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 3305-040 Linear Circuits II, Fall 2021

Class Time: 11:15 – **12:10** **MWF**
Location: C204 Houston , **Zoom class**

Instructor: Ron Pieper Associate Professor (Emeritus)
Department of Electrical Engineering,
The University of Texas at Tyler
Email: rpieper@uttyler.edu (preferred)
No office at this time

Revised "office" Hours
Tentative plan after class and by appointment
9:00 to 10:00 AM Thursday (**not first week**)
3PM -4PM Thursday **(not the first week)**
(Sept 16 afternoon have physician appointment_I
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Catalog description for EENG 3305: 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.

Required Text:
Alexander, Charles K. and Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 6th edition or 7fth Edition, McGraw-Hill, , ISBN 978-1-260-22640-9

Prerequisites:
EENG 2101 (MATLAB), EENG 3304 (Linear Circuits I)
Math 3305 (Differential Equations)

Additional Materials
: Instructor's Notes to be placed on Canvas Materials
Instructor's solutions to practice problems
Instructor's recommended practice problems
Other stuff e.g. quiz keys , prior to exams
Software: **MatlaB, Multisim (College licenses for software)**

Tentative Schedule

Topics	Chapter	time
Laplace Transform	**15**	**2-3 weeks**
Includes Convolution , step response etc.		
Fourier Series	**17**	**1.5 week**
**************Midterm 1 55 min**		**Midterm 1**
Fourier Transform	**18**	**1.5 week**
Passive and Active Circuit design	**14**	**2.0 weeks**
Includes Bode Plots		
**************Midterm 2 55 min**		**Midterm 2**
Two Port Networks	**19**	**2.0 Weeks**
Three phase circuits	**12**	**2.0 Weeks**
**************************Final 120 min**		

Tentative Grading Scheme:

assignments /quiz	10%
Matlab® MultiSim simulation exercises	**10%**
Midterm 1	20%
Midterm 2	20%
Final Exam (not comprehensive *)	**40%**

Re "Quiz" Made available, through canvas, typical intended for 10 min
Upload your solution through canvas.
Based on HW practice problems which have solutions posted
Same format for exams. Decision pending

FYI General Information regarding access to College of Engineering software licenses is available. The HEC Students can get assistance on procedure to access various engineering software by contacting Mr. Will Alequin who is on the staff down in Houston. His email: walequin@uttyler.edu

Comment * :final exam, For most part not comprehensive with two exceptions.

a) **If a specific topic from material that are appropriate for Miderm1 or Midterm 2 were not yet tested the solution is to include that topic as candidate for final. Note advance warning given in the final exam guide.**
b) **Occasionally if the performance on problem type from one of the Midterms is particularly low that problem type can potentially be retested on the final exam. Again advance warning given in the final exam guide.**

Background on grading and study habits

Typical ranges for grades in this class run as follows, 91-100% A, 80-90% B, 65% 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 can not always be easily quantified due to differences between students. If after reviewing notes, book and HWs quiz keys if you are having trouble digesting the concept or procedure involved you are highly encouraged to Zoom into an office hour or make an appointment with me. FYI you are entitled to know that questions during the zoom lecture will be encouraged.

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

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.

FYI: If repeating class the following may be of interest to you

➢ The **Grade Replacement policy** is subject to the provisions of the Repeating Courses policy (see reverse). ➢ Dean approval is required for repeats taken as ...

Grade Replacement | Repeating Courses | UT Tyler Registrar
www.uttyler.edu › registrar › policies › repeating-courses-grade-replacement
FYI in the past there was a limited window of time to apply if anticipate needing.

Accommodation Testing , information
Student Accessibility and Resources, Ph: 903.566.7079, saroffice@uttyler.edu

Regarding HW. practice problems. If you read text in advance that will help but assuming you are following the notes presented that my not always be required to make progress on the problems. However, you are strongly encouraged to keep a paper note book to record you efforts on the practice problems. The recommended procedure would be to go as far with the problem as you can go without checking solutions posted. Then look at the solution posted if you get stuck and to check your answer. Note this approach recognizes that a circuit problem may have more than one solution methodology that works.

FYI simply looking at the solutions and following the logic prior to quiz or exam is better than not looking at all but experience shows it leads to lot more mistakes than the pencil and paper procedure recommended above.
Reading Assignment 1
Read sections 15-2 and 15-3
FYI sections 15-4 and 15-5 next reading assignment

Practice problems (May be amended with a few additional problems on or before solutions posted) Current List

Chapter 15 HW 1 (unless noted otherwise problem is at back of chapter 15)
Use integral definition of Laplace Transform problems below (2), (3), (4)

1) Review Questions 15.1 … to 15.6 Answers posted in text
2) 15.1a $\cosh(at)$
3) 15.2a $\cos(\omega t+\theta)$ Note answer can be checked see Laplace table
4) $f(t)=Ae^{-at}u(t)$ find Laplace Transform for
(see practice problem sec 15.2)

Use Laplace Transform Tables as needed for following and the Review Questions (1) listed above.

5) 15.3a 15.3 e
6) 15.5c, 15,5d 15.5d 15.5f 15.5g (please note original 15.5 a replaced with 15.5 c)
7) 15.7a 15.7 c