Engineering Program

Specialization	**Technology of remote industrial sensing and controlling**
Course Number	
Course Title	**Signal conditioning circuits Lab**
Credit Hours	**3**
Theoretical Hours	**0**
Practical Hours	**1**

Brief Course Description:

Experimental study and investigation of signal conditioning circuits and their application in measurement and control. Working with real examples and applications.

Course Objectives:

Upon the completion of this course, the student will be able to:

1. Build signal conditioning circuit for measurement system
2. Build signal conditioning circuit for control system
3. Distinguish between real and ideal circuits
4. Use PC in in circuit design and testing

Detailed Course Description:

Chapter No.	Content title	Unit content	Time Needed
1	Experiment 1: Introduction to Multisim/Proteus	• Tools, Menus, workspace • Opening and running samples • Creating a project /file • Saving, closing edition • Sources, components, data plotting and presentation Debugging and testing	
2	Experiment 2: Power supply design	• Understanding +5V, V_{CC},V_{EE}, GND, AGND,DGND and common • Design unipolar, polar voltage source • Current limiters • Rectifier base power supply • Voltage regulators - Voltage divider as a voltage regulator - Zenor diode circutes - LM7805 and LM7809 - Design consideration	
3	Experiment 3: Balancing circuit design	• Voltage Divider circuit and its Application • Bridge Circuit design - AC and DC bridges - Real application - Potentiomteric sensor - Thermoresostor - Thermistor - LDR	
4	Experiment 4: Filter Design	• Passive and active filters • Understanding RC filters • Low Pass filter design • High Pass filter design • Band Pass filter design • Band-reject filter	
4	Experiment 5 Operational amplifiers :	• Ideal and practical Amplifiers - Ideal Op amp	

	concepts	- LM741, µA 741 - Pin diagram - Packaging : DIP, SOIC • Voltage follower circuit and its application • Comparator circuit and its Application • Schmitt Trigger circuit • Inverting and non-inverting op-amps amplifiers	
5	Operational Amplifiers : instrumentation and measurement	• Difference amplifier and its application • Instrumentation amplifier and its application • AD620, AD 624 • Comparison between difference and instrumentation amplifiers	
6	Operational Amplifiers : Mathematical operations •	• Proportional amplifier and its application • Integrator circuit : ideal and practical • Differentiator circuit • Logarithmic amplifier and its application • Application of Mathematical operations in control and measurement system	
7	• Converters 1: electrical parameters -	- Voltage to current converter and its application in measurement and control - Current to voltage converter and its application in measurement and control - Impedance matching	
8	Converters 2: Digital conditioning circuits -	• Analog to Digital converter - Concept - IC based ADC, application • Digital to analog converter - Summing amplifier - IC based DAC	

		Application	
9	Data conditioning elements	• Transistor as a switch • Phototransistor and Optoisolator • Isolation transformer • Applications of MOSFETs • TTL and CMOS •	
10	Term project		

Evaluation Strategies:

		Percentage	Date
1. Exams	**Mid Exam**	20%	**/ /20__**
	Lab activates and reports	30%	**/ /20__**
	Final Exam	50%	**/ /20__**
Total		100%	

Teaching Methodology:

- Working with datasheet
- Practical experimental work in small groups
- PowerPoint slides
- Term projects

Text Books & References:

Textbooks

1. Labartory sheet prepared by instructor

References

Circuit Analysis with Multisim , David Báez-López and Félix E. Guerrero-Castro 2011

MultisimTM 8 Simulation and Capture, Component Reference Guide,