

Dordt College Engineering Department

EGR 360, Introduction to Power System Analysis

Fall 2007 Syllabus

2007-08 Catalog Data:	EGR 360 Introduction to Power System Analysis (3 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 221; Mathematics 201, 204
Required Textbooks:	Hadi Saadat, <i>Power System Analysis</i> , 2 nd Edition, McGraw Hill, 2002. MHID 0-07-284869-4, ISBN 978-0-07-284796-3 (Main textbook) Dorf, Richard C, and James A Svoboda, <i>Introduction to Electric Circuits</i> , 6th Edition, Wiley, 2004. ISBN 0-471-44795-1 (Chapters 11 and 12 on AC power)
References:	Fred I. Denny and David E. Dismukes, <i>Power system operations and electricity markets</i> , CRC Press, 2002. ISBN 0-84-930813-5 Olle I. Elgerd, <i>Electric Energy Systems Theory, An Introduction</i> , 2nd Edition, McGraw-Hill, 1982. ISBN 0-07-019230-8 John J. Grainger and William D. Stevenson, <i>Power System Analysis</i> , McGraw Hill, 1994. ISBN 0-07-061293-5 Ned Mohan, <i>First Course On Power Systems, Year 2006 Edition</i> , MNPRE, Minneapolis MN, 2006. ISBN 0-9715292-7-2
Instructor:	Douglas De Boer, Professor of Engineering, ddeboer@dordt.edu
Course Objectives and Outcomes:	<i>Creational Structure:</i> 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. <i>Creational Development and Contemporary Response:</i> , 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 and Fourier 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%)

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Dates			Class
8/29	8/31		Part I Introduction , Overview of the U.S. power grid and its management. <i>Saadat's Text: Chapters 1</i>
			Part II Basics
9/03	9/05	9/07	AC Steady State Power <i>Dorf & Svoboda's Text: Chapter 11 Sections 1 – 5</i>
9/10	9/12	9/14	AC Steady State Power <i>Dorf & Svoboda's Text: Chapter 11 Sections 6 – 11</i>
9/17	9/19	9/21	AC Steady State Power <i>Saadat's Text: Chapter 2 Sections 1 – 6</i>
9/24	9/26	9/28	Three-Phase Power <i>Dorf & Svoboda's Text: Chapter 12</i>
10/01	10/03		Three-Phase Power
(no class Friday, 10/05)			<i>Saadat's Text: Chapter 2 Sections 7 – 12</i>
			Part III Elements of Power Systems
10/08	10/10	10/12)	Generators
Wed, 10/10 Test			<i>Saadat's Text: Chapter 3, Sections 1 – 4</i>
10/15	10/17	10/19	Transformers
			<i>Saadat's Text: Chapter 3, Sections 5 – 12</i>
10/22	10/24	10/26	Per Unit Measure and One-Line Diagrams
			<i>Saadat's Text: Chapter 3, Sections 13 – 14</i>
10/29	10/31	11/02	Transmission Line Parameters
			<i>Saadat's Text: Chapter 4</i>
11/05	11/07	11/08	Transmission Line Models
			<i>Saadat's Text: Chapter 5</i>
			Part IV Operation and Control of Power Systems
11/12	11/14	11/16	Power Flow Analysis
Wed, 11/14 Test			<i>Saadat's Text: Chapter 6 Sections 1 – 6</i>
11/19			Power Flow Analysis
(no class 11/21, 11/23)			<i>Saadat's Text: Chapter 6 Sections 7 – 10</i>
	11/28	11/30	Optimal Dispatch of Generation
(no class Mon., 11/26)			<i>Saadat's Text: Chapter 7 Sections 1 – 3</i>
12/03	12/05	12/07	Optimal Dispatch of Generation
			<i>Saadat's Text: Chapter 7 Sections 4 – 7</i>
12/10	12/12		Transients and Faults
(no class Fri., 12/14)			<i>Saadat's Text: Selected parts of Chapters 8 and 9</i>
Wednesday, 12/19			Final exam, 8:00 – 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.