

## SPEECH PROCESSING

<b>Course Code</b>	19EC4801B	<b>Year</b>	IV	<b>Semester</b>	II
<b>Course Category</b>	Program Elective-VI	<b>Branch</b>	ECE	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Prerequisites</b>	Signal Processing
<b>Continuous Internal Evaluation:</b>	30	<b>Semester End Evaluation:</b>	70	<b>Total Marks:</b>	100

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## Course Outcomes

Upon successful completion of the course, the student will be able to

<b>CO1</b>	Understanding fundamentals of speech processing and the process of speech production (L2).
<b>CO2</b>	Classify Signal Processing methods for Speech Recognition (L2)
<b>CO3</b>	Demonstrate different types of speech systems (L3)
<b>CO4</b>	Distinguish various HMM models (L4)
<b>CO5</b>	Differentiate Applications of Speech Recognition (L4)

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## Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)

Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation

\* - Average value indicates course correlation strength with mapped PO

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	1		1	1	1	1	1	2
CO2	3	2	2	1	1	1	1		1	1	1	1	1	2
CO3	3	2	2	2	1	1	1		1	1	1	1	1	2
CO4	3	2	3	2	1	1	1		1	1	1	1	1	2
CO5	3	2	2	2	1	1	1		1	1	1	1	1	2
Average* (Rounded to nearest integer)	3	2	2	2	1	1	1		1	1	1	1	1	2

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## Syllabus

Unit No.	Contents	Mapped CO
I	<b>Fundamentals of speech recognition:</b> Introduction, paradigm for speech recognition. <b>The speech signal:</b> The process of speech production and perception in human beings, the speech production process, representing speech in time and frequency domains, speech sounds and features.	CO1,CO2 & CO3
II	<b>Signal Processing and Analysis methods for Speech Recognition: Introduction,</b> Spectral analysis models. <b>The Bank-of-filters front-end processor:</b> types of filter banks, implementation of filter banks. <b>Linear predictive coding model for Speech recognition:</b> LPC model, LPC Analysis Equations, Auto correlation method, Covariance method and typical LPC analysis parameters.	CO1,CO2 & CO3

III	<b>Pattern Comparison Techniques:</b> Introduction, Speech detection, Distortion measures: Mathematical considerations, Perceptual considerations. Spectral distortion measures: Long spectral-distance, Cepstral-distance, Weighted Cepstral distances and Liftering, Likelihood distortions.	CO1,CO2 & CO3
IV	<b>Theory and Implementation of Hidden Markov Models:</b> Introduction, Discrete time Markov processes, Extensions to Hidden Markov models, Types of HMMs, comparison of HMMs,	CO1,CO4 & CO5
V	<b>Applications of Automatic Speech Recognition:</b> Introduction, Speech recognizer Performance scores, Characteristics of speech-Recognition Applications, Broad classes of Speech-Recognition Applications, Command and control Applications.	CO1,CO4 & CO5

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### Learning Resources

#### Text Books

1. Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2007.

#### Reference Books

1. Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition", John Wiley and Sons, 1999.

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