

Branch Name:	Artificial Intelligence and Data Science
Program Code:	ET108
Semester/Year:	Semester VIII/ Fourth Year
Course Name:	Open Elective - III: Speech Processing
Course Code:	2ET1080881T
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)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min	Max.	Mn	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Subject Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1	Digital Speech Signal Processing: Introduction Speech Signal, Signal Processing, Digital Speech Processing	4	05
2	Fundamentals of Digital Speech Processing: Transform Representation of Signals and Systems, Fundamentals of Digital Filters, Sampling, Speech enhancement, Speech Recognition, Speech synthesis	7	16
3	Digital Models for Speech Signal: Process of Speech Production, Acoustic Theory of Speech Production, Digital Model for Speech Signals	7	18
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.	8	18
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	8	20

6	Short Time Fourier Analysis: Definitions and Properties, Design of Digital Filter Bank, Spectrographic Displays, Pitch Detection, Analysis-by-Synthesis Systems.	7	18
7	Linear Predictive Coding of Speech: Basic Principles of Linear Predictive Analysis, Applications of LPC Parameters	4	05

List of Reference Books:

1. “Digital Processing of Speech Signals”, L.R. Rabiner, R.W. Schafer, Pearson Education
2. “Digital Video Processing”, A. Murat Tekalp Pearson Education 2010
3. “Digital Audio Signal Processing”, Second Edition, Udo Zolzer, A John Wiley& sons Ltd. Publications 2nd edition 2011
4. “Video Processing and Communications”, Yao Wang, Joern Ostermann, and Ya-Qin Zhang, Prentice Hall 2001

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				
CLO3		M	H		L									H		L
CLO4		M	H		L			L						L		
CLO5	H	M	H		L				L			H		M		
CLO6	H	M	H		L							M		L	M	H

H: High, M: Medium, L: Low