**B. P. Poddar Institute of Management & Technology**

**Department of Electronics & Communication Engineering**

**Academic Year: 2024-25**

**Lesson Plan**

| Serial number | Lecture/ Tutorial No. | Topics to be Covered | Text/ References | Teaching Methodology |
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| 1. | L1 | Familiarization of the students with Institute and Department Vision, Mission, PEOs, POs, PSOs, COs and Course Overview | T1 | C&T, PPT, CD |
| 2. | L2 | Explain self-information, mutual information, conditional self-information, average mutual information, average self-information, | T1 | C&T, PPT, CD |
| 3. | L3 | Explain average conditional self-information or Conditional entropy, joint entropy, differential entropy, average conditional entropy | T1 | C&T, PPT, CD,PS |
| 4. | L4 | Explain Fixed Length Code, Variable Length Code, prefix code, Kraft inequality, Source coding theorem | T1 | C&T, PPT, CD, PS |
| 5. | L5 | Develop Shannon-Fano codes for given probabilities of symbols for a DMS | T1 | C&T, PPT, PS |
| 6. | L6 | Develop Huffman codes for given probabilities of symbols for a DMS | T1 | C&T, PPT, PS |
| 7. | L7 | Develop arithmetic code for given probabilities | T1 | C&T, PPT, PS |
| 8. | L8 | Explain DMC, Lossless channel, Deterministic channel, Noiseless channel, BSC, BEC models and define their channel capacities | T1 | C&T, PPT, CD, PS |
| 9. | L9 | Explain Channel coding theorem, Information capacity theorem and Shannon's limit | T1 | C&T, PPT, CD, PS |
| 10. | L10 | Prove Shannon-Hartley law | T1 | C&T, PPT, CD |

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| 11. | L11 | Calculate channel capacity for different channels | T1 | C&T, PPT, CD |
| 12. | L12 | Develop linear block codes using generator matrix, parity check matrix and dual code | T1 | C&T, PPT, CD |
| 13. | L13 | Investigate error by designing proper error syndrome circuit and calculate error detection and correction capability | T1 | C&T, PPT, CD, PS |
| 14. | L14 | Construct standard array and identify coset leader | T1 | C&T, PPT, CD |
| 15. | L15 | Explain perfect code and Hamming code | T1 | C&T, PPT, CD, **Quiz** |
| 16. | L16 | Identify the proper code based on its properties | T1 | C&T, PPT, CD |
| 17. | L17 | Construct a set of cyclic codewords based on a given polynomial and Perform division of polynomials | T1, R1 | C&T, PPT, CD, PS |
| 18. | L18 | Develop generator and parity check matrices based on polynomial | T1, R1 | C&T, PPT, CD, PS |
| 19. | L19 | Construct encoding circuits for cyclic codes | T1, R1 | C&T, PPT, CD, PS |
| 20. | L20 | Compute syndrome and detect error in received code vector and explain Golay code | T1, R1 | C&T, PPT, CD, PS |
| 21. | L21 | Construct Syndrome circuits for cyclic codes | T1, R1 | C&T, PPT, CD, PS, **Quiz** |
| 22. | L22 | Construct decoding circuits for cyclic codes and | T1, R1 | C&T, PPT, CD, PS |
| 23. | L23 | Explain the formation of polynomial and the concept of distance for convolution code | T2 | C&T, PPT, CD, PS |
| 24. | L24 | Construct generating function and generation matrix for convolution code | T2 | C&T, PPT, CD, PS |
| 25. | L25 | Explain Viterbi decoder | T2 | C&T, PPT, CD, PS |
| 26. | L26 | **Tutorial sheet is given as action taken doc** | | |
| 27. | L28 | Discussions on previous year questions and model questions | University questions | C&T, PPT, CD, PS |

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| 28. | L29 | Discussions on model questions and model questions | University questions | C&T, PPT, CD, PS |

**Text Books:**

1. A Saha, N Manna and S Mandal, Information Theory, Coding and Cryptography, Pearson
2. S Gravano, Error Control Codes, Oxford University Press

**Reference Books:**

1. S Lin and D J Costello Jr - Error Control Coding , Prentice Hall

Video links :

1. **NPTEL – Information Theory and Coding**
   https://nptel.ac.in/courses/117/102/117102060/
2. **TutorialsPoint – Information Theory Tutorial**
   https://www.tutorialspoint.com/information_theory/index.htm
3. **Khan Academy – Probability and Information Concepts (supporting topics)**
   https://www.khanacademy.org/math/statistics-probability