The University of Texas at Tyler
Department of Electrical Engineering

Course: EENG 3306: 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), CHEM 1311 (General Chemistry I) and CHEM 1111 (General Chemistry 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, ISBN 9780199339136, 2014).

Additional Material: NI Multisim Software

Course Coordinator: Prabha Sundaravadivel, Assistant Professor

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.

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

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

Course Learning Outcomes[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 learning outcome.*

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

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics [1,2,4,5,6,12].
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors [7,3, 9,11].
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions [13].
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies. [8,10].

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

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:		hours
Engineering Sciences and Design:	3	hours
General Education Component:		hours

Grade Replacement:

If you are repeating this course for a grade replacement, you must file an intent to receive grade forgiveness with the registrar by the 12th day of class. Failure to file an intent to use grade forgiveness will result in both the original and repeated grade being used to calculate your overall grape point average. A student will receive grade forgiveness (grade replacement) for only three (undergraduate student) or two (graduate student) course repeats during his/her career at UT Tyler. (2006-08 Catalog, p. 35)

Prepared By:	David M. Beans	Date:	8 August 2016
Edited By:	Ron J. Pieper		20 August 2018
	Prabha Sundaravadivel		19 August 2019

The University of Texas at Tyler
Department of Electrical Engineering

Course: EENG 3306.001 – Electronic Circuit Analysis I

COURSE OUTLINE

Course Coordinator:	**Dr. Prabha Sundaravadivel** Assistant Professor, Department of Electrical Engineering **Office:** RBN 2015 **Email:** PSundaravadivel@uttyler.edu **Office Hours:** Wednesday 2-5 PM Email and Canvas Discussion Boards.

Class Location/Time: Hybrid Model: Synchronous zoom classes and/or in-person.

Tu Th 9:30 AM- 10:50 AM, RBN 3039

Zoom ID: 91580856060

Password: EENG3306

Grading Policy:

Quizzes	20%	Total - 2
Mid-Term Exam	20 %	October 1, 2020
Homework	10%	Total –3
PBL Activity	10%	October 22, 2020
Final Exam	35%	December 8, 2020
Class Attendance	5%	
Total	**100%**	

Semester Schedule:

Week	Start Date	Topics Covered	Lecture (Tues)	Lecture (Thurs)	Mode of Delivery
1	24-Aug-20	*Introduction, Review of Basics*	Course Introduction	Review: DC electronics	Synchronous Zoom class
2	31-Aug-20	*Amplifiers*	Review: AC electronics	Basic concepts: Introduction to Amplifiers **Homework-1**	Synchronous Zoom class
3	07-Sep -20	*Amplifiers/ Op-Amps*	Amplifier circuit models; Frequency response	loading effects, STC Frequency response, Fourier series, Two-port networks	Synchronous Zoom class

			Application: amplifier types,		
4	14 – Sep - 20	*Op-Amps*	Ideal Op-Amp; inverting configuration; weighted summing amplifier	Noninverting configuration; difference amplifier **Quiz-1**	Synchronous Zoom class
5	21- Sep- 20	*Op-Amps*	Integrators and Differentiators	DC imperfections of Op-Amps	Synchronous Zoom class
6	28- Sep- 20	*Op-Amps*	AC limitations of Op-Amps (Bandwidth of noninverting and inverting amplifier)	**Mid-Term Exam**	Synchronous Zoom class
7	5- Oct- 20	*Semiconductors*	Semiconductors; doping; current transport by drift and diffusion	P-N junction with applied bias	In-person / Synchronous Zoom class
8	12- Oct- 20	*Diodes*	Diode circuit models; zener voltage regulation	Rectifier circuits; peak rectifier **Homework-2**	In-person / Synchronous Zoom class
9	19- Oct- 20	*Diodes / MOSFET*	Limiter, waveshaping, and clamp circuits	**PBL Activity**	In-person / Synchronous Zoom class
10	26- Oct- 20	*MOSFET*	MOSFET structure and physical operation	MOSFET IV Characteristics	In-person / Synchronous Zoom class
11	2- Nov- 20	*MOSFET*	MOSFET circuits at DC, small signal models	MOSFET small-signal models and operation **Homework-3**	In-person / Synchronous Zoom class
12	9- Nov- 20	*BJT*	BJT structural operation	BJT IV characteristics, BJT Circuits at DC	In-person / Synchronous Zoom class
13	16- Nov- 20	*Transistor Amplifiers*	Transistor amplifiers; basic principles	Basic configurations, biasing, Discrete-circuit amplifiers **Quiz-2**	In-person / Synchronous Zoom class
14	23- Nov- 20	Thanksgiving Holiday			

15	30-Nov-20	*Review*	Final Exam review	Synchronous Zoom class
16	7-Dec-20		**Final Exam**	

Mode of Delivery:

Hybrid Model. The semester will begin with synchronous zoom classes. Students are expected to login through zoom to attend the lectures. At the end of each class, the recorded lectures will be posted in Canvas. After Mid-Term Exam, the mode of delivery will be reevaluated. If the student has any concerns or would like to share their feedback on the lectures, email the Instructor anytime.

Flexible Online Office Hours:

This course will have extended office hours. Students can meet with the Instructor during the office hours on Wednesdays (2-5 PM) using the course zoom link. However, if students are not available during the mentioned office hours, they are strongly encouraged to schedule a meeting with the Instructor anytime.

Homework:

There will be a total of 3 homework assignments in the class. This is to keep the students on track with the course content.

PBL Activity:

To encourage problem-based learning (PBL), students will be assigned a relevant problem related to the coursework. The Instructor will show some examples of such problems which can be solved using the students existing knowledge and further research.

Attendance Policy:

Students are expected to attend all scheduled lectures and lab meetings. By signing up for the class it is understood that the student has checked for ANY significant recurring conflicts with lecture and laboratory meeting times (including work, family, or any other commitments). No exceptions can be made for attendance requirements as this will be unfair to the other students. The progressive nature of the class means that perfect attendance is recommended if a good grade is desired. Class participation is graded based on attendance, faculty and graduate assistant observation and involvement in class activities.

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. A plagiarism check will be done all the reports submitted by students. Copied or unoriginal solutions will result in a "0" in that course component. An evidence of a pattern in academic dishonesty will lead to strong university-imposed penalties.

Mid-Term Exam:

The mid-term exam will be conducted during the class meeting time on October 1, 2020 and will have 20% weightage.

Final Exam:

The Final exam will have a 35% weightage to the overall grade. This will be a comprehensive exam and will be conducted on December 8, 2020 during the class meeting time.

How to be Successful in this course:

The main focus of the Instructor is to help students learn the important concepts in electronics and understand its relevance. Some of the ways to be successful in this course are:

- Attend all the lectures during the class meeting time. Though the lectures will be recorded and published in Canvas, attending the live classes will help the students to interact with the Instructor and clarify their questions.
- Follow the deadlines. The course has 3 homework, 2 quizzes, 2 exams and 1 activity for assessment. Each of these have a weightage in the overall grade.
- Avoid plagiarism. In the event of any plagiarism, the particular assignment will not be graded resulting in "0". Its important that you submit original assignments to get credit for your work.
- WE ARE HERE TO HELP. With all the uncertainty for the semester, the Instructors have decided to start the semester with synchronous zoom classes. This mode of delivery will be reevaluated based on student's feedback. The Instructors are doing their best to achieve the Course Learning Outcomes. If you have any questions or concerns related to this course, email the Instructor anytime or clarify the same during class meeting hours or office hours.

Students Rights and Responsibilities
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

Grade Replacement/Forgiveness and Census Date Policies :
Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at http://www.uttyler.edu/registrar. Each semester's Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar.
Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.

The Census Date is the deadline for many forms and enrollment actions that students need to be aware of. These include:

- Submitting Grade Replacement Contracts, Transient Forms, requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit.
- Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date)
- Schedule adjustments (section changes, adding a new class, dropping without a "W" grade)
- Being reinstated or re-enrolled in classes after being dropped for non-payment
- Completing the process for tuition exemptions or waivers through Financial Aid

State-Mandated Course Drop Policy
Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date). Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.

Disability Services
In accordance with federal law, a student requesting accommodation must provide documentation of his/her disability to the Disability Services counselor. If you have a disability, including a learning disability, for which you request an accommodation, please contact the Disability Services office in UC 3150, or call (903) 566-7079.

Student Absence due to Religious Observance
Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second class meeting of the semester.

Student Absence for University-Sponsored Events and Activities
If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.

Social Security and FERPA Statement:
It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically.

Emergency Exits and Evacuation:
Everyone is required to exit the building when a fire alarm goes off. Follow your instructor's directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services.

Happy Learning!