The University of Texas at Tyler
Department of Electrical Engineering

EENG 3305 – Linear Circuit Analysis II (Required)

Syllabus

Catalog Description:

Laplace transform; Transient Circuit Analysis; circuit analysis and design using the Laplace transform; convolution in time domain and frequency domain; transfer functions; frequency response and Bode plots; passive and active filter design (frequency selective circuits); Fourier series; Fourier Transform; two-port circuits; balanced three-phase AC circuits. Three hours of lecture per week.

Prerequisites: EENG 3304, MATH 3305, MATH 3404, COSC 1336

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

Text(s): Alexander, Charles K. and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, Fifth Edition, McGraw-Hill, 2013, ISBN 978-0-07-338057-5

Additional Material: Handouts

Course Coordinator: Premananda Indic, PhD

Topics Covered: (paragraph of topics separated by semicolons)

Laplace Transform; Circuit Analysis and Design using the Laplace Transform; Convolution in Time Domain; Transfer Functions; Frequency Response and Bode Plots; Passive and Active Filter Design (frequency selective circuits); Fourier Series; Fourier Transform; Balanced Three-phase AC Circuits

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 Learning Outcomes[1]: By the end of this course students will be able to:

1. Understand how the Laplace transform is used to solve differential equations for circuit design (1)
2. Design a passive RLC filter (1)
3. Solve a frequency scaling problem in active filter design. (1)
4. Design high-order filters using op-amps. (1)
5. Describe how the Fourier Series can be used to represent periodic signals (2)
6. Demonstrate the use of convolution in time to describe an LTI system. (1)
7. Determine the impulse response and step response in linear circuit. (1)
8. Compute the Fourier Transform for aperiodic signals. (1)
9. Sketch Bode plots for single pole systems by hand. (1)

10. Use modern engineering tools including modeling and simulation software and virtual instruments. (2, 4)
11. Analyze balanced three-phase circuits. (2)
12. Analyze two-port networks. (1)

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

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, 3, 5, 6, 8, 9, 11]
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; [2, 4, 7, 12]
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; [10]
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

[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	hours
Engineering Sciences and Design:	3.0	hours
General Education Component:	0	hours

Prepared By:	Hassan El-Kishky	Date:	August 23, 2007
Updated By:	Seyed Ghorshi	Date:	August 22, 2018 August 24, 2019 May 28, 2020

EENG 3305: Linear Circuits Analysis –II

Fall 2020 Syllabus

Instructor Information:

Premananda Indic, PhD
Department of Electrical Engineering,
The University of Texas at Tyler
Office: RBN 2010,
Phone: 903-566-6208,
email:pindic@uttyler.edu (preferred)

Office Hours: (All appointments are via zoom and prior confirmation is required)

Monday	: 10AM to 11:00AM
Wednesday	: 10AM to 11:00AM
Friday	: 10AM to 11:00AM
Additional Hours	: By appointment

Course Description:

The objective of this course is to study the application of Laplace transform for the analysis and design of linear circuits. The course will focus on time domain as well as frequency domain analysis; convolution; transfer functions; passive and active filter design; Fourier series and Fourier Transform; two-port circuits; balanced three-phase circuits.

The primary student learning objectives are:

1. Understand how the Laplace transform is used to solve differential equations for circuit design
2. Determine the impulse response and step response in linear circuit.
3. Demonstrate the use of convolution in time to describe an LTI system.
4. Describe how the Fourier Series can be used to represent periodic signals
5. Compute the Fourier Transform for aperiodic signals
6. Sketch Bode plots
7. Design a passive RLC filter
8. Solve a frequency scaling problem in active filter design
9. Design high-order filters using op-amps
10. Use modern engineering tools including modeling and simulation software and virtual instruments
11. Analyze balanced three-phase circuits
12. Analyze two-port networks

Recommended Textbook:

Alexander, Charles K. and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, Fifth Edition, McGraw-Hill, 2013, ISBN 978-0-07-338057-5

Evaluation and Grading:

The course grade will be based on the following activities:

1. **Homework Assignments (60%):**
   Homework will be assigned as mentioned in the course outline below. There will be six homework assignments and it should be submitted through canvas using pdf or word format. **No late submissions allowed** **(see Late Assignments and Make-up Policy below)**. Collaboration on homework assignments is strongly encouraged, however expecting a disclaimer statement at the end of your assignments if you have discussed with the students in the class or someone outside. All resources, including materials obtained from internet should be properly acknowledged.

2. **Tests (20%):**
   There will be four tests of duration 1 hour each as given in the outline. There will be a grade replacement policy. For example, if your Test 2 grade is better than Test 1, then Test 1 grade will be replaced with the Test 2. This approach will be followed for other tests. For Test 4, you will get a score of at least an average of three previous tests. Grade replacement policy is applicable to midterm exam. If your final exam score is better than midterm, then midterm grade will be replaced. It is important that you should attend all tests and should score at least 50% in each test or midterm exam to be eligible for grade replacement policy.

3. **Midterm Exam (10%):**
   There will be a midterm exam of duration 1 hour as mentioned in the outline

4. **Final Exam (10%):**
   Final exam as per University Schedule

Grading Scale

Letter Grades	Range
A	90-100
B	80-89
C	70-79
D	60-69
F	59 and below

Late assignments and make-up policy:

Accommodation of the following absences will be ensured.

1. Extra-curricular activities as a representative of UT Tyler (e.g., sponsored sports, band, conference presentations, etc.).
2. Military service (including National Guard, ROTC).
3. Officially mandated court appearances (including jury duty).

In all cases, the person or agency responsible for the event or activity should provide participants with a letter explaining the proposed absence and its duration, including travel times for off-campus events and activities. Students must provide this documentation to instructors **at least two weeks prior** to the activity or event, except when such notice is not possible.

Other Absences Granting requests for accommodating other absences is at the discretion of the instructor. That is, the instructor will review the situation in an effort to provide a reasonable accommodation and arrange for possible make-up when possible to do so, without fundamentally altering a course or creating an undue burden for the instructor or department. Official documentation is required whenever possible and must be provided at the earliest opportunity. This policy is intended primarily for the following situations:

4. Medical excuse.
5. Family emergency.
6. Religious observances and practices. Students who request religious accommodation should do so in writing during the first week of the semester. Students may seek assistance from Dean of Students Office.

Students are encouraged to read the academic honesty policy (Student Standards of Academic Conduct).

Course Outline:

Schedule	Topics	Assignments
Week 1: (August 24)	Introduction to Laplace transform Solving differential equations using Laplace transform	Review Syllabus Read Chapter 15, Page 675-697
Week 2: (August 31)	Transfer Function Impulse response and step response of a system (Time domain analysis)	Read Chapter 16, Page 715-730 HW1 due on 9/9/2020
Week 3: (September 7)	Convolution	Read Chapter 15, Page 697-705 Test 1 on 9/16/20 (9:05AM to 9:35AM)
Week 4: (September 14)	Fourier Series	Read Chapter 17 HW2 due on 9/23/20
Week 5: (September 21)	Fourier Transform	Read Chapter 18 Test 2 on 9/30/20 (9:05AM to 9:35AM)
Week 6: (September 28)	Frequency Domain Analysis Bode Plots	Read Chapter 14, Page 613-629 HW3 due on 10/7/20
Week 7: (October 5)	Review of topics studied in Week 1 through Week 6	
Week 8: (October 12)	Introduction to filters	Midterm on 10/21/20 (9:05AM to 10AM)
Week 9: (October 19)	Passive filter design	Chapter 14, Page 629-642 HW4 due on 10/28/20
Week 10: (October 26)	Active filter design	Chapter 14, Page 642-652 Test 3 on 11/04/20 (9:05AM to 9:35AM)
Week 11: (November 2)	Higher order filters using op-amps Modeling and simulation software in MATLAB	HW5 due on 11/11/20
Week 12: (November 9)	Analysis of balanced three-phase circuits	Chapter 12 Test 4 on 11/15/16 (9:00AM to 9:30AM)
Week 13: (November 16)	Analysis of two-port networks	Chapter 19 HW6 due on 12/02/20
Week 14: (November 30)	Review via zoom	
Week 15: (December 7)	Final Exam	As per university schedule