ECE 320: Energy Systems I

Spring 2024

DESCRIPTION Single-phase AC measurements, transformer parameters, transformer performance, rotating DC machines, DC-DC PE converters.

OBJECTIVES

1. Analyze single-phase AC systems.
2. Learn to take and process AC and DC measurements.
3. Learn transformer parameters and performance.
4. Learn to analyze DC machines.
5. Introduce power electronics

PREREQUISITES ECE 212, PHYS 212, PHYS 212L. Co-req: ECE 321

CLASS TIME 1:30 pm-2:20 pm MWF, JEB 221

INSTRUCTORS Yacine Chakhchoukh

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OFFICE HOURS M, W: 3:30-4:30 pm
or anytime my door is open

COURSE WEB SITE https://webpages.uidaho.edu/ece/ee/power/ECE320/

TEXT

1. S.J. Chapman, *Electric Machinery Fundamentals*, *Fifth Edition*. McGraw-Hill 2012
2. Please use the textbook from your circuits course
3. Daniel W. Hart, Introduction to Power Electronics, ISBN 978-0073380674 (2010 edition)

REFERENCES

1. A.E. Fitzgerald, C. Kingsley, and S.D. Umans, *Electric Machinery*, *Sixth Edition*. McGraw-Hill 2002. (or other editions are fine as well).
2. M. El-Hawary, *Principles of Electric Machines with Power Electronic Applications.* IEEE PRESS, 2002. **Note:** this book is available free to registered University of Idaho students through the UI library by going to http://ieeexplore.ieee.org/ from a University of Idaho IP address.

SOFTWARE

- It is recommended (but not required) that you use MathCAD for assignments and projects during this course.

GRADING:

Item	Approx. Session	Approx. Session	
Exam 1	20%	14	A: 90-100
Exam 2	25%	30	B: 80-89
Exam 3	25%	40	C: 70-79
Homework	10%		D: 60-70
Final Exam or project	20%		F: < 60

COURSE OUTLINE

Lecture Topic	*Chapter*
Introduction	
Review of Single Phase AC Circuits	Circuits Text
1. Circuit analysis, phasors	Circuits Text
2. Instantaneous and average power	Circuits Text
3. Complex power, reactive power	Circuits Text
4. Power calculation methods	Circuits Text
Transformers	
1. Ideal Transformers	Chapman Chap. 2
2. Non-ideal transformers	Chapman Chap. 2
3. Per Unit Analysis	Chapman Chap. 2
4. Magnetic Circuits and Circuit Analogs	Chapman Chap. 2
5. Electromechanical Analogs	Notes
Exam 1	Approx. L14
DC Machines	
1. Introduction to DC Machines	Chapman, Chap. 7
2. Linear DC Motors	Chapman, Chap. 7
3. Rotating DC motors	Chapman, Chap. 8
Exam 2	Approx. L30
Introduction to Power Electronics	
1. Fundamentals of Power Electronics	Hart, Chapter 6
2. DC/DC converters: Buck	Hart, Chapter 6
3. DC/DC converters: Boost	Hart, Chapter 6
4. DC/DC converters: Buck-Boost	Hart, Chapter 6
Exam 3	Approx. L40
1. Industrial and Commercial Distribution Systems	
2. Household wiring	

1. Some exams may be given as “take homes”
2. Labs for EO students will use simulation software, which will be discussed in class.

LECTURE DATES:

Monday Date	Monday	Wednesday	Friday
January 8	X	1	2
15	H	3	4
22	5	6	7
29	8	9	10
February 5	11	12	13
12	H	14	15
19	16	17	18
26	19	20	21
March 4	22	23	24
11	25	26	27
18	H	H	H
25	28	29	30
April 1	31	32	33
08	34	35	36
15	37	38	39
22	40	41	42
29	43	44	45

Final Exam: Probably take home

GENERAL GUIDELINES:

On-Campus Students:

1. Assignments handed in after the due date will be worth a maximum of 50%. However, we will allow extensions if you consult with us in advance and if you have a major schedule conflict.
2. Feel free to contact me by phone or e-mail if you have questions.
3. TA for ECE 321 (and ECE 320): Sara Gergen and Zachary Deluca.
4. Library Resources: As a UI student, you not only have access to print and electronic resources from the university's library, such as access to IEEEXplore, but you also have access to personalized assistance from the librarians. If you have assignments or research questions and aren't sure how to make the most of library resources from off-campus, you can visit the Off-Campus Access information page on the library's website at http://www.lib.uidaho.edu/offcampus/index.html