

4/4 B.Tech - SEVENTH SEMESTER

EC7T5D

Speech Processing

Credits: 3

Lecture: 3 periods/week

Tutorial: 1 period /week

Internal assessment: 30 marks

Semester end examination: 70 marks

Pre-requisites: Digital Signal Processing (EC5T6)

Course Objectives:

- To introduce the fundamental concepts of speech
- To characterize the speech signal
- To disseminate speech recognition

Learning Outcomes:

Student will be able to

- Analyze the speech production process
- Extract important features from speech for developing various speech systems
- Develop a proto-type speech recognizer using HMM models

UNIT- I

The Speech Signal: Fundamentals of Speech recognition, 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.

UNIT- II

Signal Processing and Analysis methods for Speech Recognition: Spectral analysis models, The Bank-of-filters front-end processor, Linear predictive coding model for Speech recognition, Vector quantization.

UNIT- III

Pattern Comparison Techniques: Introduction, Speech detection, Distortion measures- Mathematical considerations, Distortion measures- Perceptual considerations, Spectral distortion measures.

UNIT- IV

Theory and Implementation of Hidden Markov Models: Introduction, Discrete time Markov processes, Extensions to Hidden Markov models, Three basic problems for HMMs, Types of HMMs, Continuous observation densities in HMMs, comparison of HMMs, Implementation issues for HMMs, HMM system for isolated word recognition.

UNIT V

Large Vocabulary continuous speech recognition: Introduction, Subword speech units, subword unit models based on HMMs, Training of subword units, Language models for Large vocabulary speech recognition, Statistical language modelling, Perplexity of the language model, Overall recognition system based on subword units.

Learning Resources

Text Books:

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

References:

1. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.
2. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press, Cambridge, MA; London, England, 1997.
3. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education, first edition, 2000.