



National Institute of Technology Meghalaya
An Institute of National Importance

CURRICULUM

Programme	M.Tech/Ph.D	Year of Regulation	2021
Department	Electronics and Communication Engineering	Semester	I

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EC 525	Speech Signal Processing and Coding	3	0	0	3	50	50	100	200

Course Objectives	Introducing of physiology of acoustic production and perception model.		Course Outcomes	CO1	Able to model an electrical equivalent of speech production system
	Introducing of concepts for analysis of the speech in time and frequency domains.			CO2	Able to apply time-frequency representation in processing of speech signals
	Introducing of techniques for speech signal coding			CO3	Able to extract LPC coefficients for analysis of speech signals
				CO4	Able to apply speech coding techniques for compression and processing of speech signals

No.	Cos	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1	CO1	2	1	0	0	1	0	0	0	0	0	0	0	2	0	1	0
2	CO2	1	2	2	2	0	0	0	0	0	0	0	1	2	0	2	0
3	CO3	0	2	2	1	2	0	0	0	0	0	0	2	2	2	2	0
4	CO4	0	2	0	1	2	0	0	0	0	0	0	2	2	2	2	0

SYLLABUS

No.	Content	Hours	COs
I	Speech production and perception, information sources in speech, linguistic aspect of speech, acoustic and articulatory phonetics, nature of speech, models for speech analysis and perception; Short-term processing: need, approach, time, frequency and time-frequency analysis;	09	CO1
II	Short-term Fourier transform (STFT): Overview of Fourier representation, non-stationary signals, development of STFT, transform and filter-bank views of STFT. Cepstrum analysis: Basis and development, delta, delta-delta and mel-cepstrum, homomorphic signal processing, real and complex cepstrum.	10	CO2
III	Linear Prediction (LP) analysis: Basis and development, Levinson-Durbin's method, normalized error, LP spectrum, LP cepstrum, LP residual. Sinusoidal analysis: Basis and development, phase unwrapping, sinusoidal analysis and synthesis of speech.	09	CO3
IV	Speech coding: Need and parameters, classification, waveform coders, speech-specific coders, GSM, CDMA and other mobile coders; Applications: Some applications like pitch extraction, spectral analysis and coding standard.	08	CO4
Total Hours		36	

Essential Readings

- Lawrence Rabiner and Ronald Schafer, "Digital Processing of Speech Signals", Pearson, 1st Edition, 1978.
- John R. Deller Jr., John H.L. Hansen and John G. Proakis, "Discrete-Time Processing of Speech Signals", Wiley-IEEE Press, 1999.

Supplementary Readings

- Douglas O'Shaughnessy, "Speech Communications: Human and Machine", Wiley-IEEE Press, 2nd Edition, 1999.
- Thomas F. Quatieri, "Discrete-Time Speech Signal Processing: Principles and Practice", Pearson, 1st Edition, 2008.