Dordt College
EGR 220, PHYS 206, Linear Circuits and Electronics

Fall 2014 Syllabus

2013-14 Catalog Data:	**EGR 220 Linear Circuits and Electronics (4 credit hours)** (Fall) **PHYS 206 Linear Circuits and Electronics (4 credit hours)** (Fall) 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. The lab includes a formal design project. Prerequisite: Engineering 117 or Physics 202 or Physics 216. Corequisite: Mathematics 204. [Cross listed: Physics 206, Engineering 220]
Prerequisites by topic:	Calculus including techniques of integration, sequences, and series. Basics of DC circuits.
Textbook:	Alexander and Sadiku, *Fundamentals of Electric Circuits*, 4th ed., McGraw-Hill, 2009 (ISBN 978-0-07-352955-4).
References:	Horowitz and Hill, *The Art of Electronics*, 3rd ed., Cambridge University Press. Edminister, Joseph, *Schaum's Outlines—Electric Circuits*
Instructor:	Douglas De Boer
Course Objectives and Outcomes:	*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. Additional goals are listed below. *Creational Development*: Students will be able to recount several of the important historical contributions in the development of the modern techniques of circuit analysis. This includes knowledge of the names of some of the persons who made these important contributions. *Contemporary Response*: Students will write on how the technical subjects of this course have been applied in culture. Students will also understand the career pathways in electrical engineering such as in power systems engineering, communication systems engineering, computer engineering, etc. *Religious Orientation*: Students will write on the worldview or religious motivations of one of the key contributors to the field of linear circuit analysis or a related field.
Laboratory:	The laboratory meets for three hours each week. Three weeks are used to cover basic instrumentation, measurement uncertainties, and loading effects. One week is provided to introduce circuit simulation (SPICE-based). A design project takes three weeks. Transients in first and second-order circuits take two weeks. Phasors and the sinusoidal steady state take one week. Topics in electronics: operational amplifiers, diodes and rectifiers, and single transistor circuits take five weeks.
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. Most assignments and handouts are available via Dordt's course management system, https://instructure.dordt.edu (also known as "Canvas@Dordt" or just plain, "Canvas.").
Academic Integrity:	Students must do their own work. Students may discuss homework but may not show papers to each other outside of peer grading. This course is subject to the policies on academic integrity as published in the Student Handbook and the "Canvas@Dordt" web site for this course.
Accommodations:	Students who require assistance or accommodations based on the impact of a documented disability must contact Marliss Van Der Zwaag, the Coordinator of Services for Students with Disabilities to access accommodations. Telephone 722-6490, e-mail Marliss.VanDerZwaag@dordt.edu
Means of Evaluation:	Homework (10%), Two Tests (25% each), One Formal Laboratory Report (10 %), Lab quizzes (5%), Final Exam (25%). Absences, tardiness and late assignments will be handled on a case-by-case basis. Your course grade will be reduced if a bad pattern emerges.

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Fall 2014 Syllabus, Course Outline

Dates			Class	Laboratory (Mon, Tu.)
	8/27	8/29	Basics—mostly review of EGR 117 *Text Chapter 1.*	(no lab this week)
9/01	9/03	9/05	More Basics New: Meters, Dependent Sources, Switches, *Text: Chapter 2*	1.) Safety and introduction to the instrumentation
9/8	9/10	9/12	Methods of Circuit Analysis: Review of nodal and mesh analysis. New content includes supernodes and supermeshes. *Text Chapter 3.*	2.) Uncertainty, Tolerances, and Loading Effects
9/15	9/17	9/19	Circuit Theorems: Superposition, Source Transformations, Thevenin's, *Text: Chapter 4through Section 4.5*	3.) Introduction to the oscilloscope and signal generator
9/22	9/24	9/26	Circuit Theorems: Norton's, Maximum Power Transfer *Text: Chapter 4, Section 4.5 to the end of Chapter 4*	4.) Introduction to circuit simulation
9/29	10/01		Ideal Operational amplifiers. *Text: Chapter 5 to the end of Section 5.3* **Test on Wednesday covers through Chapter 4**	5.) Project (1st of 3 weeks)
Wed, 10/01 Test (no class Friday, 10/03)				
10/6	10/8	10/10	Operational amplifiers. *Text: Chapter 5*	Project (2nd of 3 weeks)
10/13	10/15	10/17	Capacitors and inductors. *Text: Chapter 6 through Section 6.3.*	Project (3rd of 3 weeks)
10/20	10/22	10/24	First order circuits. *Text Chapter 7*	6.) Op amps
10/27	10/29	10/31	Second order circuits. *Text Chapter 8*	7.) RL and RC circuits, step and pulse responses
11/03	11/05	11/07	Sinusoids and Phasors, *Text Chapter 9* **Test on Wednesday covers through Chapter 8**	8.) RLC circuits
Wed, 11/05 Test				
11/10	11/12	11/14	Sinusoidal Steady-State Analysis, *Text Chapter 10*	9.) Diodes and Rectifiers
11/17	11/19	11/21	Introduction to AC steady-state power, *Text Chapter 11.*	10.) Sinusoidal Steady-State and Phasors
11/24 (no class 11/26, 11/28)			AC steady-state power, transformers, diodes, rectifier circuits. *Text Chapter 11.*	11.) Transistors
	12/3	12/5	Three-Phase circuits. *Text Chapter 12.*	12.) Common Emitter Amplifier
(no class 12/1)				
12/8	12/10		Transformers. *Text Chapter 13.*	(no lab this week)
(no class Friday, 12/12)				
Wednesday, 12/17			Final exam, 10:30 a.m. – 12:30 p.m.	

Note: Schedule may vary by up to two weeks in order to accommodate the dynamics of this particular cohort of students. The lab schedule is entirely tentative.