University of Tehran
School of Electrical and Computer Engineering

Course:	**8101026 - Electronics 3 Laboratory**
Course type:	<table><tr><td></td><td colspan="6">EE*</td><td colspan="3">CE*</td><td rowspan="2">Credit: 1</td></tr><tr><td></td><td>Com</td><td>E</td><td>P</td><td>B</td><td>Con</td><td>D</td><td>SW</td><td>HW</td><td>IT</td></tr><tr><td>Required</td><td>☐</td><td>☒</td><td>☐</td><td>☐</td><td>☐</td><td>☒</td><td>☐</td><td>☐</td><td>☐</td></tr><tr><td>Elective</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr></table>
Level:	Undergraduate ■ Graduate ☐
Co-requisite(s):	None.
Prerequisite(s):	Electronics 3, 8101089
Prerequisite by topic:	Frequency response of amplifiers, Opamp application circuits, Current sources, Frequency compensation, Analog multipliers.
Textbook(s):	[1] Instruction Manual for Electronics 3 Laboratory, By: Samad Sheikhaei, 2013.
Coordinator:	Samad Sheikhaei
Goals:	In this course, the students become familiar with the design, implementation, and measurement of the circuits related to the Electronics 3 course, on the bread board or dotted board. However, as the circuits taught in Electronics 3 are all integrated circuits, implementation and test of all those circuits using discrete components is not possible.
Outcome:	Upon successful completion of the course, students will be able to 1. Measure frequency response of amplifiers. 2. Analyze the basic amplifier circuits including CE, CB, and CC, with respect to high and low cut-off frequency and confirm those analyses with practical measurements. 3. Analyze and measure the feedback amplifiers and apply frequency compensation on those circuits. 4. Use opamps in practical applications, such as opamp-RC filters, oscillators, and Schmitt triggers. 5. Implement high output resistance current sources using transistors and measure their output resistance and current matching.
Topics:	The experiments in this laboratory include: Lab1. Frequency response of amplifiers: Common Emitter and Common Base. Lab2. Frequency response of amplifiers: Common Collector and

	Cascode. Lab3. Frequency response of feedback amplifiers. Lab4. Opamp applications: RC active filters. Lab5. Opamp applications: Oscillators and Schmitt triggers. Lab6. Precise current sources and current mirrors. Lab7-Lab8: Differential amplifiers and frequency compensation. Lab9. Analog multipliers.
Computer usage:	Circuit simulators such as Spice.
Assignments:	There are 9 laboratory experiments, from which, 8 need pre-reports.
Projects:	There is no additional project. Labs 7 and 8 are in the form of a PCB/dotted board project, which includes design, building and measurement.
Grading:	Lab Pre-repots: 33 % Lab Reports: 17 % Class Activities: 20 % Presence: 10 % (Each absence upto -5%) Written exam: 20 %
Further readings:	Text books for Electronics 2 and 3 courses, such as: [1] A. Sedra, K. Smith, "Microelectronic Circuits, 7th Edition," Oxford University Press, 2014. [2] P.R. Gray, P.J. Hurst, S.H. Lewis, R.G. Meyer, "Analysis and Design of Analog Integrated Circuits, 5th Edition," Wiley, 2009. [3] B. Razavi, "Design of Analog CMOS Integrated Circuits, 2nd Edition," McGraw-Hill Education, 2016.
Prepared by:	Samad Sheikhaei
Date:	September 2017

*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		