

LABORATORY 1

Programme: M.Tech. (ECE)
Course: LAB Core Course

Year: 2018
Credits: 2

Semester: ODD
Hours: 24

Course Context and Overview (100 words): This course will provide relation between Signal generation and transmission over various wireless channels. Review of various channels, signal transmission over AWGN and Rayleigh channel, error control coding like LBC and Convolution code. It also helps to understand analyze and simulate BER performance with and without coding over channels like AWGN, Rayleigh, Rice etc.

Prerequisites Courses: Digital Communication, Digital Signal Processing

Course outcomes (COs):

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| On completion of this course, the students will have the ability to: |
| CO1 Explain various Modulation schemes. |
| C02 Explain and Simulate Various channels like AWGN, Rayleigh, Rician. |
| C03 Explain and Simulate Detection of BPSK and M-QAM signals. |
| C04 Simulate BER performance over Various channels. |
| C05 Simulate and practice various coding gain like (Linear Block code) and Convolution codes. |

Course Topics:

| Topics | Lecture Hours | |
|---|---------------|---|
| UNIT – I | | |
| 1. BER Performance over AWGN Channel | | |
| 1.1 Generation of BPSK signal | 1 | 3 |
| 1.2 Transmitting BPSK signal over AWGN channel. | 1 | |
| 1.3 Plot BER performance for various SNR Values | 1 | |
| UNIT – II | | |
| 2. BER Performance over Rayleigh Channel | | 3 |
| 2.1 Generation of BPSK signal | 3 | |
| 2.2 Transmitting BPSK signal over Rayleigh channel. | | |
| 2.3 Plot BER performance for various SNR. | | |
| UNIT – III | | 3 |

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| 3. Performance of M-QAM, M-QPSK over AWGN Channel | | |
| 3.1 Generation of M-QAM signal | 1 | |
| 3.2 Transmitting M-QAM signal over AWGN channel. | 1 | |
| 3.3 Plot BER performance for various SNR. | 1 | |
| UNIT – IV | | |
| 4. Performance of M-QAM over Rayleigh Channel | | |
| 4.1 Generation of M-QAM signal | 1 | 3 |
| 4.2 Transmitting M-QAM signal over Rayleigh channel. | 1 | |
| 4.3 Plot BER performance for various SNR. | 1 | |
| UNIT-V | | |
| 5. Capacity over various channels | | 3 |
| 5.1 Analyzing capacity over AWGN channel. | 1 | |
| 5.2 Simulate capacity over AWGN channel. | 1 | |
| 5.3 Simulate capacity over Rayleigh channel and plot capacity vs SNR graph. | 1 | |
| UNIT-VI | | |
| 6. Performance of BPSK over Rician Channel | | 3 |
| 6.1 Generation of BPSK signal | 1 | |
| 6.2 Transmitting BPSK signal over Rician channel. | 1 | |
| 6.3 Plot BER performance for various SNR. | 1 | |
| UNIT-VII | | |
| 7. Understanding Coding Gain : Repetition code | | 3 |
| 7.1 Transmitting un-coded BPSK signal and plotting BER performance. | 1 | |
| 7.2 Use of repetition code to transmit the same signal and finding BER performance. | 1 | |
| 7.3 Plot BER performance for both the cases and determine the coding gain for generalized repetition code. | 1 | |
| UNIT-VIII | | |
| 8. BER simulation for Linear (n,k) Block Code | | 3 |
| 8.1 Generation Linear Block code and modulate using BPSK signal. | 1 | |
| 8.2 Transmitting BPSK signal over AWGN channel and detecting linear block code using syndrome calculation. | 1 | |
| 8.3 Plot BER performance for various SNR and finding the coding gain. | 1 | |

Textbook references (IEEE format):**Books:**

- J.Proakis, *“Digital Communication”*, McGraw Hill, 5th Ed.
- M.S.Alouni, *“Digital Communication over Fading Channels”*, Wiley-2nd Ed., 2004.
- Shu-Lin Costello , *“Error Control Coding” Pearson, 2nd Ed, 2011.*

Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.):**Evaluation Methods:**

| Item | Weightage |
|---------------------|------------|
| Lab 1-8 Performance | 20 |
| Lab Report | 30 |
| Lab Attendance | |
| Lab Exam. | 30 |
| Lab Exam Report | 20 |
| Total | 100 |

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