LESSON PLAN

NAME OF FACULTY: **MR. SUSHANTA KUMAR SAHU**
DISCIPLINE: M Tech in ECE
SEMESTER: 2ND
SUBJECT: **Information Theory and Coding Techniques (PPCIE205)**
LESSON PLAN DURATION: 30 classes

SL NO	Lecture Day	Broad Topic	Details Topics	DATE
Module I - Entropy, Relative Entropy, and Mutual Information				
1)	1st	Introduction to Entropy	• Definition of entropy in information theory. • Understanding entropy as a measure of uncertainty. • Examples illustrating the concept of entropy. Link 1	
2)	2nd			
3)	3rd	Joint Entropy and Conditional Entropy	• Introduction to joint entropy and conditional entropy. • Calculating joint entropy and conditional entropy. • Applications of joint and conditional entropy in information theory.	
4)	4th			
5)	5th	Relative Entropy and Mutual Information	• Definition and significance of relative entropy. • Understanding mutual information as a measure of dependence. • Practical examples demonstrating the use of relative entropy and mutual information.	
6)	6th			
7)	7th	Chain Rules and Data-Processing Inequality	• Exploring chain rules for entropy, joint entropy, and conditional entropy. • Understanding the data-processing inequality and its implications.	
8)	8th			
9)	9th	Fano's Inequality	• Introduction to Fano's Inequality. • Applications of Fano's Inequality in information theory.	
10)	10th			
Module I - Typical Sequences and Asymptotic Equipartition Property				
11)	11th	Asymptotic Equipartition Property Theorem	• Definition and explanation of AEP. • Understanding the AEP theorem and its significance.	
12)	12th			
13)	13th	Consequences of the AEP	• Data compression as a consequence of AEP. • High-probability sets and the typical set.	
14)	14th			

Module II - Source Coding and Data Compression				
15)	15th	Kraft Inequality and Huffman Codes	• Explanation of Kraft Inequality. • Design and optimality of Huffman Codes.	
16)	16th			
17)	17th	Shannon–Fano–Elias Coding	• Overview of Shannon–Fano–Elias Coding. • Competitive optimality of the Shannon Code.	
18)	18th			
19)	19th	Channel Coding Theorem and Zero-Error Codes	• Understanding the Channel Coding Theorem. • Zero-error codes and the converse to the coding theorem.	
20)	20th			
Module III - Linear Binary Block Codes				
21)	21st	Introduction to Linear Binary Block Codes	• Definition and basic properties of linear binary block codes.	
22)	22nd			
23)	23rd	Generator and Parity-Check Matrices	• Understanding the role of generator and parity-check matrices.	
24)	24th			
25)	25th	Error Detection, Cyclic Codes, and BCH/Rs Codes	• Techniques for error detection using linear block codes. • Introduction to cyclic codes. • Parameters of BCH (Bose-Chaudhuri-Hocquenghem) and RS codes.	
26)	26th			
27)	27th	Interleaved and Concatenated Codes	• Exploring interleaved and concatenated codes. • Applications and advantages of these coding techniques.	
28)	28th			
29)	29th	Review	• Recap of key concepts from all modules.	
30)	30th			

Textbooks:

1. Elements of Information Theory by Thomas Cover, Joy Thomas, second edition, A JOHN WILEY & SONS, INC., PUBLICATION.
2. Channel Codes: Classical and Modern by William Ryan, Shu Lin, Cambridge University Press.

Reference Book:

Information Theory and Reliable Communication" by Robert Gallager, ISBN: 978-0-471-29048-3.