ITT Technical Institute

ET445

Advanced Circuit Analysis I

Onsite Course

SYLLABUS

Credit hours: 4

Contact/Instructional hours: 50 (30 Theory Hours, 20 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisites: ET285 Digital Electronics II or equivalent, TM420 Technical Calculus

Course Description:

This course of study concentrates on the analysis of analog circuits. Some methods utilized are transient and impulse analysis of circuit response, using such techniques as differential equations, Laplace transforms and computer-aided circuit simulation programs. Laboratory includes applications to support the analysis of analog circuits.

STUDENT SYLLABUS: ADVANCED CIRCUIT ANALYSIS I

Instructor: ____________________________
Office hours: ____________________________
Class hours: ____________________________

Note:
Selected lab examples and exercises are placed in the CD files accompanying the textbook. They are carefully selected to study the various concepts covered in each chapter.

Major Instructional Areas

- Ohm's Law and Resistive Power
- Kirchhoff's Laws
- Source Transformations
- Thevenin's and Norton's Theorems
- Circuit Analysis with Dependent Sources
- Graphical Significance of Differentiation
- Graphical Significance of Integration
- Combinations of Capacitance and Inductance
- Exponential Function
- First-Order Circuits
- Inverse Transforms of First-Order Poles
- Inverse Transforms of Multiple-Order Poles
- Transform Impedances
- Second-Order Circuits

Course Objectives

Upon successful completion of this course, the student should be able to:

1. Explain Ohm's law and apply it in various situations.
2. Explain Kirchhoff's voltage law and apply it in different scenarios.
3. State Kirchhoff's current law and apply it in various ways.
4. Determine the current, voltages, and power in a single-loop and single node-pair circuit.
5. Determine the Thevenin and Norton equivalent circuits for a given circuit.
6. Apply graphical differentiation to piecewise linear continuous functions.
7. Explain and apply the instantaneous voltage-current relationships for a capacitance and an inductance.
8. Explain and apply the voltage-current relationships for mutual inductance.
9. Determine equivalent circuits and predict the voltages and currents in a circuit immediately after an excitation is first applied.
10. State the mathematical properties for and sketch the exponential function.
11. Determine the time required for an exponential response to reach a specified level.
12. Define and explain the purposes of the Laplace transform as applied to circuit analysis.
13. State the forms for several of the most common Laplace transform operations.
14. Determine the Laplace transform of a given time function.
15. Determine the inverse transform of a given s-domain function.
16. Define transform impedance and admittance and determine these quantities for a given element value.
17. Determine the complete s-domain model for a given circuit.
18. Apply various circuit analysis methods to s-domain circuit models.
19. Apply Laplace transform methods to obtain complete solutions for second-order circuits.

Student Textbook Package

- Stanley, William D. 2006. *Network Analysis with Applications, Custom 2nd Edition. Boston, MA: Pearson Custom Publishing.*
- Snyder, Gary. 2011. *Multisim Circuit Files for Advanced Circuit Analysis I and II CD, Custom 1st Edition. Boston, MA: Pearson Custom Publishing.*
- National Instruments. 2011. *Multisim Guide, Custom 1st Edition. Boston, MA: Pearson Custom Publishing.*

Course Outline

Unit	Topic (Lecture Period)	Chapte r	Lab and Other Coverage
1	Basic Circuit Laws	1	Lab, Homework Exercises
2	Circuit Analysis Methods	2	Lab, Homework Exercises
3	Circuit Analysis Methods Part II	2	Lab, Homework Exercises
4	Capacitive and Inductive Transients and Equivalent Circuits	3	Lab, Homework Exercises Exam 1: Units 1-3
5	Capacitive and Inductive Transients and Equivalent Circuits Part II	3	Lab, Homework Exercises
6	Initial, Final, and First-Order Circuits	4	Lab, Homework Exercises Exam 2: Units 4-5
7	Initial, Final, and First-Order Circuits Part II	4	Lab, Homework Exercises
8	Laplace Transforms	5	Lab, Homework Exercises
9	Circuit Analysis with Laplace Transforms	6	Lab, Homework Exercises Exam 3: Units 6-8
10	Circuit Analysis with Laplace Transforms Part II	6	Lab, Homework Exercises
11	Review and Final Examination		The final exam will be based on the content covered in chapters 1-6.

Evaluation Criteria and Grade Weights

- Homework 25%
- Unit Exams 30%
- Labs 25%
- Final Exam 20%

Final grades will be calculated from the percentages earned in class as follows:

A	90 - 100%	4.0
B+	85 - 89%	3.5
B	80 - 84%	3.0
C+	75 - 79%	2.5
C	70 - 74%	2.0
D+	65 - 69%	1.5
D	60 - 64%	1.0
F	<60%	0.0