**University of Management and Technology**

**School of Engineering**

**Department of Electrical Engineering**

**Course Outline**

Course code……EE 465………………… Course title……Instrumentation and Measurements

|  |  |
| --- | --- |
| Program | BSEE |
| Credit Hours | 3 |
| Duration | One semester |
| Prerequisites | EE465 |
| Resource Person | Khan M. Nazir |
| Counseling Timing  (Room# ) | 09:30 – 12:00 , Monday & Wednesday  11:00 -13:00, Tuesday & Thursday  Project Lab |
| Contact | 03454030919  Khan.nazir@umt.edu.pk |

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

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

**Learning Objective:**

Upon Completion of the course, the students will be able to:-

a. DefineCharacteristics of Instrumentation and Measurements.

b. Define Types of Errors and Carry out Error Analysis

c. Differentiate between Units and Dimensions and Carry out Dimensional Analysis

d. Explain various types of Standards of Measurements and Measurement Methods, and carry out Statistical Analysis.

e. Explain Different types of Measuring Instruments and Calculate Various Parameters.

f. Perform Resistance, Inductance, Capacitance, and frequency Measurements using Bridge Circuits.

g. Discuss working of Electronic Instruments

h. Explain Working of Various Types of Display Devices, including Oscilloscopes, Plotters, and Spectrum Analyzers.

i. Design Signal Conditioning Circuits

J. Explain various Types of Sensors, and Design Data Acquisition System.

K. Discuss working of Actuators and PLCs.

**Learning Methodology:**

Lecture, interactive, participative

**Grade Evaluation Criteria**

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

|  |  |
| --- | --- |
| Quizzes & Assignments | 25 |
| Midterm Exam | 25 |
| Final Exam | 50 |
| Total | 100 |

**Marks Evaluation Marks in percentage**

**Recommended Text Books:**

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**Text books:**

1. Electronic Instrumentation and Measurement Techniques, W.D. Cooper & A.D. Helfrical
2. Process Control Instrumentation Technology Eighth Edition by Curtis Johnson.

**Reference Books:**

1. Measurements and Instrumentation Principles by Alan S Morris

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

**Course code………EE465 Course title…Instrumentation and Measurements**

|  |  |  |
| --- | --- | --- |
| **Week** | **Course Contents** | **Reference Chapter(s)** |
| 1 | Introduction  Elements of a generalized measurement Systems  Characteristics of Instruments and Measurement Systems:  Static Characteristics  Dynamic Characteristics | Ch-1 TB1  (Notes) |
| 2 | Units ,Dimensions, and Dimensional Analysis.  Standards of Measurements | Ch-1 TB1 |
| 3 | Error Analysis | Ch-1 TB1 |
| 4 | Sensors(Thermal, position , strain) | Ch-4,5 TB2 |
| 5 | Sensors(motion, pressure, flow, optical) | Ch-5, 6 TB2 |
| 6 | Signal Conditioning Circuits:  Types of bridges for measurement of resistance, inductance and capacitance. | Ch-2 TB2 |
| 7 | Analog signal conditioning, RC Filters  Use of Op-amp for signal conditioning | Ch-2 TB2 |
| 8 | **Mid Term Examination** |  |
| 9 | Use of Op-amp for signal conditioning | Ch-2 TB2 |

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| --- | --- | --- |
| 10 | Digital Signal Conditioning, DAC, ADC. | Ch-3 TB2 |
| 11 | Data acquisition systems | Ch-8 TB2 |
| 12 | Data Presentation Elements:  Principles of Operation, construction and working of different analog meters, Voltmeter, Ammeter, Ohmmeter, Multi-meter meter , Megger.  AC Indicating Instruments, Thermo instruments.  Instrument Transformers | Ch-4 TB1 |
| 13 | Electronic Instruments, Principle of operation, construction and working of digital meters, Ramp type, Dual slop, Successive approximation voltmeters.  Digital meter resolution | Ch-6 TB1 |
| 14 | Principle of operation, construction and working of oscilloscope, recording instruments, signal generators | Ch-7 TB1 |
| 15 | Actuators. PLCs | Ch-8 TB2 |
| 16 | **Final Examination** |  |