The University of Texas at Tyler
Department of Electrical Engineering

Course: EENG 3306.031 – Electronic Circuit Analysis I (Required)

Syllabus

Catalog Description:

Generalized amplifier models; two-port networks applications of operational amplifiers; non-ideal characteristics of operational amplifiers; electrical characteristics, small-signal models and applications of diodes; bipolar junction transistors, and FETS; amplifier analysis and design; limitations of small-signal models

Prerequisites: EENG 3304 (Linear Circuits Analysis I)
EENG 3104 (Linear Circuits Analysis I Laboratory)

Credits: 3 (3 hours lecture, 0 hours laboratory per week)

Text(s): *Microelectronic circuits, 7th Edition*, by Sedra and Smith (Oxford University Press).

Additional Material: Matlab®
Instructor's Lecture Notes

Course Coordinator: Dr Joseph Kamto

Topics Covered: (paragraph of topics separated by semicolons)

Generalized amplifier models; applications of operational amplifiers; non-ideal characteristics of operational amplifiers; electrical characteristics, small-signal models and applications of diodes; small-signal models and applications of bipolar junction transistors; small-signal models and applications of FETS; amplifier analysis and design; *h*-parameter representations of amplifiers; distortion and limitation of small-signal models.

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Evaluation Methods: (only items in dark print apply):

1. Examinations / Quizzes
2. Homework
3. Report
4. Computer Programming
5. Project
6. Presentation
7. Course Participation
8. Peer Review

Course Objectives[1]: By the end of this course students will be able to:

1. Analyze dc electronic circuits (including resistance, independent sources, and dependent sources) using basic circuit-analysis techniques (Kirchhoff's Laws, Ohm's Law, Thevenin- and Norton-equivalent circuits).
2. Analyze ac electronic circuits (including resistance, capacitance, self- and mutual inductance, independent sources, and dependent sources) using basic circuit-analysis techniques. (Kirchhoff's Laws, Ohm's Law, Thevenin- and Norton-equivalent circuits, phasor transform).
3. Compute the time-domain response of a linear network to a periodic, non-sinusoidal signal using superposition and the Fourier series.
4. Analyze linear electronic circuits using the four basic amplifier models (voltage, current, transconductance, and transimpedance)
5. Analyze electrical circuits represented by two-port parameters

6. Analyze circuits using operational amplifiers including the limitations imposed by non-ideal electrical characteristics.
7. Design diode-application circuits—e.g., rectifiers, clipping circuits, and Zener-diode voltage regulators]
8. Use the operational principles and electrical characteristics of bipolar junction transistors (BJTs) to determine the quiescent operating point of a BJT.
9. Use the operational principles and electrical characteristics of bipolar junction transistors to derive appropriate small-signal models.
10. Use the operational principles and electrical characteristics of MOSFETs to determine the quiescent operating point of an enhancement-mode MOSFET.
11. Use the operational principles and electrical characteristics of MOSFETs to derive the appropriate small-signal model.
12. Analyze transistor amplifiers using midband small-signal models.
13. Calculate the limits of small-signal operation of diodes, bipolar transistors, and MOSFETs from their V-I characteristics

[1]*Numbers in brackets refer to method(s) used to evaluate the course objective.*

Relationship to Program Student Outcomes (only items in dark print apply)[2]: This course supports the following Electrical Engineering Program Outcomes, which state that our students will:

1. have the ability to apply mathematics, science, and engineering principles in the practice of electrical engineering; [3]
2. have the ability to use modern engineering tools and techniques in the practice of electrical engineering; [12,13]
3. have the ability to analyze electrical circuits, devices, and systems; [4,7,8,9]
4. have the ability to design electrical circuits, devices, and systems to meet application requirements; [5,6]
5. have the ability to design and conduct experiments, and analyze and draw conclusions from experimental results;
6. have the ability to identify, formulate, and solve problems in the practice of electrical engineering using appropriate theoretical and experimental methods; [1,2]
7. have effective written, visual, and oral communication skills; [4,5,6]
8. possess an educational background to understand the broader context in which engineering is practiced, including:
   a. knowledge of contemporary issues related to science and engineering;
   b. the impact of engineering on society;
   c. the role of ethics in the practice of engineering;
9. have the ability to contribute effectively to multi-disciplinary engineering teams; [1,4]
10. have a recognition of the need for and ability to pursue continued learning throughout their professional careers. [10,11]

[2]*Numbers in brackets refer to course objective(s) that address the Program Outcome.*

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:	0.5	Hours
Engineering Sciences and Design:	2.5	Hours
General Education Component:		Hours

Prepared By:	Joseph Kamto	Date:	08/27/2018

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Department of Electrical Engineering

EENG 3306 – Electronic Circuit Analysis I
2018 Fall Semester
Course Outline

Date	Topics	Reading	Homework
27 Aug 2018	Introduction / Syllabus	1.1	
29 Aug 2018	Basic concepts and introduction to amplifiers	1.4	HW1Assigned
03-05 Sep 2018	Amplifier frequency response Two-port networks	1.6	HW1 Due,
10 Sep 2018	Op amps 1	2.2-2.3	
12 Sep 2018	Op amps 2	2.3-2.4	HW2 Assigned
17 Sep 2018	Op amps 3	2.4-2.5	HW2 Due,
19 Sep 2018	Op amps 4		
24 Sep 2018	**Test1**	2.6-2.7	
26 Sep 2018	Op amps 5	2.7-2.8	HW3 Assigned
01 Oct 2018	Semiconductors	3.1-3.3	HW3 Due
03 Oct 2018	Semiconductors	3.4-3.6	HW4 Assigned
08 Oct 2018	**Review**		
10 Oct 2018	**Midterm**		
15-17 Oct 2018	Diodes 1	4.1-4.2	HW4 Due
22-24 Oct 2018	Diodes 2	4.3-4.4	
29 Oct 2018	Diodes 3	4.5-4.6	
31 Oct 2018	Diodes 4	4.6-4.7	HW5 Assigned
05 Nov 2018	MOSFETs 1		HW5 Due,
07 Nov 2018	MOSFETs 1		
12 Nov 2018	**Review**	5.1-5.2	
14 Nov 2018	**Test2**		
19-21 Nov 2018	MOSFETs 2	5.2-5.3	HW6 Assigned
26 Nov 2018	MOSFETs 2		
28 Nov 2018	BJTs 1	6.1-6.2	HW6 Due
03-05 Dec 2018	BJTs 2	6.3-6.4	
10 Dec 2018	**Review**		
12 Dec 2018	**Final Exam**		

Academic Integrity	Students should be aware that absolute academic integrity is expected of every student in all undertakings at The University of Texas at Tyler. Failure to comply can result in strong university-imposed penalties.
Homework and Lab Project Policy	Homework and project reports will be due in class or lab one week after assignment. Project reports should be written as per the guidelines provided. A 25% penalty will be assessed per week for late project reports and homework. The progressive nature of the class means that perfect attendance is
Student Responsibility	To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link: http://www.uttyler.edu/wellness/rightsresponsibilities.php *Adult behavior is expected. Disruptive behavior/activities that interfere with teaching and/or learning will not be tolerated and may result in an administrative withdrawal without refund.*

Background on grading and study habits	Typical ranges for grades in this class run as follows, 91-100% A, 80-90% B, 69% to 79% C. The class examples and HW problems provide a basis for gauging you comfort level with the material. The amount of time a student should study cannot always be easily quantified due to differences between students.
Academic Integrity	Students should be aware that absolute academic integrity is expected of every student in all undertakings at The University of Texas at Tyler. Failure to comply can result in strong university-imposed penalties.
Classroom Etiquette	Please remember to turn off cell phones before coming to class. Working on class assignments or surfing the web while class is going on is not acceptable. If these activities are important for you on a particular day, it would be better you did them outside the class environment. That being said attendance is important and will take periodically during the semester. If you know you have an emergency schedule conflict that comes up, please inform me (email OK). Although I do not plan to integrate attendance data in with student evaluation it can and will provide additional information if a student is experiencing problems

EENG 3106 Electronic Circuit Analysis I Laboratory

Schedule, Fall 2018 (preliminary)

Joseph Kamto

jkamto@uttyler.edu

Prerequisite or co-requisite: EENG 3306 (Electronic Circuit Analysis I)

Meeting time: 2:00–5:30 PM, M

Place: HEC B214

Date	Laboratory activities	Assignment Due
Aug 27	Course orientation; Part Kits	
Sep 03	Labour day	Assignment 0 and laboratory policies;
Sep 10	Amplifier models and two-port networks	
Sep 17		Simulation for Amplifier models and two-port networks
Sep 24	Operational amplifier designs	Results for Amplifier models and two-port networks
Oct 01		Simulation for Operational amplifier designs
Oct 08		Results for Operational amplifier designs
Oct 15	Diode rectifier and waveshaping circuits	
Oct 22		Simulation for Diode IV characteristics
Oct 29	Diode IV characteristics	Results for Diode IV characteristics
Nov 05		Simulation for Diode rectifier and waveshaping circuits
Nov 12	MOSFET IV characteristics	Results for Diode rectifier and waveshaping circuits
Nov 19		Simulation for MOSFET IV characteristics
Nov 26	BJT IV characteristics	Results for MOSFET IV characteristics
Dec 03		Simulation for BJT IV characteristics
Dec 10	Common-emitter amplifier	Results for BJT IV characteristics
Dec 12		Simulation for Common-emitter amplifier
		Results for Common-emitter amplifier

Important course management information:

1. All assignments are to be submitted through UT-Tyler Learning Management Software (LMS), which was changed to Canvas in 2017.
2. Credit is given for *Assignment 0 and laboratories policies* if submitted prior to the due date. *No* credit is given if submitted after the due date. However, no credit will be assigned for *any* work until *Assignment 0 and laboratory policies* has been accepted. No retroactive credits will be given.
3. Be aware that *Assignment 0 and laboratory policies* is *separate* from Assignment 0 in EENG 3306.
4. Laboratory bench assignments will be rotated for each new experiment. The roster will be posted prior to the start of the experiment. Two students will be assigned to each bench if the class roster has an even number of students; three students will be assigned to bench 1 in the event the roster contains an odd number.
5. It is responsibility of a student group to collect components from the cabinet at the end of each previous laboratory session and for the first laboratory session collect at the course orientation.
6. Individuals having access to a National Instruments myDAQ may request to borrow the parts kits from their assigned benches and perform laboratory experiments off-site. It is the responsibility of experimenters to determine whether the experiment is suitable for myDAQ. Components must be returned by the due date of

the results of the experiment. Credit for the laboratory will be withheld until components are returned and will be reduced if the components are returned late.

7. Circuits are to be disconnected and parts returned to the cabinets at the conclusion of each experiment. Tools and hand-held digital multimeters are to be returned to the laboratory cabinets *at the end of each laboratory session*.
8. Simulation results for a given experiment are due by 5 PM on the day the laboratory is to begin.

Patriot e-mail: All students at UT-Tyler have been given Patriot e-mail accounts with addresses of the form:

<user name>@patriots.uttyler.edu

Any e-mail messages sent either individually or to the class as a whole will be sent to Patriot e-mail accounts.

Privacy of e-mail: I may forward e-mail messages of general interest (e.g., questions about a laboratory procedure) to the class. **Please let me know if a message is considered to be private.**

Grading: Each simulation assignment carries 50 points credit. Each results assignment carries 25 points credit. 25 points are given for *Assignment 0 and laboratory policies* if submitted by the due date, 0 points if submitted after the due date.

Grading scale: 90-100– A; 80-89–B; 70-79–C; 60-69 – D; <60 – F. Final scores will be rounded to the nearest integer.

Course and instructor evaluations: Student evaluations of both the course and the instructor at the end of the course are a valuable means of assessment; filling them out is strongly encouraged. Departmental evaluation forms will be presented at the last regularly-scheduled class meeting.

Academic misconduct: Academic misconduct will not be tolerated. Examples of academic misconduct include (but are not limited to) submitting the work of others as one's own (plagiarism) and doing work intended to be submitted by another person. *Copying materials from on-line sources for your laboratory reports without attribution is plagiarism!*

Disability statement: If you have a disability, including a learning disability, for which you request disability support services/accommodation(s), please contact the Disability Support Services office so that the appropriate arrangements may be made. In accordance with federal law, a student requesting disability support services/accommodation(s) must provide appropriate documentation of his/her disability to the Disability Support Services counselor. In order to assure approved services, the first week of class, diagnostic, prognostic, and prescriptive information should be received 30 days prior to the beginning of the semester services are requested. For more information, call or visit the Student Services Center. The telephone number is 566-7079 (TDD 565-5579). Additional information may also be obtained at the following UT Tyler Web address: http://www.uttyler.edu/disabilityservices

Grade Replacement: A student will receive grade forgiveness (grade replacement) only for three course repeats during his/her undergraduate career at UT Tyler. Grade forgiveness means that only the last grade earned is used to compute the grade point average. However, all grades will appear on the student's official transcript. A student must file an intent to receive grade forgiveness with the registrar by the census date (see Schedule of Classes for date) of the semester in which the course will be repeated. Failure to file an intent to use grade forgiveness will result in both the original and repeated grade being used to calculate overall grade point average. If a student attempts to repeat a course but withdraws and receives an automatic "W," the attempt counts against the grade forgiveness limit and the original grade remains. A student may not exercise grade forgiveness for courses taken at UT Tyler and repeated at another college or university, nor may grade forgiveness be used when a course taken elsewhere is repeated at UT Tyler. The grade forgiveness option may not be exercised to remove a grade awarded in a case of academic dishonesty. Once the baccalaureate degree has been awarded by UT Tyler, grade forgiveness may not be used to replace a grade taken before graduation.