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

Fall 2012 Syllabus

2011-12 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: one of Engineering 104 or Physics 116 or 202. Corequisite: Mathematics 204. [Cross listed: Physics 206, Engineering 220]
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.
Prerequisites by topic:	Calculus including techniques of integration, sequences, and series. Basics of DC circuits.
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. Most assignments and handouts are available via Dordt's course management system, http://courses.dordt.edu
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 College's policies on academic integrity. http://www.dordt.edu/campus_life/student_handbook/general_information.shtml#academic_dishonesty. See also the homework standards posted on the course web page.
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 (8 %), One Research paper (7%), Final Exam (25%)

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Fall 2012 Syllabus, Course Outline

Dates			Class	Laboratory (Mon, Tu.)
	8/29	8/31	Introduction to Electrical Engineering, Sections 1–5 Charge, Current, Voltage, SI Units	(no lab this week)
9/03	9/05	9/07	Introduction to Electrical Engineering, Sections 6–13 Resistors, AC Circuits, Passive Sign Convention, History of Electrical Engineering, Def'n Node, Loop	1.) Safety and introduction to the instrumentation
9/10	9/12	9/14	Introduction to Electrical Engineering, Sections 14–16 Single loop, KVL, Single Node-Pair, KCL, Mesh	2.) Uncertainty, Tolerances, and Loading Effects
9/17	9/19	9/21/	Meters, Dependent Sources, Switches, *Text: Chapter 2*	3.) Introduction to the oscilloscope and signal generator
9/24	9/26	9/28	Nodal and mesh analysis including handling of supernodes and supermeshes *Text: Chapter 3*	4.) Introduction to circuit simulation
10/01	10/03		Circuit Theorems: Superposition, Source Transformations, Thevenin's, *Text: Chapter 4through Section 4.5*	5.) Project (1st of 3 weeks)
Wed, 10/03 Test (no class Friday, 10/05)				
10/08	10/10	10/12	Circuit Theorems: Norton's, Maximum Power Transfer *Text: Chapter 4, section 4.6 to the end.*	Project (2nd of 3 weeks)
10/15	10/17	10/19	Operational amplifiers. *Text: Chapter 5* Test on Wednesday	Project (3rd of 3 weeks)
10/22	10/24	10/26	Capacitors and inductors. *Text: Chapter 6 through Section 6.3.*	6.) Op amps
10/29	10/31	11/02	First order circuits. *Text Chapter 7*	7.) RL and RC circuits, step and pulse responses
11/05	11/07	11/09	Second order circuits. *Text Chapter 8*	8.) RLC circuits
Wed, 11/07 Test				
11/12	11/14	11/16	Sinusoidal Steady State, *Text Chapter 9* Test on Wednesday	9.) Diodes and Rectifiers
11/19 (no class 11/21, 11/23)			Sinusoidal Steady-State Analysis, *Text Chapter 10*	10.) Sinusoidal Steady-State and Phasors
	11/28	11/30	Introduction to AC steady-state power, *Text Chapter 11.*	11.) Transistors
(no class Monday 11/26)				
12/03	12/205	12/07	AC steady-state power, transformers, diodes, rectifier circuits. *Text Chapter 11.*	12.) Common Emitter Amplifier
12/10	12/11		Three-Phase circuits. *Text Chapter 12.*	(no lab this week)
(no class Fri., 12/14)				
Wednesday, 12/19			Final exam, Monday, 8:00 a.m. – 10:00 a.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.