



University of Tehran
School of Electrical and Computer Engineering

Course:	8101554 – Electronic Circuits									
Course type:	EE*						CE*			Credit: 3
	Com	E	P	B	Con	D	SW	HW	IT	
	Required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Elective	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Level:	Undergraduate <input checked="" type="checkbox"/> Graduate <input type="checkbox"/>									
Co-requisite(s):	None.									
Prerequisite(s):	Electrical Circuits (8101522)									
Prerequisite by topic:										
Textbook(s):	[1] B. Razavi, <i>Fundamentals of microelectronics</i> . . [2] Mireshghi, <i>Fundamentals of electronics</i> .									
Coordinator:	Sadrossadat, Professor, School of ECE									
Goals:	<p>The course provides an introduction into basic semiconductor device physics and analog integrated circuits. It starts from physics of Diodes as principle microelectronic device and continues toward diode circuits. Then, physics and structure of bipolar transistors will be discussed and continues toward bipolar circuits and amplifiers and different topologies of BJT amplifiers. At the end, physics and structure of MOS transistors will be discussed and continues toward MOS circuits and different topologies of MOS amplifiers and finally compare them with their BJT counterparts.</p> <p>Finally it's going to familiarize the audience with basic principles of semiconductor devices such as Diodes, Bipolar transistors, and MOS transistors and finally making them capable of analyzing circuits and amplifiers containing these devices.</p>									
Outcome:	<p>Upon successful completion of the course, students will be able to:</p> <ol style="list-style-type: none"> 1. Analyze and understand diodes and transistors and their applications and behaviors 2. Perform analog electronics circuit/amplifiers analysis and design 3. Use HSPICE (or other SPICE-like simulators e.g. PSPICE) to simulate and validate their analytical design of electronic circuits. 									
Topics:	<ol style="list-style-type: none"> 1. Introduction to Microelectronics: <ul style="list-style-type: none"> o Why Microelectronics 2. Basic Physics of Semiconductors: <ul style="list-style-type: none"> o Semiconductor Materials and Their Properties o PN Junction 									

	<ul style="list-style-type: none"> ○ Reverse Breakdown <p>3. Diode Models and Circuits:</p> <ul style="list-style-type: none"> ○ Ideal diode ○ PN Junction as a Diode ○ Large-Signal and Small-Signal Operation ○ Applications of Diodes <p>4. Physics of Bipolar Transistors:</p> <ul style="list-style-type: none"> ○ Structure of Bipolar Transistor ○ Operation of Bipolar Transistor in Active Mode ○ Bipolar Transistor Models and Characteristics ○ Operation of Bipolar Transistor in Saturation Mode ○ The PNP Transistor <p>5. Bipolar Amplifiers:</p> <ul style="list-style-type: none"> ○ Operating Point Analysis and Design ○ Bipolar Amplifier Topologies <p>6. Physics of MOS Transistors:</p> <ul style="list-style-type: none"> ○ Structure of MOSFET ○ Operation of MOSFET ○ MOS Device Models ○ PMOS Transistor ○ CMOS Technology ○ Comparison of Bipolar and MOS Devices <p>7. CMOS Amplifiers:</p> <ul style="list-style-type: none"> ○ Common-Source Stage ○ Common-Gate Stage ○ Source Follower
Computer usage:	1- HSPICE 2- MATLAB
Assignments:	8 homework assignments
Projects:	3 projects
Grading:	Assignments: 10 % including 8 homework Projects: 15 % including 3 projects Quizzes: 10 % including 8 quizzes Midterm exams: 27.5% Final exam: 37.5 %
Further readings:	The websites and sources that is being introduced in the class.
Prepared by:	
Date:	

*EE: Electrical Engineering		CE: Computer Engineering	
Com	Communications	SW	Software
E	Electronics	HW	Hardware
P	Power	IT	Information Technology
B	Bioelectronics		
Con	Control		
D	Digital System		