Revised Fall 2016

EGR 255
Electric Circuits Laboratory

COURSE OUTLINE

Prerequisites:

MTH 176 and MTH 178

Co-requisite:

EGR 251 – Basic Electric Circuits I

Course Description:

Teaches principles and operation of laboratory instruments such as VOM, electronic voltmeters, digital multimeters, oscilloscopes, counters, wave generators and power supplies. Presents application to circuit measurements, including transient and steady-state response of simple networks with laboratory applications of laws and theories of circuits plus measurement of AC quantities.

Semester Credits: 1 Credit **Lecture Hours:** 0 Hours **Lab/Recitation Hours:** 3 Hours

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Course Outcomes

At the completion of this course, the student should be able to:

1. Know laboratory safety.
2. Proper use of test equipment.
3. Know basic circuit variables and associated units.
4. Know and apply Kirchhoff's and Ohm's laws.
5. Use parallel and series equivalents to analyze resistive circuits.
6. Analyze, design, and use voltmeters, ammeters, and ohmmeters.
7. Understand and apply node-voltage and mesh-current circuit analysis.
8. Find Thevenin and Norton equivalent circuits.
9. Analyze circuits containing dependent sources.
10. Analyze and design circuits containing operational amplifiers.
11. Understand energy storage elements: inductors and capacitors.
12. Analyze and design simple first- and second-order circuits.
13. Understand the properties of sinusoidal signals and phasors.
14. Analyze steady-state ac circuits.
15. Use PSpice to simulate electric circuits

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Required Materials:

1. **Each** student **must** have a laboratory parts kit. The kit contains electronic parts for each lab, basic tools, a breadboard trainer, a multimeter, and a software oscilloscope. A site has been established by Electronix Express for all parts (**except the sound card oscilloscope for $33.95 – do not buy this**) at http://elexp.com/virwestern.htm . The correct oscilloscope kit is made by Velleman (model PCSGU250) also available from Electronix Express (see http://elexp.com/tst_u250.htm) or others. (**Be sure to check the pricing on this item**.)

2. Scientific Calculator (i.e. TI-89 Calculator)

Textbooks:

Lab-in-a-Box , 3e Edition Revised, by Robert W. Hendricks and Kathleen Meehan, 2011. John Wiley and Sons, Inc., Hoboken, NJ.

Electric Circuits, 10th Edition, Revised Printing by James W. Nilsson, 2015, Pearson Prentice Hall, Inc., Upper Saddle River, N.J.

The following supplementary materials are available:

1. PSpice Circuit Analysis software
2. Microsoft Word and Excel Software
3. Matlab Software

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Topical Description:

Week	Topic[1]	Text[2]
1	Exp. 1 - Breadboard Basics	Chapter 1
2	Exp. 3 – Ohm's Law	Chapter 2.2
3	Exp. 4 – Kirchhoff's Laws	Chapter 2.4
4	Exp. 5 – Series and Parallel Circuits	Chapter 3.1-3.2
5	Exp. 6 - Voltage and Current Dividers	Chapter 3.3-3.4
6	Exp. 7 – Delta-Wye Configuration	Chapter 3.7
7	Exp. 8 – Mesh-Current and Node-Voltage Analysis	Chapter 4.1-4.8
8	Exp. 9 – Superposition and Thevenin Equivalent	Chapter 4.10-4.13
9	Exp. 11 – An Inverting Amplifier Circuit	Chapter 5.1-5.3
10	Exp. 12 – A Non-Inverting Amplifier Circuit	Chapter 5.1-5.3
11	Exp. - Introduction to the Oscilloscope	Chapter 3[1]
12	Exp. 14 – A Series RC Circuit	Chapter 7.2-7.4
13	Exp. 22 – Introduction to Phasors	Chapter 9.1-9.3
14	Exp. 24 – Using Nodal or Mesh Analysis to Solve AC Circuits	Chapter 9.8-9.9

[1]Experiments in Lab-in-a-Box text.
[2]Chapters from Electric Circuits text.

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Notes to Instructors:

1. Students must be quickly informed of the laboratory equipment requirements so that parts/equipment can be ordered and received by the first lab. Because of this lead time, a back-up plan to provide resources for the first lab must be in place.

2. Laboratory safety must be covered before beginning the laboratory sessions.

3. Labs should cover the major course topics.

4. Labs should be introduced as closely as possible to the relevant lecture material.

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