Dordt College Engineering Department
EGR 220, Linear Circuits and Electronics

Spring, 2004

2001-02 Catalog Data:

EGR 220 Linear Circuits and Electronics (4 credit hours) (Spring)
Assumes a prerequisite knowledge of DC electrical circuits including the definitions of electrical quantities, circuit elements (sources, resistors, capacitors, inductors), understanding of Kirchhoff's laws and basic concepts in AC circuits such as frequency and phase. Topics in this course include general linear circuit analysis including Norton's and Thevenin's theorems, superposition, nodal and loop analysis, natural and forced responses in RLC circuits, and sinusoidal steady state analysis. The course also gives introductions to operational amplifier circuits, single stage BJT and FET transistor circuits and steady-state balanced 3-phase power calculations. Prerequisite: Mathematics 113, and one of Engineering 104 or Physics 116 or 201 [Cross listed: Physics 206]

Textbook: Dorf and Svoboda, *Introduction to Electric Circuits*, 6th ed., Wiley, 2003.

References: Horowitz and Hill, *The Art of Electronics*, 3rd ed., Cambridge University Press.
Edminister, Joseph, *Schaum's Outlines—Electric Circuits*

Instructor: Douglas De Boer

Web Page The course web page is frequently updated and used to communicate all assignments.

Goals: *Creational Structure*: Students will understand electrical theory to the extent that they will be able to apply systematic techniques of linear circuit analysis as described in the college catalog. This means that students will be able to represent a circuit via a well labeled schematic drawing, derive appropriate equations from the schematic, and know how to solve those equations. This will be the main goal of this course. Other goals are listed below.

Prerequisites by topic: Calculus including techniques of integration, sequences, and series. DC electrical circuits including the definitions of electrical quantities, circuit elements (sources, resistors, capacitors, inductors), understanding of Kirchhoff's laws. Basic concepts in AC circuits such as frequency and phase.

Laboratory: The laboratory session meets for 3-hours each week. The first six weeks are used to cover basic instrumentation including measurement uncertainties and loading effects. Three of the first six weeks are devoted to a design project. Two weeks are devoted to transients in first and second-order circuits. Six weeks are devoted to miscellaneous topics: operational amplifiers, circuit simulation, diodes and rectifiers, single transistor circuits, etc..

Computer use: Orcad-Pspice is used for circuit simulation. Students are encouraged (but not required) to use programs such as Mathcad or Matlab for homework solutions when appropriate.

Means of Evaluation: Homework (10%), Two Tests (25% each), One Formal Laboratory Report (8 %), One Research paper (7%), Final Exam (25%)

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EGR 220, Linear Circuits and Electronics, Course Outline
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Dates			Class	Laboratory (Wed.)
	1/14	1/16	Introduction, basic definitions, circuit elements *Text: Chapters 1-2*	1.) Safety and introduction to the instrumentation
1/19	1/21	1/23	Single loop and single node-pair circuits *Text: Chapter 3*	2.) Uncertainty and Tolerances
1/26	1/28	1/30	Nodal and mesh analysis *Text: Chapter 4 except sections 4-3, 4-6*	3.) Loading Effects
2/02	2/04	2/06	Complete Nodal and Mesh analysis including handling of supernodes and supermeshes. *Text: Chapter 4, emphasis on sections 4-4, 4-5, 4-7*	4.) Battery tester project (1st of 3 weeks)
2/09	2/11	2/13	Circuit Theorems: Superposition, Thevenin's, *Text: Chapter 5 through section 5-5*	Project (2nd of 3 weeks)
2/16	2/18	2/20	Circuit Theorems: Norton's, Maximum Power Transfer *Text: Chapter 5, section 5-6 to the end.*	Project (3rd of 3 weeks)
2/23	2/25	2/27	Operational amplifiers. *Text: Chapter 6* Test on Wednesday, covers through Section 5-5 of Chapter 5	5.) Introduction to the oscilloscope and signal generator
Wed, 2/25 Test				
3/01	3/03	3/05	Capacitors and inductors. *Text: Chapter 7*	6.) Introduction to circuit simulation
3/08 (no class Friday, Spring Break)	3/10		First order circuits. *Text Chapter 8*	7.) Op amps
(Week of 3/17 no classes all week)			No class, spring break	No lab, spring break
(no class Monday, Spring Break)	3/24	3/26	Second order circuits. *Text Chapter 9*	8.) RL and RC circuits, step and pulse responses
3/29	3/31	4/2	Diodes and Transistors *Handout*	9.) RLC circuits
Wed, 3/31 Test				
4/05	4/07	4/09	Sinusoidal Steady State Test on Wednesday, covers through Chapter 9	10.) Diodes and Rectifiers
4/12	4/14	4/16	Sinusoidal steady-state analysis. *Text Chapter 10*	10.) Sinusoidal Steady-State and Phasors
4/19	4/21	4/23	AC steady-state power, transformers, diodes, rectifier circuits. *Text Chapter 11.*	11.) Transistors
4/26	4/28	4/30	Three-Phase circuits. *Text Chapter 12.*	12.) Common Emitter Amplifier
Tuesday, 5/4			Final exam, 8:00 – 10:00 a.m.	

Note: Schedule may vary by up to two week in order to accommodate the dynamics of this particular cohort of students.