Function, Median Smoothing and Speech Processing.	06	10	

5	Digital Representation of The Speech Waveforms: Sampling Speech Signals, Statistical Model for Speech, Instantaneous Quantization, Adaptive Quantization, Differential Quantization, delta Modulation, DPCM, comparison of Systems, Direct Digital Code Conversion	06	10
6	Short Time Fourier Analysis: Definitions and Properties, Design of Digital Filter Bank, Spectrographic Displays, Pitch Detection, Analysis-by-Synthesis Systems.	04	07
7	Linear Predictive Coding of Speech: Basic Principles of Linear Predictive Analysis, Applications of LPC Parameters	04	10
8	Digital Video Processing: Basics of Video Analog Video and Digital Video, Standards, Digital Video Processing	04	05
9	Time Varying Image Formation Models: Three Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation.	04	10
10	Spatial Temporal Sampling: Sampling for Analog and Digital Video, 2-D Rectangular Sampling, 2-D Periodic Sampling, Sampling on 3-D Structure, Reconstruction from Samples.	06	10
11	Sampling Structure Conversion: Sampling rate change for 1-D signals, Sampling Lattice Conversion	04	05
12	Two Dimensional Motion Estimation: 2-D Motion Vs Apparent Motion, 2-D Motion Estimation, Optical Flow Equation, Block Motion Models, Phase-Correlation Method, Block-Matching Method.	06	10
	Total	56	100

List of Text Book:

1. "Digital Processing of Speech Signals", L.R. Rabiner, R.W. Schafer, Pearson Education
2. "Digital Video Processing", A. Murat Tekalp Pearson Education

List of Reference Books:

1. "Digital Audio Signal Processing", Second Edition, Udo Zolzer, A John Wiley & sons Ltd. Publications.
2. "Video Processing and Communications", Yao Wang, Joern Ostermann, and Ya-Qin Zhang, Prentice Hall

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand basics of speech processing and helps the student to analyze a speech signal	1 Remembering 2 Understanding
CLO2	Implement speech coding and speech classification techniques.	2 Understanding 5. Evaluate
CLO3	Implement digital model of speech signal and predict the error of speech signal and learn LPC coder.	4 Analyze
CLO4	Learn method used for generation of digital video from analog and also of video format conversion.	3 Applying
CLO5	Learn beyond signal and image processing.	3 Applying 4 Analyze
CLO6	Deal with speech and video processing algorithms.	2 Understanding

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1					L	M						H	H	M	L	
CLO2		H	M	M	L					L		H		M	L	
CLO3		M	H		L									H		L
CLO4		M	H		L			L					L		M	H
CLO5	H	M	H		L				L			H	L		M	H
CLO6	H	M	H		L							M	L		M	H

H: High, M: Medium, L: Low