



# Sir Syed University of Engineering & Technology

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## EE-110 Basic Electronics (3+1)

3<sup>rd</sup> Semester - Batch 2010

Department of Computer Engineering

### Introduction

This course provides “live” experiments, manual analysis of Semiconductor Devices theory. Develops skills that will virtually cover every basic concept of circuits containing Rectifier and Zener diodes, bipolar, field effect and Uni-junction transistor, and integrated-circuit voltage regulators, on a bread boarding electronic circuits using electronic measuring instruments, testing equipments and use of basic hand tools and skills associated with electronic laboratory experiments.

This course will act as a springboard for subsequent electronics courses such as MBSD, Digital Electronics and VLSI Design Techniques. This course introduces the student to methods of solid state devices used today industry. The mathematical rigor of the course has been designed to coincide with a standard course in algebra and trigonometry, although engineering and scientific notation is used.

### Course Goals and Measureable Intended Student Learning Outcomes

By the end of the course, students will be able to:

- Analyze and construct circuits that demonstrate the understanding of rectifier diodes
- Construct circuits that illustrate the application of bipolar transistors
- Build and measure the parameters values of current and voltage in field effect transistor
- Familiar with the use of test equipment for circuit analysis

### Text Book:

1. Title: Electronic Devices and Circuit Theory  
Edition: 9<sup>th</sup>  
Author's Name: Robert L. Boylestad / Louis Nashelsky
2. Title: Electronic Devices  
Edition: 8<sup>th</sup>  
Author's Name: Thomas L. Floyd

### Reference Book:

1. Title: Electric Circuits  
Edition: 2<sup>nd</sup>  
Author's Name: Bogart, Theodore F. Bogart, Theodore F.

### Teaching Methodology

The teaching will consist of classroom lectures and laboratory practical. Extensive web based materials will be provided for this course. Homework assignments that reinforce concepts will be assigned. Quizzes and class tests also conduct after every topic will be covered.

### Course Supervisor

1, **Engr. Syed Hassan Raza Naqvi**, Masters of Science in Electrical Engineering from Linkoping University, Sweden. Currently working as an Assistant Professor in Computer Engineering Department, my special interests are in the field of System on Chip for Media and Communication.

### Course Members:

1. Syed Hassan Raza Naqvi (Assistant Professor, CED, SSUET)
2. Osama Ahmed Siddiqui (Assistant Professor, CED, SSUET)
3. Syed Asim Hasan (Lecturer, CED, SSUET)
4. Zain Ali Shah (Lecturer, CED, SSUET)
5. Samreena Bano (Jr. Lecturer, CED, SSUET)

**Course Outline**

WEEK	DATE	TOPIC	LECTURE	TOPIC CONTENTS	STATUS
Week 1	27th Jan. 2011	BCAM Review	Lecture 1	Introduction, Thevenin Theorem	
			Lecture 2	Examples of Thevenin Theorem, Norton Equivalent Circuit	
			Lecture 3	Superposition Theorem, Examples of Series and Parallel circuits	
Week 2	31st Jan. 2011	Basic Electronics Introduction	Lecture 4	Basic structure of atoms, Properties of Materials	
			Lecture 5	Properties of insulators, Conductors, and Semiconductors, Covalent bonding	
			Lecture 6	Band theory, Transport in Semiconductors,	
Week 3	7th Feb. 2011	Diode	Lecture 7	Intrinsic semiconductors, Extrinsic semiconductors, Doping	
			Lecture 8	N doping, P doping, Properties of both P and N type materials	
Week 4	14th Feb. 2011		Lecture 9	P-N junction, Depletion Layer, Threshold Voltage	
			Lecture 10	Load line analysis and diode approximations	
Week 5	21st Feb. 2011	Diode Applications	Lecture 11	Series-Parallel configuration	
			Lecture 12	Half wave Rectification	
			Lecture 13	Full wave Rectification	
Lecture 14	Clipper circuits				
Week 6	28th Feb. 2011		Lecture 15	Clamper circuits	
			Lecture 16	Introduction to LEDs, Introduction to Zener diode.	
Week 7	7th Mar. 2011	Bipolar Junction Transistors	Lecture 17	Zener diode applications.	
			Lecture 18	Transistor construction	
			Lecture 19	NPN Transistor operation	
		Lecture 20	PNP Transistor operation		
		Lecture 21	Revision		
Week 8	14th Mar. 2011	Spring Semester Mid Term Examination 2011			
Week 9	21st Mar. 2011	Bipolar Junction Transistors (Cont.)	Lecture 22	Transistor configuration	
			Lecture 23	Transistor configuration (cont.)	
			Lecture 24	Transistor data sheet and terminal identification	
Week 10	28th Mar. 2011	BJT DC Analysis	Lecture 25	Operation regions, fixed bias configuration	
			Lecture 26	Fixed bias configuration (cont. )	
Week 11	4th April 2011		Lecture 27	Emitter Bias configuration	
			Lecture 28	Voltage divider bias configuration	
			Lecture 29	DC bias with voltage feedback configuration	
Week 12	11th April 2011	Field Effect Transistors	Lecture 30	Miscellaneous bias configuration	
			Lecture 31	Junction Field Effect Transistors	

			Lecture 32	Construction and Characteristics of JFET	
			Lecture 33	Depletion Type MOSFET	
Week 13	18th April 2011		Lecture 34	Enhancement Type MOSFET	
			Lecture 35	Basic Operation of MOSFET	
			Lecture 36	Complementary Metal Oxide Semiconductor	
Week 14	25th April 2011	FET Biasing	Lecture 37	Introduction, Fixed Bias Configuration	
			Lecture 38	Self Bias configuration	
Lecture 39	Voltage Divider Biasing				
Week 15	2nd May 2011		Lecture 40	Depletion Type MOSFET Biasing	
			Lecture 41	Enhancement Type MOSFET Biasing	
			Lecture 42	Summary Table	
Week 16	9th May 2011	Revision	Lecture 43	Revision	
			Lecture 44		
			Lecture 45		
Week 17	16th May 2011	Preparation Leaves			
Week 18	23rd May 2011	Spring Semester Final Examination 2011			

### Lab work and Project

Lab work will be described by the course supervisor in the weekly lab and you will be given the lab assignments which should be checked by the course supervisor / assistant on the spot and marked after the completion. The lab work, assignment and final viva will account for 10% of the grade. After the midterm you will be given a semester project, which will account at least 10% of the sectional awards.

### Lab Outline

WEEK	DATE	LAB	TOPIC CONTENTS	STATUS	
Week 1	31st Jan. 2011	Lab 0	Introduction to Basic Electronics		
Week 2	7th Feb. 2011	Lab 1	To verify superposition principle in DC Circuits.		
Week 3	14th Feb. 2011	Lab 2	To study the characteristics of silicon diodes.		
Week 4	21st Feb. 2011	Lab 3	To calculate and draw the DC output voltages of half-wave rectifiers.		
Week 5	28th Feb. 2011	Lab 4	To calculate and draw the DC output voltages of full-wave rectifiers.		
Week 6	7th Mar. 2011	Lab 5	To calculate and measure the output voltages of clipper circuits.		
Week 7	14th Mar. 2011	Lab 6	To calculate and measure the output voltages of clamper circuits.		
Week 8	21st Mar. 2011	Spring Semester Mid Term Examination 2011			
Week 9	28th Mar. 2011	Lab 7	To study the characteristics of Zener diode. To study the voltage regulation in Zener diode regulation circuit.		
Week 10	4th April 2011	Lab 8	Characterization of an NPN Bipolar Junction Transistor (BJT)		

Week 11	11th April 2011	Lab 9	To graph the collector characteristics of a transistor. To measure AC & DC voltages in a common emitter amplifier.
Week 12	18th April 2011	Lab 10	To determine the quiescent operating conditions of the fixed and voltage divider bias BJT configurations.
Week 13	25th April 2011	Lab 11	To study the Basic Transistor Applications.
Week 14	2nd May 2011	Lab 12	To establish the output and transfer characteristics for a JFET transistor.
Week 15	9th May 2011	Lab 13	Final Project and Lab Viva
Week 16	16th May 2011	Lab 14	Final Project and Lab Viva
Week 17	23rd May 2011	Preparation Leaves	
Week 18	30th May 2011	Spring Semester Final Examination 2011	

### Attendance

Attendance is required as per university policy and will account of the sectional marks.

### Mid Term and Final Exam

The Mid Term exam will be held in 8th week of this semester and will account of 15% of the grade. A comprehensive Final Exam will be held which will account for 60% of the grade.

### Class and Home Assignments

The homework assignments will be conceptually difficult. Note the strategy of the work: you need to start on the homework assignment soon after they are assigned to you. These home works will account for 5% of the grade.

- ✓ Late work **will not** be accepted in any circumstance

