Dordt College Engineering Department
EGR 360, Introduction to Power System Analysis

Fall 2011 Syllabus

2011-12 Catalog Data:

EGR 360 Introduction to Power System Analysis (4 credit hours) (Fall, Odd)

An introduction to the design, planning and operation of electric power utilities, including principles of economic dispatch and politics which impact design and operation strategies. Topics include power transmission lines, transformers, generators, system modeling, load flow analysis, faults, and system stability. Prerequisites: Engineering 220; Mathematics 201.

Required Textbooks:

Ned Mohan, *First Course On Power Systems, Year 2006 Edition*, MNPRE, Minneapolis MN, 2006. ISBN 0-9715292-7-2 (Main textbook)

One of. . .
Dorf, Richard C, and James A Svoboda, *Introduction to Electric Circuits*, 6th Edition, Wiley, 2004. ISBN 0-471-44795-1 (covering Chapters 11 and 12 on AC power)
or Alexander and Sadiku, *Fundamentals of Electric Circuits*, 4th ed., McGraw-Hill, 2009 ISBN 978-0-07-352955-4. (covering Chapters 11 and 12 on AC power)

References:

Fred I. Denny and David E. Dismukes, *Power system operations and electricity markets*, CRC Press, 2002. ISBN 0-84-930813-5

Olle I. Elgerd, *Electric Energy Systems Theory, An Introduction*, 2nd Edition, McGraw-Hill, 1982. ISBN 0-07-019230-8

John J. Grainger and William D. Stevenson, *Power System Analysis*, McGraw Hill, 1994. ISBN 0-07-061293-5

Hadi Saadat, *Power System Analysis*, 2nd Edition, McGraw Hill, 2002. MHID 0-07-284869-4, ISBN 978-0-07-284796-3

Instructor:

Douglas De Boer, Professor of Engineering, ddeboer@dordt.edu

Course Objectives and Outcomes:

Creational Structure: Students will be able to analyse typical power systems circuits containing perhaps a half-dozen busses. The result of such an analysis will typically be the power flow (real and reactive) through a transmission line, voltage and current levels, and required ratings for equipment. These analyses will emphasize balanced three-phase systems, load flow, and economic dispatch. In order to do such an analysis the students will have to know the basic laws of nature for electric power systems.

Creational Development and *Contemporary Response*:, Students will write a research paper organized around a thesis statement on a topic related to the regulation and/or related politics of power systems operations or a technical aspect of the planning for, design of, or operation of power systems.

Prerequisites by topic:

1.) Linear Circuit Analysis
2.) Laplace Transforms
3.) Differential Equations

Computer use:

The primary software used for this course is the Evaluation/Education version of the Power World Simulator from Power World Corporation and Matlab with the Power Systems Toolbox that accompanies the textbook. Students are encouraged (but not required) to use programs such as Mathcad or Matlab for homework solutions when appropriate.

Means of Evaluation:

Homework (14%), Two Tests (23% each), Computer Project (6 %),
One Research paper (9%), Final Exam (25%)

Dordt College Engineering Department
EGR 360, Introduction to Power System Analysis

Fall 2011 Syllabus

Dates				Class
				Part I Introduction,
	8/23	8/25	8/26	Overview of the U.S. power grid and its management., *Mohan's Text: Chapter 1* Review of Phasors, *Alexander & Sakiku's Text—Ch. 9 Sec. 1-5* or *Dorf & Svoboda's Text: Ch. 10 Sec. 1-8, 12*
				Part II Basics
8/29	8/30	9/01	9/02	AC Steady State Power, *Alexander & Sakiku's Text—Ch. 11 Sec. 2, 4, 6* or *Dorf & Svoboda's Text: Ch. 11 Sec. 1-5*
9/05	9/06	9/08	9/09	AC Steady State Power, *Alexander & Sakiku's Text—Ch. 11 Sec. 3, 5, 7, 8* or *Dorf & Svoboda's Text: Chapter 11 Sections 6 – 8*
9/12	9/13	9/15	9/16	AC Steady State Power, *Mohan's Text: Chapter 2 Sections 1 – 3*
9/19	9/20	9/22	9/23	Three-Phase Power, *Alexander & Sakiku's Text—Ch. 12* or *Dorf & Svoboda's Text: Chapter 12*
9/26	9/27	9/29	9/30	Three-Phase Power, One-Line Diagrams, Per-Unit Measures, Per Phase Analysis, *Mohan's Text: Chapter 2 Sections 4 – 8*
				Part III Elements of Power Systems
10/03	10/04			The Environment and Prime Sources of Energy *Mohan's Text: Chapter 3* (no class 10/6, 10/7) **Tu, 10/04 Test**
10/10	10/11	10/13	10/14	Transmission Lines *Mohan's Text: Chapter 4*
10/17	10/18	10/20	10/21	Transformers, *Mohan's Text: Chapter 6 and Alexander & Sakiku's Text—Ch. 13* or *Dorf & Svoboda's Text: Ch. 11 Sec. 9, 10*
10/24	10/25	10/27	10/28	High Voltage DC transmission *Mohan's Text: Chapter 7*
10/31	11/01	11/03	11/04	Synchronous Generators *Mohan's Text: Chapter 9*
				Part IV Operation and Control of Power Systems
11/07	11/08	11/10	11/11	Power Flow Analysis Mohan*'s Text: Chapter 5*
11/14	11/15	11/17	11/18	Voltage Regulation and Stability *Mohan's Text: Chapter 10* **Tu, 11/15 Test**
11/21	11/22			Voltage Regulation and Stability *Mohan's Text: Chapter 10* (no class 11/24, 11/25)
	11/29	12/01	12/02	Optimal Dispatch Mohan*'s Text: Chapter 12* (no class 11/28)
12/05	12/06	12/08		Stability of Power Systems and Protection from Faults *Mohan's Text: Portions of Chapters 11, 13 as time allows* (no class Fri., 12/09)
Wednesday, 12/14				Final exam, 3:30 – 5:30 p.m.

Note: Schedule may vary by up to a month in order to accommodate the new 4-credit hour format of this course and best adapt it to our needs.