212 CNE Course Syllabus

Course Code	212 CNE
Course Name	Electronics Instruments and Measurements
Credit Hours	3
Contact Hours	4
Instructor Name	Dr. Abdulhalim

Text Book (title, author, and year)
• Measurement and Instrumentation Principle, A. Morris, 3e, Butterworth and Heinemann Group, 2001. • Introduction to Instrumentation and measurements, B. Northrop, 2e, Taylor and Francis Group, 2006.

Specific Course Information	
Catalog Description	This course introduces students to measurement accuracy, precision, and resolution, measurements errors, resistance, inductance, capacitance, frequency, and phase measurement techniques. A brief introduction to measurement errors is covered.
Prerequisites	NIL
Co-requisites	NIL
Required/Elective	Required

Course Learning Outcomes	
1	To define mathematical skills needed for analysing DC and AC bridge circuits.
2	To state and outline the new measurement systems and techniques for many real applications.
3	To explain the operation concept of sensors, identify their types, and outline their role for modern measurements.
4	To explain resistance, capacitance, inductance, frequency, and phase measurement techniques, evaluate the measurement accuracy and identify the potential sources of error in the measurements.
5	To relate physical observations and measurements to their theoretical principles.
6	To conduct measurement laboratory experiments using laboratory test equipment such as multimeters, power supplies, signal generators, and oscilloscopes.
7	To show the team work ability for implementing fibre optics communications projects.
8	To search the Web for new advances in measurement devices and measurements techniques.

Mapping course LOs to the SLO.												
Course LOs #	Student Learning Outcomes											
	a1	a2	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2
1	√											
2		√										
3			√									
4			√									
5			√									
6				√								
7								√				
8										√		

List of Theory Topics

Introduction to measurements and instrumentations: accuracy, precision, resolution and sensitivity.
Measurement errors: random, systematic, gross, limiting errors.
Resistance measurement techniques: Voltmeter-ammeter method, ohmmeter, substitution, and DC bridge circuits.
Capacitance measurement techniques: Approximate method, and Schering bridge.
Inductance measurement techniques: Approximate method, Maxwell bridge, and Hay bridge.
Frequency measurement techniques: Digital counter-timer, phase-looked loop, oscilloscope, and Wien bridge.
Phase measurement techniques: Digital counter-timer, and Lisajous pattern method.
Sensors, actuators and transducers: Speaker and microphone, strain gauge, accelerometer, Sensor classifications, resistive, capacitive, inductive, and piezoelectric sensors.

List of Lab Experiments

1. Introduction to measurement devices
2. Measurement accuracy, precision, resolution and sensitivity.
3. Identifying measurement errors.
4. Voltmeter-ammeter resistance measurement method.
5. Substitution resistance measurement method.
6. Wheatstone bridge for resistance measurement method.
7. Schering bridge for capacitance measurement technique
8. Maxwell bridge for inductance measurement technique
9. Hay bridge for inductance measurement technique
10. Digital counter-timer for frequency measurement
11. Wien bridge for frequency measurement
12. Lisajous pattern for phase measurement