



Arab Academy for Science, Technology & Maritime Transport
College of Engineering & Technology
Electrical & Control Engineering Department

University/Academy: Arab Academy for Science, Technology & Maritime Transport
Faculty/Institute: College of Engineering & Technology
Program: B.Sc. Mechanical Engineering

Form no. (12)
Course Specification

1- Course Data

Course Code: EE 218	Course Title: Instrumentation and Measurement			Academic Year/Level: 2nd / 4th
Specialization: Electronics & Comm. Eng.	No. of Instructional Units 3 Credits	Lecture 2hrs.	Tutorial 2hrs.	Practical 2hrs.

2- Course Aim

- Understanding the basic concepts and techniques of measuring physical electrical and electronic quantities. To train students for the effective usage of the basic laboratory instruments.
- Understanding the basic measurement parameters such as accuracy, precision, standards. To study the operation and construction of analog, electronic and digital multi-meters.

3- Intended Learning Outcome

a-Knowledge and Understanding	<p>K1: Acquiring knowledge and understanding of concepts and theories of mathematics and sciences, appropriate to the discipline.</p> <ul style="list-style-type: none"> • Explain the statistical analysis parameters and units of measurements based on the analysis of the arithmetic mean, deviation from mean, standard deviation, and variance. <p>K8: Acquiring knowledge and understanding of current engineering technologies as related to disciplines.</p> <ul style="list-style-type: none"> • Illustrate the usage of AC voltmeters with rectifiers. • Explain the concept and the usage of True RMS voltmeter. <p>Demonstrate the Q-meter circuits, by calculating the power and power factors</p> <p>K13: Acquiring knowledge and understanding of elementary science underlying electronic engineering systems and information technology.</p> <ul style="list-style-type: none"> • Identify some terms which are used in measurements, such as accuracy, precision and different types of errors. • Explain the theory of operation of oscilloscope based on two approaches Cathode ray tube and the Oscilloscope deflection. <p>K15: Acquiring knowledge and understanding of principles of analyzing and design of electronic circuits and components.</p> <ul style="list-style-type: none"> • Explain the principle of operation of the d'Arsonval movement by using DC voltmeters (Analog voltmeters), and DC Ammeters (Analog Ammeters). • Describe the Ohmmeter by using two techniques: series type and shunt type ohmmeters. • Explain the Alternating current indicating instruments by using two techniques: AC voltmeters with full wave rectifiers, AC voltmeter with half wave rectifiers. • Describe the DC bridges and the AC bridges by using four methods (Wheatstone bridge, Schearing bridge, Wien bridge, and Maxwell bridge).
--------------------------------------	---

<p>b- Intellectual Skills</p>	<p>I1: The ability to select appropriate mathematical and computer-based methods for modeling and analyzing problems .</p> <ul style="list-style-type: none"> • Detect the accuracy and errors, between an Analog Instruments and digital instruments by solving book problems. • Examine the output of AC bridges and DC bridges by calculating the accuracy and error. Calculate the output of different types of signals using full wave rectifier and half wave rectifier. <p>I11: The ability to analyze results of numerical models and assess their limitations.</p> <ul style="list-style-type: none"> • Calculate different types of errors, Accuracy, Precision, Resolution, and Sensitivity problems in tutorial reports. • Compute the statistical analysis (Mean Deviation, Standard Deviation, and Variance) problems in tutorial reports. • Select the units and the standards of measurement by using SI units.
<p>c- Professional and Practical Skills</p>	<p>P3: The ability to create and/or re-design a process, component or system, and carry out specialized engineering designs.</p> <ul style="list-style-type: none"> • Design the DC bridges and calculate the unknown values. • Design the AC bridges and calculate the unknown values. <p>P5: The ability to use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results.</p> <ul style="list-style-type: none"> • Apply the oscilloscope to analyze different signals. • Connect different components; examine the circuit by analog and digital instruments to detect the error and to calculate the statistical analysis. • Calculate the load effect by using different analog voltmeters with high and low internal resistance. <p>P15: The ability to use use relevant laboratory equipment and analyze the results correctly.</p> <ul style="list-style-type: none"> • Measure different parameters by using analog avometer. • Measure different parameters by using digital voltmeter <p>P18: The ability to use appropriate tools to measure system performance.</p> <ul style="list-style-type: none"> • Calculate the quality factor of AC circuits by using Q-meter.
<p>d- General Skills</p>	<p>G4: The ability to demonstrate efficient IT capabilities.</p> <ul style="list-style-type: none"> • Sketch the output of experiments using excel and Matlab.

4- Course Contents

<ul style="list-style-type: none"> • Definitions- accuracy , precision and types of errors • Statistical analysis • Units of measurements. • Permanent magnet moving coil. • DC voltmeters (Analog voltmeters) • DC Ammeters (Analog Ammeters) • Series type and shunt type ohmmeters • Alternating current indicating instruments, AC voltmeters with full wave rectifiers. • Dc bridges and sources of error. • Ac bridges and sources of error • Ac voltmeters using rectifiers • True RMS – Responding Voltmeter • Basic Q-meter circuits • The oscilloscopes block diagram, Cathode ray tube and The Oscilloscope deflection. • Oscilloscope techniques

5- Teaching and Learning Methods

- | |
|---|
| <ul style="list-style-type: none"> - Lectures - Tutorials: - Reports & sheets: - Laboratories - Seminars |
|---|

6-Teaching and Learning Methods for Students with Special Needs

- | |
|---|
| <ul style="list-style-type: none"> - Lectures - Tutorials - Reports & sheets - Laboratories - Seminars |
|---|

Academic Support:

- Dr. Safa Gaser is appointed as an academic supervisor for handicapped students.
- Constant follow ups are done for handicapped students after each assessment to evaluate their academic level of achievement.

7- Student Assessment:

a- Procedures used:	<ul style="list-style-type: none"> 5- Written Examinations 6- Practical Examinations 7- Class Activities (Assignments, etc -----) 8- Final Examination 										
b- Schedule:	<ul style="list-style-type: none"> Assessment 1 (7th and 12th Week Written Exam) Assessment 2 (7th and 12th Week practical Exam) Assessment 3 (continuous assessment) Assessment 4 (16th week Final Exam) 										
c- Weighing of Assessment:	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Assessment 1</td> <td style="text-align: right;">50%</td> </tr> <tr> <td>Assessment 2</td> <td style="text-align: right;">5%</td> </tr> <tr> <td>Assessment 3</td> <td style="text-align: right;">5%</td> </tr> <tr> <td>Assessment 4</td> <td style="text-align: right;">40%</td> </tr> <tr> <td>Total</td> <td style="text-align: right;">100%</td> </tr> </table>	Assessment 1	50%	Assessment 2	5%	Assessment 3	5%	Assessment 4	40%	Total	100%
Assessment 1	50%										
Assessment 2	5%										
Assessment 3	5%										
Assessment 4	40%										
Total	100%										

8- List of References:

a- Course Notes	
b- Required Books (Textbooks)	J.B.GUPTA,“ Electronic and Electrical Measurements and Instrumentation
c-Recommended Books	<ul style="list-style-type: none"> • Helfrick, “Modern Electronic Instrumentation and Measurment”, Prentice Hall, 2009 • Austin and Pickersgill “ Instrumentation and control”, 2005 • C.J. Chesmond “Basic control system technology “ , 2008
d- Periodicals, Web Sites, ..., etc.	

Course coordinator:

Program Manager: