	National Institute of Technology Meghalaya An Institute of National Importance	CURRICULUM

Programme	**Bachelor of Technology in Electronics and Communication Engineering**	Year of Regulation	**2018-19**
Department	**Electronics and Communication Engineering**	Semester	**V**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EC 325	**Statistical Communication Theory**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives		Course Outcomes		
	To provide students an understanding of the concepts related to statistical theory for communication.		CO1	Able to understand how the information is measured and able to use it for effective coding.
	To explore the measures of information and uncertainty such as entropy and mutual information knowledge in various applications.		CO2	Able to gain insights into how the channel capacity is computed for various channel models.
	To familiarize students on channel capacity and its bound on various channels.		CO3	Able to use the statistical information in basic detection theory to solve the problems related to communication engineering.
	To summarize the application of detection and estimation theory in communication (wired and wireless).		CO4	Enabling the students to think in terms of innovative ideas to improve the existing technology in the field of communication through improving the estimation process.

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	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**2**	**3**	**-**
2	CO2	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**1**	**2**	**-**
3	CO3	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**2**	**1**	**1**	**2**	**2**	**2**	**-**
4	CO4	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**2**	**1**	**-**	**2**	**3**	**2**	**-**

SYLLABUS

No.	Content	Hours	COs
I	**Information and Entropy:** Information measure, Entropy of a source, Properties of Entropy, Joint and conditional entropies, Mutual information, Relationship between Entropy and Mutual Information, Chain Rules for Entropy, Kraft Inequality, Optimal Codes, bounds on the Optimal Code Length, Huffman Codes, Optimality of Huffman Codes.	**08**	**CO1**
II	**Channel Capacity** Discrete memoryless channels and their channel capacities, Properties of Channel Capacity, Introduction to Shannon capacity theorem, Preview of the Channel Coding Theorem, Channel Coding Theorem, Zero-Error Codes, Fano's Inequality and the Converse to the Coding Theorem, hamming codes.	**08**	**CO2**
III	**Statistical Decision Theory:** Introduction, Binary hypothesis testing, Baye's Criterion, minimax and Neyman-Pearson tests, Composite Hypothesis testing.	**06**	**CO3**
IV	**Parameter estimation I:** Review of Gaussian Variables and Processes, Minimum Variance Unbiased Estimation (MVUE), Fisher Information Matrix, Cramer-Rao Lower Bound, Linear Models, Generalized Minimum Variance Unbiased Estimation, Best Linear Unbiased Estimators (BLUE)	**07**	**CO4**
V	**Parameter estimation II:** Maximum Likelihood (ML) estimation, Generalized Likelihood ration test, Bayes Estimation- Minimum Mean-Square Error Estimate (MMSE), Maximum A Posteriori Estimate (MAP), Least Square Estimation (LS), Any case study.	**07**	**CO4**
	Total Hours	**36**	

Essential Readings

1. Thomas M. Cover and Joy A. Thomas, "Elements of Information Theory", Second Edition, Wiley Series in Telecommunications and Signal Processing. Wiley-Interscience, USA, 2006.
2. S. M. Kay, "Fundamentals of Statistical Signal Processing: Detection Theory", First edition, Printice hall, Volume II, 1998.
3. S. M. Kay, "Fundamentals of Statistical Signal Processing: Estimation Theory", First edition, Printice hall, Volume I, 1993.

Supplementary Readings

1. R. B. Ash, "Information Theory", First edition, Dover Publisher, 1990.
2. Mourad Barkat, "Signal Detection and Estimation", Second Edition, Artech House, 2005.
3. H.V.Poor, "An Introduction to Signal Detection and Estimation", Second Edition, Spring Verlag.1994.