

DELAWARE STATE UNIVERSITY
ENGR 309-ELECTRONIC CIRCUIT ANALYSIS
FALL 2016

Classes: SC 213 (tentative), Mon, Wed, Fri 11:00-11:50
Labs: SC 235 (tentative), Tue 13:30-16:20
Start date: Aug. 29, 2016 End date: Dec. 8, 2016

Instructor: Dr. Sokratis Makrogiannis
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Office Hours: Mon, Wed 13:00-14:30, Fri 13:00-14:00 and by appointment.

COURSE DESCRIPTION:

- a. Introduction to the physical principles of solid-state electronic devices. Quantitative study of elementary circuits including biasing, linear power amplifiers, low-frequency small signal analysis, multiple transistor circuits, and feedback. Three (3) lectures and one (1) three-hour laboratory per week.
- b. Prerequisites or co-requisites: Pre-requisites ENGR 205 - Analog Circuits I
- c. Required for BS in Engineering Physics and BS in Physics Programs.

TEXT:

Required:

Microelectronic Circuits 7th Edition, Sedra, Adel; Smith, Kenneth C., Oxford University Press, 2009.

Recommended:

Microelectronic Circuit Analysis and Design 4th edition, Neamen, Donald A. McGraw Hill, 2010.

COURSE OBJECTIVES:

- a. After taking this course the student will be able to:
 - i. Analyze an electronic circuit to solve for current, voltage or frequency response which involves single and multi-stage amplifiers.
 - ii. Use op-amp with resistor, capacitor and others to design integrator, differentiator, amplifier and other circuits and interpret ideal and non-ideal behavior of op-amp circuits.
 - iii. Construct electronic devices by interpreting the structure and behavior of p-n junction diode and transistors.

- iv. Perform experiments involving operational amplifiers, diodes and transistors in the laboratory.
- b. Addresses the students learning outcomes of BS in Engineering Physics 01.1, 01.2, 03.5, 04.11 and BS in Physics 01.1, 01.2, 02.3, 02.4, 02.5, 03.6.

HOMWORK AND GRADES OVERVIEW:

1. In general, there will be a homework assignment and/or a quiz due almost each week on Friday. Homework is prepared at home and quizzes are taken in-class at the end of the class.
2. There will be a closed-book and closed-notes midterm examination.
3. There will be a closed-book and closed-notes comprehensive final examination.
4. Your overall grade for the semester will be based upon the homework, quizzes, lab deliverables and exams as defined in the schedule table.

Type of Assessment	Weight of Assessment
Assignments	20%
Quizzes	10%
Midterm Exam	20%
Final Exam	30%
Labs	20%

Percentage	Grades
90 – 100 %	A
80 – 89 %	B
70 – 79%	C
60 – 69%	D
< 60%	F

READING AND LAB ASSIGNMENTS:

Reading and/or lab assignments will be given for each lecture period. Students are expected to complete the assignments prior to each designated class. Additional material will also be developed in class lectures, so missing class is not advisable.

CHANGES IN COURSE REQUIREMENTS:

Since all classes do not progress at the same rate, the instructor may wish to modify the above mentioned requirements or their timing as circumstances dictate. For example, the instructor may wish to change the number and frequency of examinations, or the number and sequence of assignments. If such modification is needed, the student will be given adequate notification. Moreover, there may be non-typical classes for which these requirements are not strictly applicable in each instance and may need modification. If such modification is needed, it will be in writing and conform to the spirit of this policy statement.

GENERAL:

All students **MUST** activate their **UNIVERSITY** e-mail address at their earliest convenience. All communication (notices, letters, grades etc.) will be sent to the student through the **UNIVERSITY** email system.

COURSE WEBSITE:

Blackboard of DESU will be used as the primary website for this course. Please visit Blackboard (<http://dsuonline.blackboard.com>) and check your university email periodically for important course-announcements, homework assignments and others.

ATTENDANCE POLICY:

Students are expected to attend all classes. Students are expected to arrive on time and be prepared for the class. Attendance may be taken at the beginning of each class. Please notify in advance if you are going to miss a class. Absence does not justify missed assignment due dates and missed tests/exams. If you miss a class, you are responsible for all material covered or assigned in class.

LATE WORK:

Project assignments are due on their due date at (or before) the start of class; late assignments lose 33% per day of delay; this implies a score of 0% for assignments delayed more than 2 days. If you are unable to hand in an assignment by the deadline, you must discuss it with me before the deadline.

MAKEUP EXAMS:

If any student misses a quiz or exam for any valid and documented reason, the student needs to make up the quiz/exam **within a week** to receive credit. Exams cannot be made up unless there is an extreme and documented emergency.

GROUP WORK AND ACADEMIC INTEGRITY:

While students are encouraged to discuss the assignments, each student is evaluated for individual effort in assignments and tests (i.e., sharing code is not allowed), unless there are specific instructions for group work. Individual assignments which are too similar will receive a zero. We should all strive to maintain academic integrity in education.

TOPICS COVERED:

- a. Introduction to Electronics
- b. Operational Amplifiers
- c. Diodes
- d. Bipolar Junction Transistors
- e. Field-Effect Transistors
- f. Differential and Multistage Amplifiers
- g. Frequency Response

(TENTATIVE) SCHEDULE:

Week #	Week Beginning Date	Description	Work Due	Text Reference
1	8/29/2016	Course Overview Signals and Amplifiers Signals Frequency Spectrum of Signals Analog and Digital Signals		SS Ch. 1
2	9/5/2016	Amplifiers Circuit Models for Amplifiers Frequency Response of Amplifiers		
3	9/12/2016	Operational Amplifiers The Ideal Op Amp The Inverting Configuration The Noninverting Configuration	A1	SS Ch. 2
4	9/19/2016	Difference Amplifiers Integrators and Differentiators DC Imperfections		
5	9/26/2016	Effect of Finite Open-Loop Gain and Bandwidth on Circuit Performance Large-Signal Operation of Op Amps	A2	
6	10/3/2016	Mid-Term Exam		
7	10/10/2016	Diodes The Ideal Diode Terminal Characteristics of Junction Diodes	A3	SS Ch. 4
8	10/17/2016	Modeling the Diode Forward Characteristic Operation in the Reverse Breakdown Region—Zener Diodes Rectifier Circuits		
9	10/24/2016	Limiting and Clamping Circuits Special Diode Types Bipolar Junction Transistors (BJTs) Device Structure and Physical Operation Current–Voltage Characteristics BJT Circuits at DC	A4	SS Ch. 6
10	10/31/2016	Applying the BJT in Amplifier Design Small-Signal Operation and Models Basic BJT Amplifier Configurations		
11	11/7/2016	Biasing in BJT Amplifier Circuits Discrete-Circuit BJT Amplifier Transistor Breakdown and Temperature Effects	A5	
12	11/14/2016	MOS Field-Effect Transistors		SS Ch. 5

		(MOSFETs*) Device Structure and Physical Operation Current–Voltage Characteristics MOSFET Circuits at DC Applying the MOSFET in Amplifier Design		
13	11/21/2016	Small-Signal Operation and Models Basic MOSFET Amplifier Configurations Biasing in MOS Amplifier Circuits Discrete-Circuit MOS Amplifiers The Body Effect and Other Topics Differential and Multistage Amplifiers (*)	A6	SS Chs. 7, 9
14	11/28/2016	Frequency Response (*)		SS Ch. 10
15	12/5/2016	Review and Final Exam		

(*) Pending on time availability and class interest

NOTE:

If you have a disability which is documented with the Student Accessibility Services Office and wish to discuss academic accommodations with me, please contact me as soon as possible.