

Department of Electrical Engineering			
Electrical Measurements & Sensors (63315)			
Total Credits	3		
major compulsory			
Prerequisites	P1 : Electrical Cirucits (63292) OR Electrical Circuits II (63212)		
Course Contents			
Measurements and errors, electromechanically indicating instruments, bridge measurements, electronic measuring instruments, oscilloscopes, signal generators, sensors and transducers, data acquisition systems			
Intended Learning Outcomes (ILO's)			Student Outcomes (SO's)
Contribution			
1	Student will be able to demonstrate and understand basic measurements concepts and errors	E	15 %
2	Student will be able to demonstrate and understand different types of electrical parameters meters including DC, AC, bridges , Electronic meters, oscilloscope and signal generator	E	30 %
3	Student will be able to construct, design different simple types of electrical parameters meters including DC, AC, bridges , Electronic meters.	C	20 %
4	Student will be able to demonstrate and understand sensors and transducers	E	10 %
5	Student will be able to construct, design components of measurement system using sensors and transducers to meet a certain goal.	C	15 %
6	Student will be able to demonstrate and understand tools necessary analog and digital data acquisition systems.	E	10 %
Textbook and/ or References			
Helfrik A D,Cooper W D, Modern Electronic Instrumentation and Measuring Techniques , Printice Hall Int. Ed.1990 Butterworth-Heinemann,[1].Measurement and Instrumentation Principles, 3rd Edition.2001			
Assessment Criteria		Percent (%)	
First Exam		20 %	
Second Exam		15 %	
Projects		15 %	
Final Exam		50 %	
Course Plan			
Week	Topic		
1	Introduction :Accuracy and precision , systems of units, conversion of units, significant figures		
2	Measurement Errors : Type of errors, statistical analysis ,probability of errors ,limiting errors		
3	Electromechanical Indicating Instruments (EI I) :Suspension galvanometer, permanent magnet moving coil mechanism,DC-ammeter, DC-voltmeter ,ohm meter types, multimeter		
4	E I I : Calibration of DC instruments ,AC measuring equipment, thermo instruments ,electro dynamo meters in power measurements , watt hour meters ,power factor meters,		

	instrument transformers.
5	Bridge Measurements :Wheatstone bridge , Kelvin bridge , AC bridge and their applications , Maxwell bridge ,Hay bridge , Wien bridge.
6	Electronic Instruments :DC- Electronic multimeters
7	AC Electronic multimeters with rectifiers, Digital Multimeters
8	First Hour exam
9	Oscilloscope: The cathode ray tube ,deflection amplifiers, time base, dual trace Measurement of voltage ,frequency and phase, oscilloscope probes,Lissajou Figures , analog storage oscilloscopes, digital storage oscilloscopes
10	Signal Generators: Sine wave generator ,puls and square wave generators ,function generators
11	Sensors and Transducers; Classification of sensors and transducers, strain gauges .temperature measurements
12	Sensors and transducers : displacement transducers, capacitive transducers , inductive transducers
13	Second Hour exam
14	Sensors and transducers :, thermo couples sensors, solarimeters, wind velocity measuring sensors
15	Analog and Digital Data Acquisition Systems :Instrumentation systems , interfacing transducers to electronic control ,multiplexers
16	Final Exam