GAUHATI UNIVERSITY
GUWAHATI

LESSON PLAN

Subject : **Fundamental of Speech Processing**
Subject Code : **CS/IT 4056**
Semester : **4 th**
Department : Computer Science
Lecturer : Dr. Sanjib Kr Kalita

L-T-P-C=4-0-2-6

Theory = 100 marks.

MODULE. NO.	TOPIC	COURSE CONTENT	NO. OF SLOTS	REMARKS
1	**Fundamentals of Speech Signal**	History of speech recognition research, The Speech Signal : Speech production mechanism, Classification of speech, sounds, nature of speech signal	1	Assignment-1 Class Test -1 **Quiz 1**
		models of speech production	1	
		Speech signal processing: purpose of speech processing, digital models for speech signal, Digital processing of speech signals, Significance, short time analysis	2	
		Total slots	**4**	
2	**Time Domain Methods for Speech Processing**	Time domain parameters of speech	1	
		methods for extracting the parameters	1	
		Zero crossings	1	
		Auto correlation function	1	
		pitch estimation	1	
		Total slots	**5**	
3	**Frequency Domain Methods for Speech Processing**	Short time Fourier analysis	1	Assignment 2 Class Test 2
		filter bank analysis	1	
		spectrographic analysis	1	
		Formant extraction	1	
		pitch extraction, Analysis - synthesis systems	1	
		Total slots	**5**	
4	**Linear Predictive**	Formulation of linear prediction problem in time domain	1	

	Coding of Speech	solution of normal equations	2	
		Interpretation of linear prediction in auto correlation and spectral domains	2	
Total slots			**5**	
5	**Speech Analysis**	Cepstral analysis of speech	2	Assignment 3 Class Test 3 Quiz 2
		formant and pitch estimation	1	
		Mel frequency cepstrum computation	1	
		Applications of speech processing - Speech recognition, Speech synthesis and speaker verification	2	
Total slots			**6**	
6	**Automatic Speech Recognition**	Basic pattern recognition approaches	1	
		Parametric representation of speech	1	
		Evaluating the similarity of speech patterns	1	
		Isolated digit Recognition System	1	
		Continuous digit Recognition System	1	
Total slots			**5**	

7	**Hidden Markov Model For Speech Recognition**	Hidden Markov Model (HMM) for speech recognition	1	Assignment 4 Class Test 4 Quiz 3
		Viterbi algorithm	1	
		Training and testing using HMMs	1	
		Adapting to variability in speech (DTW)	1	
		Language models	1	
Total slots			**5**	
8	**Speaker Recognition**	Issues in speaker recognition and speech synthesis of different speakers	**1**	Assignment 5
		Text to speech conversion	**1**	
		Calculating acoustic parameters	**1**	
		synthesized speech output performance and characteristics of text to speech	**1**	
		Voice processing hardware and software architectures	**1**	
Total slots			**5**	

Assignments and Class test:

Students are to submit at least three assignments and to appear three class tests.

TEXTBOOK

1. L. Rabiner and B.-H. Juang, Fundamentals of Speech Recognition, Prentice Hall, 1995, ISBN 0-13-015157-2
2. L. R. Rabiner and R. W. Schafer, Digital Processing of Speech Signals, Prentice-Hall, 1978, ISBN 0-13-213603-1.

REFERENCES

1. J.L Flanagan : Speech Analysis Synthesis and Perception - 2nd Edition - Sprenger Vertag, 1972.
2. I.H.Witten : Principles of Computer Speech , Academic press, 1983.
3. Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd ed., IEEE Press.
4. Discrete Time Speech Signal Processing: Principles and Practice - Thomas F. Quateri 1st ed., PE.
5. Speech & Audio Signal Processing- Ben Gold & Nelson Morgan, 1 ed., Wiley.
6. Speech Recognition - Claudio Becchetti and Lucio Prina Ricotti, Wiley

VIDEO RESOURCES

1. NPTEL, IIT KHARAGPUR, Prof. SK Das Mandal

Signature