**University of Management and Technology**

School of Engineering

Department of Electrical Engineering

**Course Outline**

Course code: **EL 410** Course Title: **Communication Systems Lab**

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| --- | --- |
| Program | BSEE |
| Credit Hours | 1 |
| Duration | One semester |
| Prerequisites | Signals and Systems lab |
| Resource Person | Ayesha Iqbal (Section C2, D1, D2)  Bilal Anwar (Section A1, B1, C1) |
| Counseling Timing | See Office Window |
| Contact | [ayesha.iqbal@umt.edu.pk](mailto:ayesha.iqbal@umt.edu.pk)  [bilal.anwar@umt.edu.pk](mailto:bilal.anwar@umt.edu.pk) |

**Chairman/Director signature………………………………….**

**Dean’s signature…………………………… Date………………………………………….**

**Learning Objective:**

The goals of the communication laboratory are to allow students to perform experiments that demonstrate the theory of signals and communication systems that are discussed in course, It introduce students to some of the electronic blocks that make up communication systems (which may not be discussed in the lecture course because of time limitations. It will make students familiarize you with proper laboratory procedure, including precise recordkeeping, logical troubleshooting, safety, and learning about the capabilities and limitations of your equipment. Subject areas included are Amplitude Modulation: Baseband and carrier communications, Double Sideband (DSB), Single Sideband (SSB).Angle Modulation: Instantaneous frequency, Bandwidth of FM/PM, Generation of FM/PM, Demodulation of FM/PM. The course directly contributes to **objectives** a, d, e and f of the HEC Electrical Engineering Curriculum.

In accordance with HEC curriculum **outcomes** a, b, d and e, upon completion, students will be able to:

* Familiarize with various performance and design parameters of Analog Communication Systems.
* Get in-depth knowledge of analog modulation and detection schemes.
* Understand the fundamental concepts of Analog communication systems.
* Apply these concepts to the design of contemporary analog communication system.

**Learning Methodology:**

Practical, interactive, participative

**Grade Evaluation Criteria**

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

Marks Evaluation Marks in percentage

|  |  |
| --- | --- |
| Lab Manuals & Performance | 40% |
| Final Viva or Quiz + Performance | 60% |
| Total | 100% |

**Recommended Text Books:**

**Text book:** Simon Haykin, "Communication Systems", John Wiley,5th edition

**Reference Books:**

1. B. P. Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press, 5th Edition
2. John G. Proakis & Masoud Salehi, “Communication Systems Engineering”, Pearson Education, 2nd Edition

**Calendar of Course contents to be covered during semester**

Course Code: EE410 Course title: Communication Systems Lab

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| --- | --- | --- |
| **Week** | **Course Contents / Lab Experiments** | **Tools / Equipment /Theory Topics (T.B)** |
| 1 | Introduction to LabView (Communication System Block Diagram (Transmitter and Receiver)) | * LabVIEW * Lecture Notes |
| 2 | Fourier Series Analysis on LabVIEW | * Article 2.1 – 2.6 |
| 3 | Fourier Series and Spectrum Analyzer Overview | * Article 2.1 – 2.6 * Spectrum Analyzer Overview (Hardware) * Span, RBW, Ref. Lvl, Centre Frequency |
| 4 | Amplitude Modulation (LabVIEW) | * Article 3.1 – 3.3 * Modulation, Modulation Schemes * Amplitude Modulation (DSB-SC) |
| 5 | Amplitude Modulation (Communication Trainer) | * Article 3.1 – 3.3 * Principle of Amplitude Modulation * Modulation index & Side Bands Power * Communication Trainer (IT-4101) * Spectrum Analyzer |
| 6 | Amplitude Demodulation (Communication Trainer) | * Article 3.1 – 3.3 * Amplitude Demodulation * Communication Modules KL-92001, 93002 |
| 7 | SSB Modulation and Demodulation (Communication Trainer) | * Article 3.4-3.8 * Principle of Single side band Modulation & Demodulation * Communication Trainer (IT-4101, 4102) |
| 8 | Frequency Modulation (LabVIEW) | * Article 4.1 – 4.3 * Principle of Frequency Modulation(FM) * Quadrature Modulator |
| 9 | Frequency Modulation ( Communication Trainer) | * Article 4.3 * Frequency Modulation * FM transmitter * Principle of Varactor & Reactance Modulator * Communication Trainer   IT-4103   * Spectrum Analyzer |
| 10 | Frequency Demodulation (Communication Trainer) | * Article 4.5 -4.6 * Frequency Demodulation * Detuned Resonant Circuit * Quadrature Detector * Phase lock loop (PLL) * Communication Trainer   IT-4103   * Spectrum Analyzer |
| 11 | Frequency Division Multiplexing (Communication Trainer) | * Article 3.7 – 3.8 * Time & Frequency Division Multiplexing /Demultiplexing * FDMA & TDMA * Communication Trainer   IR-4104 |
| 12 | Pulse Amplitude and Pulse Width Modulation (LabVIEW) | * Article 7.3, 7.8-7.9 * Pulse Amplitude Modulation (PAM) * Pulse Width Modulation (PWM) |
| 13 | Noise Generation (Communication Trainer) | * Article 6.4-6.6 * Classification of Noise. * Signal to Noise Ratio and Noise Figure. * Operation of Noise Generation Module (IT-4106) * Operation of Signal Attenuation Network |