**University of Management and Technology**

School of Engineering

Department of Electrical Engineering

**Course Outline**

Course code……EL465………… Course title……Instrumentation & Measurement Lab

|  |  |
| --- | --- |
| Program | BSEE,BSH |
| Credit Hours | 1 |
| Duration | One semester |
| Prerequisites | Applied Physics |
| Resource Person | Waseem Iqbal[1] (Section B1)  AsfaJaved[2] (Section A1,A2,C1,D1,D2)  Fahad Usman Khan[3] (Section C2) |
| Counseling Timing | See Office Window |
| Contact | [waseem.iqbal@umt.edu.pk](mailto:waseem.iqbal@umt.edu.pk)[1]  [asfa.javed@umt.edu.pk](mailto:asfa.javed@umt.edu.pk)[2]  [fahad.khan@umt.edu.pk[3](mailto:fahad.khan@umt.edu.pk[3)] |

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

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

**Learning Objective:**

This Lab is primarily intended to cover all necessary topics of instrumentation and measurement for students of electrical engineering. Student will learn the basic measurement techniques, instruments, and methods used in Electrical measurements. It covers in detail both analogue and digital instruments, measurements errors and uncertainty, instrument transformers, bridges, amplifiers, oscilloscopes, data acquisition, sensors, instrument controls and measurement systems. Participants will learn how to apply the most appropriate measurement method and instrument for a particular application.. 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, the upon completion, students will be able

* Have good understanding of Measurement and Instrumentation.
* Analyzing the process of signals conditioning.
* acquire hands-on experience with Instruments e.g. Multimeters, Wattmeter, ADC etc
* Be able to study and understand the working and application of instruments in industry.

**Learning Methodology:**

Lecture, 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:   
1.** Electronic Instrumentation and Measurement Techniques, W.D. Cooper & A.D. Helfrical, 2nd Edition

2. Process Control Instrumentation Technology Eighth Edition by Curtis Johnson, 8th Edition

**Reference Books:**

1. Measurements and Instrumentation Principles by Alan S Morris, 3rd Edition

2. A course in Electrical Measurements and Instrumentation by J.B Gupta, Revised Edition

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

**Course code…………**EL465**………...... Course title… …** …Instrumentation & Measurement Lab

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| --- | --- | --- |
| **EL-465 Instruments & Measurements Lab**  **List Of Experiments** | | |
| **Week** | **Experiments** | **Text Book Reading Chapter** |
| **1** | Designing a Virtual Thermometer using LabVIEW | TB1:Ch 1 |
| **2** | Errors In Measurement and Basic Statistical Sampling | TB1:Ch 1 |
| **3** | Design a Multimeter using Galvanometer | TB1: Ch 4 |
| **4** | Study and Identification of different Sensors | TB2: Ch4,5,6 |
| **5** | Study the bridge rectifier (by making use of cathode ray oscilloscope)   * 1. To calculate input frequency Vin   2. To calculate Vrms, Vavg, Irms&Iavg | TB1:Ch 5 |
| **6** | Measuring Power & Power Factor   * + 1. By three Ammeter method     2. By Three Voltmeter method | TB1:Ch 4 |
| **7** | To measure the power of Resistive load by Analogue Wattmeter & calculating its power factor | TB1: Ch 4 |
| **8** | Studying Operation of DC (Wheatstone) Bridge | TB1:Ch 5 |
| **9** | Studying Operation of AC Bridges | TB1:Ch 5 |
| **10** | Thermistor for Temperature Measurement | TB2: Ch4,5,6 |
| **11** | Design of Operational Amplifier as Buffer, Averaging, Integrator, & Differential Amplifier | TB2: Ch2 |
| **12** | Signal Conditioning Circuit | TB2: Ch2 |
| **13** | Analog to Digital Converter (ADC) | TB2: Ch3 |
| **14** | Analog to Digital Converter (ADC) | TB2: Ch3 |
| **15** | Digital to Analog Converter (DAC) | TB2: Ch3 |