



Lahore University of Management Sciences
EE241L- Introductory Circuits Lab
Spring 2016-17

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Course URL (if any)	lms

Course Basics				
Credit Hours	2			
Lecture(s)	Nbr of Lec(s) Per Week	1	Duration	30 mins
Lab (per week)	Nbr of Lec(s) Per Week	1	Duration	5hrs
Tutorial (per week)	Nbr of Lec(s) Per Week	-	Duration	-

Course Distribution	
Core	EE major
Elective	All SSE
Open for Student Category	
Close for Student Category	

COURSE DESCRIPTION
<p>A lab course to introduce electric circuits, electrical measurements and electronic devices. Topics include generating and measuring electrical signals; building and analyzing simple circuits using transformers, OP-Amps, diodes, MOSFETs, BJTs, filtering and modulation. Lab also includes a term project on constructing a complete electronic system.</p>

COURSE PREREQUISITE(S)
None

COURSE OBJECTIVES
<p>Familiarize students with basic laboratory instruments used in circuits and electronics Provide a self-contained introduction to building, testing and understanding basic electrical circuits and electronic devices Labs are designed in such a way that at the end students will be able to know Charging and discharging of capacitors, time constant of RC circuit Working of diodes, how to use diodes as rectifiers, clippers and clampers Input output characteristics of op-amp and comparator XY feature and working of oscilloscope Negative feedback and non-inverting amplifiers, design of sound system Design and frequency response of low and high pass filters Resonance in LC circuits, Frequency response of band pass filters, Transformers and their use to induce voltage I-V characteristics of MOSFET Amplification using MOSFET Modulation and demodulation of signals CMOS logic gates and inverters</p>



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Course Learning Outcomes	
EE 241 L- CLO1:	<p>The students should be able to:</p> <p>1- Use test and measurement equipment such as multi-meters, power supplies, signal generators, and oscilloscopes for performing measurements of electronic circuits</p> <p>2- Build/assemble and troubleshoot electronic circuits according to the provided circuit diagram</p> <p>3- Verify the response of electronic circuits such as filters, amplifiers, modulators and rectifiers.</p> <p>4- Use circuit design tools/software for circuit simulations using Proteus</p> <p>5- Demonstrate the ability to work in small teams.</p> <p>6- Design and develop a complete electronic system</p> <p>7- Present their work by writing a technical report and giving an oral presentation in a poster session.</p> <p>8- Analyze basic electronic circuits and predict their behavior.</p>
CLO2:	
CLO3	
CLO4:	
CLO5:	
CLO6:	
CLO7:	
CLO8:	

Relation to EE Program Outcomes				
EE-240 CLOs	Related PLOs	Levels of Learning	Teaching Methods	CLO Attainment checked in
CLO1	PLO5	Psy-1	Instruction, Lab Work	Lab Sessions
CLO2	PLO1	Psy-2	Instruction, Lab Work	Lab Sessions
CLO3	PLO1	Psy-3	Instruction, Lab Work	Lab Sessions
CLO4	PLO5	Psy-4	Instruction, Lab Work	Lab Sessions, Lab Assignments, Project
CLO5	PLO9	Psy-4	Project in small teams	Group Project
CLO6	PLO4	Psy-(5-6)	Project in small teams	Group Project
CLO7	PLO10	Psy- (1-6)	Projects in small teams	Group Project
CLO8	PLO1	Psy -7	Lab Lectures, Lab Assignments	Lab Assignments, Final Exam, Mid Term Exam

Grading Breakup and Policy
<p>Home Work: 10 %</p> <p>Class Participation/ Lab performance: 35 %</p> <p>Mid:10%</p> <p>Project: 20%</p> <p>Final Examination: 25%</p>

Examination Detail	
Midterm Exam	YES
Final Exam	<p>Duration: 90 mins</p> <p>Based on learning from the Labs and pre-lab assignments.</p>



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COURSE OVERVIEW				
Week/ Lecture/ Module	Topics	Recommended Readings	Objectives/ Application	
LAB 1	Breadboard ,function generator, oscilloscope, dc power supply, color code of resistors	A First Lab in Circuit and electronics by Y. Tsividis. Good lab practices and other useful hints – pages 1-10 Ground Connections – pages 11-13 Experiments 1&2 – pages 14-23	Familiarization with the basic lab equipment	Lab 1 to Lab4
LAB2	Resistor-Capacitor (RC) circuits	Background section in Experiment 6 of Y. Tsividis pg. 46 - 49.	To know the charging and discharging of capacitor in first-order RC circuits and their time constant	
LAB3	Diodes and their applications	Background section in Experiment 9 of Y. Tsividis pg. 67 - 69 and handout on diode equation	To know how diodes can be used in practical circuits as rectifiers, limiters, clippers and clampers	CLO1, CLO2
LAB4	Basic Characteristics of Op Amps and Comparators	Op Amp section in Experiment 4 of Y. Tsividis pg. 35 - 36	Input-output characteristics of an op-amp and how an op-amp is used to construct a simple comparator	
LAB5	Proteus simulations		To get familiarize with the simulation software (Proteus) and how it can be helpful in analyzing the circuit response	CLO3, CLO8
LAB6	Audio amplification system(sound system)	Background section in Experiment 5 of Y. Tsividis pg. 41 - 42.	How to make a simple sound system and the operation of a microphone	Lab 6 to Lab11
LAB7	Filters and their frequency response	Background section in Experiment 7 of Y. Tsividis pg. 53 - 56.	How to design low and high pass filters	
LAB8	LC circuits, resonance and transformers	Background section in Experiment 8 of Y. Tsividis pg. 62 - 66	To determine the frequency response of LC circuits and bandpass filtering, use of transformer and basic principle of AM radio	
LAB9	MOSFETs	Experiment 11 of Y. Tsividis pg. 82 - 89.	I-V characteristics of MOSFET and their use as voltage controlled resistor and switch	
LAB10	Principles of amplification	A MOSFET-resistor inverter section in Experiment 12 of Y. Tsividis pg. 90 - 91	To determine the Input output characteristics of amplifier using NMOS and voltage gain	CLO1, CLO2
LAB11	Amplitude modulation(AM)	Background section in Experiment 10 of Y. Tsividis pg. 74 - 76.	Modulation and demodulation of signals and design of radio receivers	
LAB12	Project		To determine the voltage transfer characteristic curve of CMOS inverter	CLO4, CLO5, CLO6, CLO7

Textbook(s)/Supplementary Readings

- **"A First Lab in Circuit and electronics"** by Y. Tsividis, John Wiley & Sons, 2002.

Reference texts:

- "Microelectronic Circuits Laboratory Explorations Manual" by Sedra Smith 4th Edition, Oxford University Press, 1998.
- "Basic Engineering Circuit Analysis" by David Irwin and Mark Nelms, 10th edition, John Wiley & Sons.



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