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**DEPARTMENT OF ELECTRICAL ENGINEERING**

**Course Descriptive File**

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| 1 | Course Title | Communication System |
| 2 | Course Code | EE-325 |
| 3 | Credit Hours | 48 |
| 4 | Pre-requisites | Signals and systems, Probability Methods in Engineering |
|  5 |  Co-requisites | Digital Signal Processing  |
| 6 | Semester | VI |
| 7 | Resource Person | Dr. Sadia Murawwat |
| 8 | Contact Hours (Theory) | 48 |
| 9 | Contact Hours (Lab) | 48 |
| 10 | Office Hours  | 8Am-4PM |
| 11 | Email | sadia.murawwat@lcwu.edu.pk |
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| 12 | Course Outline as per Scheme of Studies ( SoS) |
| Amplitude Modulation: Baseband and carrier communications, Double Sideband (DSB), Single Sideband (SSB), Vestigial Sideband (VSB), Super heterodyne AM Receiver, Carrier Acquisition, Television, Angle Modulation: Instantaneous frequency, Bandwidth of FM/PM, Generation of FM/PM, Demodulation of FM/PM. Noise: Mathematical representation, Signal to Noise Ratio, Noise in AM, FM, and PM systems Pulse Modulation: Sampling and Quantization, Pulse Amplitude Modulation, Pulse Position and Pulse Width Modulation, Quantization Noise, Signal to Quantization Noise Ratio, Pulse code Modulation, Delta Modulation, Frequency Shift Keying, Phase Shift Keying. |
| 13 | Course Objectives as per SoS |
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| 14 | Books  |
| Textbook1. B.P Lathi and Zhi Ding, “Modern Digital and Analog Communication Systems”, Oxford University Press, Latest Edition.

Reference Books 1. Simon Hayin, “Communication Systems,” John Wiley, Latest Edition
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| 15 | Course Learning Outcomes (CLOs) |
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| Sr | CLO | Domain | Taxonomy Level | PLO |
| 1 | Use theorems such as Parseval’s theorem and tools such as Fourier transform to represent and quantify signals in time and frequency domain as well as understand the characteristics of distortion-less communication channel. | Cognitive | 3 | 2 |
| 2 | Describe the basic theory, compare advantages and disadvantages, identify and compute parameters, the performance metrics, and explain the working of the different types of analog transceiver designs using time and frequency domain analysis. | Cognitive | 2 | 2 |
| 3 | Apply principles of Analog to Digital conversion and design Quantizers under various constraints. | Cognitive | 2 | 4 |
| 4 | Build and troubleshoot various electronic circuits for analog modulation and demodulation and understand their working in order to apply theory into practice. | Psychomotor | 2 | 5 |

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| 16 | Marks Breakup  |
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| Quizzes | 10% |
| Homework/assignments  | 10% |
| Midterm exam | 25% |
| Terminal exam (3 hours) | 30% |
| Total (theory) | 65% |

Theory

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| Lab Assessments | 5%5% |
| Lab Sessional Exams(xx% Lab performance + xx% Lab Assessments) | 10% |
| Lab Terminal Exam  (xx% Lab performance + xx% Lab Assessments) | 10% |
| Total (lab) | 25% |

Lab

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| Final marks | Theory marks\*0.75+Lab marks\*0.25 |

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| **17** |
| **Week** | **Topic** | **CLO** | **Taxonomy****Level** | **Specific Outcome** | **Contact Hours** | **Assessment** |
| 1 | Introduction to Communication Systems (Analog and Digital) | CLO1,2 | C2 |  | 3 | Assignment 1Quiz 1 |
| 2 |  Noise: Mathematical representation, Signal to Noise Ratio. | CLO2 | C2 |  | 3 |
| 3 | Pulse Modulation: Sampling and Quantization. | CLO3 | C2 |  | 3 |
| 4  | Pulse Amplitude Modulation, Pulse Position and Pulse Width Modulation. | CLO3 | C2 |  | **3** | Assignment 2 Quiz 2 |
| 5 | Quantization Noise, Signal to Quantization Noise Ration, pulse Code Modulation, Delta Modulation. | CLO3 | C2 |  | 3 |
| 6 | Frequency Shift Keying, Phase Shift Keying, Binary Shift Keying, QPSK, Constellation diagrams. | CLO2 | C2 |  | 3 |
| 7 | Review of other important blocks of digital communication systems (channel coding, source coding, pulse shape filtering, signal access method) | CLO2,3 | C2 |  | 3 | Assignment 3 Quiz 3 |
| 8 | Revision |  |  |  | 3 |
| 9 | Amplitude Modulation: Baseband and carrier communications, Double Sideband | CLO1 | C3 |  |  |
| 10 | Single sideband, Vestigial Sideband | CLO1 | C3 |  |  |
| 11 | Super Heterodyne AM Receivers, Carrier Acquisition | CLO1 | C3 |  |  | Assignment 1 Quiz 1 |
| 12 | Television, Angle Modulation: Instantaneous Frequency | CLO1 | C3 |  |  |
| 13 | Bandwidth of FM/PM, Generation of FM/PM | CLO1 | C3 |  |  | Assignment 2 Quiz 2 |
| 14 | Demodulation of FM/PM | CLO1 | C3 |  |  |
| 15 | Noise: Mathematical representation, Signal to noise ratio, noise in AM, FM and PM | CLO1 | C3 |  |  | Assignment 3 Quiz 3 |
| 16 | Revision |  |  |  |  |  |

* Every instructor have his/her plan for course material used for assignments and quizzes, table above is just a guideline.

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| **18** | **Course Learning Outcomes (CLOs) and Assessment Plan** |
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| CLOActivity  | CLO 1 | CLO2 | CLO3 | LAB CLO1 | LAB CLO2 | LAB CLO3 | LAB CLO4 |
| Quiz 1 |   |  | C3 |  |  |  |  |
| Quiz 2 |   |  | C3 |  |  |  |  |
| Quiz 3 |   |  | C3 |  |  |  |  |
| Assignment 1 |  |  | C3 |  |  |  |  |
| Assignment 2 |  |  | C3 |  |  |  |  |
| Assignment 3 |  |  | C3 |  |  |  |  |
| MID TERM EXAM | C1 |  | C3 |  |  |  |  |
| Quiz 1 |  | C2 |  |  |  |  |  |
| Quiz 2 |  | C2 |  |  |  |  |  |
| Quiz 3 |  |  | C3 |  |  |  |  |
| Assignment 1 |  |  | C3 |  |  |  |  |
| Assignment 2 |  | C2 |  |  |  |  |  |
| Assignment 3 |  | C2 |  |  |  |  |  |
| FINAL TERM EXAM |  | C2 | C3 |  |  |  |  |
| Lab Final Exam |  |  |  |  |  |  | C4 |

\*Add columns according to number of course CLO’s and Lab CLO’s for your respective course. Complete as per your planned quiz and assignments for this session.  |

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| **19** | **Lab Details** |
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| **Laboratory Resources** |
| * Hardware based
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| **Computer Resources** |
| * Software based
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| **20** | **Mapping of CLOs to PLOs**  |

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| PLOCLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 | PLO10 | PLO11 | PLO12 |
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| CLO1 |   | C1 |  |  |  |  |  |  |  |  |  |  |
| CLO2 |  | C2 |  |  |  |  |  |  |  |  |  |  |
| CLO3 |  |  |  | C3 |  |  |  |  |  |  |  |  |
| CLO4 |  |  |  |  |  |  |  |  |  |  |  |  |
| LAB CLO1 |  |  |  |  |  |  |  |  |  |  |  |  |
| LAB CLO2 |  |  |  |  |  |  |  |  |  |  |  |  |
| LAB CLO3 |  |  |  |  |  |  |  |  |  |  |  |  |
| LAB CLO4 |  |  |  |  | C4 |  |  |  |  |  |  |  |

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| **21** | **List of Experiment With Objectives as Per OBE Format**  |
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| **Lab Experiment No.**  | **Title and Objectives**  |
| **1** | Introduction to Communication Systems and Lab equipment. |
| **2** | To examine the principle diagram of the operation of a transmitter and receiver |
| **3** | To study the basic bloc diagram of Digital Communication Systems |
| **4** | To study and implement the principle of Pulse Code Modulation (PCM) on MATLAB and communication module MCM 30/EV. |
| **5** | To study and implement the principle of Differential Pulse Code Modulation (DPCM) on MATLAB and communication module MCM 30/EV. |
| **6** | To study and implement the principle of Amplitude Shift Keying (ASK) on MATLAB and communication module MCM 30,24/EV. |
| **7** | To study and implement the principle of Phase Shift Keying (PSK) on MATLAB and communication module MCM 30,24/EV. |
| **8** | To study and implement the principle of Quadrature Phase Shift Keying (QSK) on MATLAB using the importance of constellation diagram. |
| **9** | To study and implement the principle of Quadrature Phase Shift Keying (QSK) on MATLAB using the importance of constellation diagram with noise addition. Analysis. |
| **10** | To study and implement the principle of Analog Modulation Scheme DSB, DSB-SC, SSB on MATLAB and communication module MCM 24/EV. |
| **11** | Illustrate the importance of Super Heterodyne Receiver and design a super heterodyne receiver on Simulink. |
| **12** | Illustrate the importance of Phase Locked Loop (PLL) and design a super heterodyne receiver on Simulink. |
| **13** | Design of radio. Project Discussion session. (SOFTWARE DEFINED RADIO) |
| **14** | Design of Digital Communication System in Simulink |
| **15** | REVISION session |
| **16** |  |

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**\*title and objective to be achieved in every experiments**