

-Syllabus-

-Introduction to Electrical Circuits Laboratory Section 016-

WSU Catalog Description: ECE 3300.

Instructors: Xinyu Ning GTA of ECE

Office Hours: Wednesday, 9:00 AM – 1:00 PM (By prior arrangement via Email)

Email: hu6589@wayne.edu

Course Meeting Time and Location:

Monday 2:30 PM- 5:20 PM, 3350 Engineering Building,

Goals: To develop competence in analysis, design, testing, and troubleshooting of simple electrical circuits. To prepare students for more advanced courses in circuit analysis.

Learning Objectives

At the end of this course, students will be able to:

- *Operate* DC power sources and function generators for the proper generation of signals.
- *Use* an oscilloscope to monitor the waveforms of voltage signals.
- *Measure* electrical circuit and signal parameters using a multimeter and a scope.
- *Verify* the application of Kirchhoff's current and voltage laws and Ohm's law to circuit problems.
- *Construct* various types of electrical circuits to verify their Thevenin and Norton equivalents.
- *Analyze* experimental data to verify various laws and theorems of electrical circuits.
- *Obtain*, experimentally and by simulation, the transient response of circuits containing energy-storing components (i.e., inductors and capacitors).

Laboratory Resources: Lab equipment, Multisim 14.1.

VLab: <https://vlab.vdi.wayne.edu/>

Assignments

Student work in this laboratory course is divided into Pre-lab, Laboratory, and Post-Lab activities.

- **Pre-lab work:** Students are expected to read lab's pre-reading, activity, and post-lab activities before coming to lab, solve all associated problems with each week's activity and submit the hard copy of it to the lab instructor. Students are not allowed to go through the lab activities without submitting their pre-lab report.
- **Laboratory work:** Students use protoboards to build and experiment with simple circuits in the lab. The students will use available instruments (a function generator and a DC power supply) to supply signals and power to their circuits. They will also use instruments (a scope and a multimeter) to make measurements of current and voltage signals. Each student is required to obtain a spiral-bound notebook. The notebook will be used as a laboratory journal; students enter data, sketches, and notes during each lab exercise. At the end of some lab exercises, the instructor will examine and sign student journals.
- **Post-lab work:** If specified, students are expected to write reports to discuss and summarize their lab results. The lab report submitted by each student must be entirely his/her own work. Each report should include a title page, an introduction, experimental results, theoretical analysis and derivations, simulation results, discussion, and conclusion. A student's lab report must be based on his/her lab journal entries, and post-lab work. The report must be hard copy. It should be submitted to the lab instructor at the *beginning* of the next lab session. Late reports will not be accepted and a score of zero will be assigned.

Laboratory Report Format

The following are guidelines for preparing lab reports.

- **Cover page:** It should include *Course name, Exp title and #, date of the experiment, Student name & ID*.
- **Introduction:** State the *objective, Theory, Equipment, and Procedure* of the experiment.
- **Experimental Results:** Various measurements are typically made in a given experiment. In this section, you are to describe (using diagrams) the experimental set-up and present your measurements. Present your data in tables or graphs. Use a spreadsheet (or graphing software) to generate all graphs. You should include all scope display captures (as opposed to sketches).
- **Simulation Results:** Most experiments will require you to perform circuit analysis using Multisim. You should include your own screen capture results that are generated by

Multisim. These include circuit schematic and virtual instrument displays (e.g., scope traces). Also, include additional tables and graphs that help illustrate your simulation results.

- **Theoretical Results:** This section provides all analytical analysis (derivations) associated with the experiment. It also presents the ideal values that you use to benchmark your experimental results. *This section could be included in the Post-lab section.*
- **Discussion:** In this section, you are to compare experimental, theoretical and simulation results. Present those results in table form. Most measurements will contain some errors. This error is computed as: $\text{percent error} = (\text{theoretical value} - \text{measured value}) * 100 / (\text{theoretical value})$. Calculate the percent error and then describe the possible sources for the error. If the error is less than 5 percent, consider the theory, simulation, and measurements to coincide. If the error is greater than 5 percent, you should present possible sources for that error (such as things that are not accounted for in the experiment or in the theoretical results, or possible set-up errors). *This section could be included in the Conclusion.*
- **Conclusion:** In this section, you answer the following questions: Have the objectives of the experiment been met? Were there errors in the measurements that you could not account for? Also, summarize all key findings.

Lab Attendance and Make-Up Policy

Students are expected to attend every lab session in its entirety. Students should not schedule other classes or commitments that conflict with any part of the time during which the lab section is scheduled. Attendance is recorded and it will affect the final grade. In no case will a lab report be accepted from a student if he/she did not actually perform the experiment in the lab. **Since arriving late and leaving early are disruptive to the lab, 5% ~ 20% points will be deducted from this experiment score, for each occurrence.**

Every student is required to perform all laboratory experiments. Performing the experiment in another session is expressly forbidden. **Lab make-up is only possible in emergency situations.** In order to make up a lab, a student would need to obtain permission from the Professor-in-Charge of the Lab. For excused absence, the student has two days to contact the lab instructor (and the Professor-in-Charge). **The student must complete the make-up lab before the next scheduled experiment.** The report for the make-up experiment must be submitted at the beginning of the next lab session. Failure to perform the makeup lab on the scheduled day or failure to submit the lab report on the due date will be treated as an unexcused absence and result in a zero for that experiment.

If a student misses a lab because of an unexcused absence, the student will be assigned a score of zero. **A student will fail the lab if he/she has TWO unexcused absences or missed TWO post-lab reports.**

Quiz Schedule: There could be 10-15 min quizzes for some experiments at the beginning of the lab session or quizzes for taking home. Exact dates will be announced later on during the semester.

Grading policy: There are two possibilities, depending on the progress of the lectures/lab material during the semester:

Distribution of Points (100 points maximum):

- Final Project: 25
- Attendance: 5
- Reports: 40
- In-class work: 30

Without Final Project:

- Attendance: 10
- Reports: 50
- In-class work: 40

Note: A student who violates lab rules and/or arrives late to the lab (or leaves the lab early) will risk losing points from his/her final score (refer to the sections on lab rules and attendance. for details: Before leaving the Lab, students are expected to return the components to the correct bins neatly hang all leads and probes and turn OFF the power on all instruments. **A student's final grade will be negatively affected if he/she does not follow the Laboratory Rules. For every violation, 10% ~ 20% points will be deducted from this experiment score.** For example, if one didn't return the resistors back to the correct drawer after lab finished he will lose 10% points this time; if one student leaves without turn off the power of power supply, 20% score of this lab will be deducted.).

Grading Scale:

This lab course score is a 20% score of the ECE 3300 course.

Plagiarism and Academic Dishonesty

Simply put, you must only submit your own work (based on your own experimental data and your own analysis and simulation results) for grading. Failing to do so constitutes plagiarism and/or academic dishonesty. A person who uses as part of his communication (printed, electronic or oral) with others text, arguments, data, illustrations or ideas of another person without acknowledging what he/she had borrowed is guilty of plagiarism.

One common example of plagiarism in lab courses is the use of old student reports. Another example is copying content from the world-wide-web. The use of any portion of somebody else's work is strictly prohibited and will not be tolerated.

During examination times no talking and passing papers or other items among the students will be allowed. The penalty for plagiarism and or academic dishonesty is course failure (F grade), and further appropriate action according to the applicable College of Engineering and University Policies.

Additional explanations for this semester:

- **Group work:** If needed, 1 or 2 students in every group. The 2 students in one group can share the experiment data and only need to submit one post-lab report.
- **Quiz:** If needed, one quiz this semester. It could be group work or individual work, closed book or open book
- **Post-lab report:** The lab reports do not experiment with data records. Every student could easily understand and repeat the experiment after reading the reports in the future even it's a long time later. Please explain every step's data and figures. Make tables to calculate the errors between measurement data and theoretical data.