EGR 2201-N10: CIRCUIT ANALYSIS

Sinclair Community College, Spring Semester 2018
Tuesday & Thursday 6:00 - 8:50 PM, Room 1-230

INSTRUCTOR: Nick Reeder, Office Room 1-118, Phone 937-512-2303, nick.reeder@sinclair.edu
Office Hours: Mon. 11:30-12:30, Tues. 11:30-12:30 & 5:00-6:00, Wed. 11:30-12:30, Thurs. 11:30-12:30.

COURSE DESCRIPTION: Principles of linear circuit analysis, covering circuits containing passive and active components. Analysis of direct-current (DC) and alternating-current (AC) circuits, including transient behavior and sinusoidal steady-state behavior. This calculus-based course is designed for Engineering University Transfer students. Three classroom, three lab hours per week.

Credit hours: 4 credit hours (= 3 classroom hours and 3 lab hours per week)
Prerequisite: MAT 2270 or EGR 1101

TEXT & SUPPLIES:
- C. K. Alexander & M. Sadiku, *Fundamentals of Electric Circuits*, 6th ed.
- Scientific calculator
- Flash drive
- Safety glasses

TENTATIVE SCHEDULE:

Dates	Unit	Class Topics	Reading	Lab
January 11, 16	1	Basic Concepts	Chapter 1	Lab #1
January 18, 23	2	Basic Laws	Chapter 2	Lab #2
January 25, 30	3	Nodal Analysis	Sections 3.1 to 3.3 and Appendix A	Lab #3
February 1, 6	4	Mesh Analysis	Sections 3.4 to 3.10	Lab #4
February 8, 13	5	Superposition & Source Transformation	Sections 4.1 to 4.4	Lab #5
February 15, 20	6	Theorems: Thevenin's, Norton's, Maximum Power	Sections 4.5 to 4.11	Lab #6
February 22, 27	7	Operational Amplifiers	Chapter 5	Lab #7
March 1	8	**Midterm Exam**		
March 6, 8		**No class; Spring Break**		
March 13, 15	8	Capacitors and Inductors	Chapter 6	Lab #8
March 20, 22, 27	9	First-Order Circuits	Chapter 7	Lab #9
March 29, April 3	10	Second-Order Circuits	Chapter 8	Lab #10
April 5, 10, 12	11	Sinusoids and Phasors	Chapter 9 and Appendix B	Lab #11
April 17, 19	12	Sinusoidal Steady-State Analysis	Chapter 10	Lab #12
April 24, 26	13	AC Power Analysis	Chapter 11	Lab #13
May 1, 3		**Review & Final Exam**		**Lab Exam**

HOW TO SUCCEED IN THIS COURSE:

* Attend all scheduled hours of class.
* Read the scheduled textbook sections before class.
* If you are having any difficulties with the course, see me during my office hours, or contact me by phone or e-mail. If you get sick or have personal problems, contact me as soon as possible so that we can plan a strategy to keep you from falling too far behind.

GRADING COMPONENTS:

Homework: 15%
Labs: 20%
Quizzes: 15% (lowest quiz grade dropped)
Midterm Exam: 20%
Final written exam: 20%
Final lab exam: 10%

GRADING SCALE:

A	90% – 100%
B	80% – 89.9%
C	70% – 79.9%
D	60% – 69.9%
F	less than 60%

COURSE POLICIES:

* I expect you to attend all class meetings, and I will take attendance. While attendance is not a direct part of your grade, missing class may cause your grade to drop, as described below.
* Labs and homework assignments are **due at the beginning of class** on the due date. **I will deduct 25 percent from your grade on any late assignment that you turn in within one week of the due date. I will not give any credit for an assignment handed in more than one week late.**
* If you miss a quiz for any reason, you'll receive a grade of 0 for that quiz; **I don't give make-ups for missed quizzes.**
* If you miss an exam, contact me (either in person, by phone, or by e-mail) as soon as possible to arrange a make-up. **If you take an exam late, I will deduct 25 percent from your grade for that exam.**
* Make sure that all assignments are complete when you hand them in. If you skip part of an assignment, I will take off points for the missing part, and I won't let you hand the assignment in a second time to regain the lost points.
* Turn off cell phones, and do not use them during class. Do not use the computers for non-academic work.
* No food or soft drinks in the classroom. Stow water bottles at floor level, never on the computer desk or lab bench.
* While you may discuss assignments with other students, anything that you turn in must be your own work, not work that you have copied from another student. Cheating includes copying someone else's work, obtaining or distributing an advance copy of a quiz or exam, and allowing someone else to copy your work. Depending on the severity of the incident, the penalty for cheating ranges from a zero on that assignment to an 'F' in the course. See Sinclair's Academic Integrity Policy (below) for more on this topic.

COLLEGE POLICIES:

Sinclair Academic Policies. To view policies on topics such as dropping a course, late registrations, administrative withdrawal, grades, student behavior guidelines, safety and security, academic and other counseling, go to https://www.sinclair.edu/services/basics/registration-and-student-records/policies/.

Sinclair Academic Integrity Policy. Conduct yourself in accordance with Sinclair's honor code and academic integrity policy at https://www.sinclair.edu/services/conduct-safety/student-judicial-affairs/academic-integrity-policy/.

Understanding these policies is your responsibility.

USEFUL CONTACT INFORMATION:

Engineering University Transfer Coordinator: Eric Dunn, Room 6–112, Phone (937) 512-2721, eric.dunn@sinclair.edu

EGR Dept. Chair: Paul Lawrence, Room 3–134, Phone (937) 512–2570, paul.lawrence@sinclair.edu

Co–op Coordinator: Chad Bridgman, Room 3-134, (937) 512–2508, chad.bridgman@sinclair.edu

QUALITY STANDARDS FOR HOMEWORK ASSIGNMENTS

1. Use lined white paper, letter-size (roughly 8 by 10 inches), with no ragged edges.
2. Write on only one side of each sheet, with roughly one-inch margins all around.
3. Use pencil.
4. Include this information at the top of the first page:
    a. your first and last name
    b. course number and section number
    c. assignment type and number (for example, "Homework 1")
    d. the due date
5. Organize your work:
    - Write horizontally from the top of the page to the bottom. No zigzagging across the page. No tiny equations running up and down the edge of the page.
    - Use a single column. If a short answer, leave any remaining space to the right empty. Do not try to fill in every empty area of the sheet.
    - Leave at least one blank line between problems.
6. Answer all assigned parts of all assigned problems.
7. Start each solution by listing the problem number. For multi-part problems, include the correct a, b, c, etc. designator.
8. You don't need to copy the problem wording to your homework paper. But if the question involves an electrical schematic or other diagram, neatly copy the diagram to the homework paper with all the given quantities and labels. Use a straightedge if neat straight lines do not come naturally to you.
9. Show ALL calculations, steps, and explanations needed to arrive at an answer. If an equation is solved, show that equation in symbolic form *(example: V = IR)* and the numbers you substituted in *(example: V = 2A x 470 ohms)*. If a decision needs to be made, explain how you chose the result you did *(example: "The second bulb is burned out because DMM#2 reads 0 volts.")* For operations on your calculator, show the equations you use and the numbers you entered into your calculator, and write "by calculator" next to the result.
10. Make your work neat and readable. No coffee stains, pizza sauce, etc.
11. To make corrections, either use a good eraser OR cross out the error with a single horizontal line. Do not use X's to cross out the mistake, and do not black out the mistake with a solid "blob."
12. Use proper electrical units. Carry units all the way through the problem; units should not appear magically at the end of a problem.
13. Draw a box around final answers on problems that require manual solution steps.
14. For multi-page assignments, staple pages using **one staple** in the upper left corner.
15. Submit each assignment separately. Do not staple homeworks to lab reports.

LAB REPORT FORMAT

A lab report communicates the data that you collected in an experiment, along with your analysis of the data and a statement of what you learned from the experiment. Note these points:

- Write the **entire** report by yourself, even if you performed the lab with a partner. **Every table, every diagram, and every word in the report should be your own work.**
- When you write a measured or calculated value, insert a space between the number and the unit. For example, write 12.2 mA, **not** 12.2mA.
- Write complete sentences with **correct spelling, grammar, punctuation, and sentence structure**. Write clearly.
- Type your report, using 12-point Times New Roman font, and use software to create any diagrams or graphs in your report. No part of your report should be handwritten, except your original lab sheets, which you will staple to the back of your typed report.

A lab report should contain the following items, in the order listed:

- **Title page**, listing course number, title of experiment and lab number, date performed, date submitted, your name, and your lab partner's name (if any).
- **Data tables**. Each table should have a short title describing the data it contains. Most tables will include both predicted values and measured values, along with percentage errors. To calculate percentage error, use the equation
    - % error = |measured value - predicted value| ÷ predicted value × 100
- **Graphs** (if called for) created using Microsoft Word or other software.
- **Answers to all questions** asked in the lab handout. **Be sure to explain how your data support the answers that you are giving.** For instance, don't just say, "Yes, Ohm's law is verified." Rather, say, "The data in Table 3 show that Ohm's law is verified, because . . ."
- **Technical conclusion**, where you state what you have learned from the lab. **Be sure to relate your conclusions back to the objective(s) listed at the beginning of the lab handout.** Also, either this section or the previous section should include some discussion of how far off (percentage errors) your measured values were from the predicted values. Are your percentage errors acceptably small, or too large? If they're too large, can you explain why they're so big (measurement error, faulty equipment, etc.)?
- Staple the original lab sheets, with your handwritten data, to the back of your typed report.

The next two pages show a sample lab report.

SINCLAIR COMMUNITY COLLEGE

EGR 2201

LAB #8: Ohm's Law

Date Performed: March 14, 2015

Date Submitted: March 21, 2015

Name: Smiley Burnett

Lab Partner: Fuzzy St. John

Instructor: Nick Reeder

SAMPLE LAB REPORT: Page 2 of 2

Data Tables:

DATA TABLE A: Resistor Values

Resistor ID	Nominal Value	Measured Value
R1	1 kΩ	0.988 kΩ
R2	1.2 kΩ	1.19 kΩ
R3	2 kΩ	2.04 kΩ
R4	3.3 kΩ	3.34 kΩ
R5	4.7 kΩ	4.66 kΩ

DATA TABLE B: Current Through R1 for Different Voltages

Voltage	Current through R1		
	Predicted	Measured	% Error
5.00 V	5.00 mA	4.87 mA	2.60 %
10.0 V	10.0 mA	9.89 mA	1.10 %
15.0 V	15.0 mA	15.4 mA	2.67 %
20.0 V	20.0 mA	19.4 mA	2.50 %

DATA TABLE C: Values of Current at 10 V with Different Resistors

Resistor	Current at 10.0 V		
	Predicted	Measured	% Error
R2	8.33 mA	8.37 mA	0.480 %
R3	5.00 mA	4.87 mA	2.60 %
R4	3.03 mA	3.00 mA	0.990 %
R5	2.13 mA	2.17 mA	1.88 %

Answers to Lab Questions:

1. *How does current change as resistance increases at a fixed voltage?*

From Data Table 3 we see that current decreases as resistance is increased at a fixed voltage. The current had its maximum value (8.37 mA) when the resistance was smallest (1.2 kΩ), and it became proportionately smaller as the resistance increased.

Technical Conclusion:

From the data in Data Table B, we see that with a fixed resistance, current is approximately proportional to voltage. Going down the rows of the table, voltage increases, and so does current. Also, although our data do not all satisfy the equation $I = V/R$ precisely, they do all satisfy the equation to within about 2.7 %.

From the data in Data Table C, we see that with a fixed voltage, current is approximately inversely proportional to resistance. Going down the rows of the table, resistance increases, and current decreases. Again, although our data do not all satisfy the equation I = V/R precisely, they do all satisfy the equation to within about 2.6 %.

Thus, since all percentage errors are well within the range that one would expect with 5% tolerance resistors, we conclude that our data do verify Ohm's law.