

ELECTRIC CIRCUITS & ELECTRONIC DESIGN LAB
EE316-08, Tuesday at 5:00 pm on Panopto
Lab Room: TBA

Instructor: Buddhanoy Matchima (Misha)

E-mail: mb0194@uah.edu

Office: <https://zoom.us/j/96644912906?pwd=QWlRbk1HRWhMZm1BZHJFVnM3c2ZZUT09> Or
Meeting ID: 966 4491 2906 Passcode: EE316-08

Office Hours: TR: 3:30 PM – 5:30 PM

Course Objective: EE316 allows students to construct several design circuits and master the use of electronic measurement instrumentation. These labs emphasize electrical engineering concepts through a hands-on approach, allowing students to gain significant experience with electrical instruments such as function generators, digital multimeters, oscilloscopes, step down transformers, power supplies, operational amplifiers, etc. Topics to be covered include KCL, KVL, Norton/Thevenin equivalent circuits, inverting and non-inverting amplifiers, differentiators and integrators, bridge rectifiers, AC/DC converters, filter design, and signal amplification using BJTs, JFETs and MOSFETs. In addition, students will gain experience in measuring various electronic device characteristics.

Text*: Lab details will be posted on Canvas

Important Instructions:

- I. All acts of dishonesty in any work constitute academic misconduct. This includes, but is not limited to cheating, plagiarism, fabrication of information, and abetting any of the above. Academic misconduct will not be tolerated and may result in a failing grade in the course. Please consult the Student Handbook for further description of academic misconduct and penalties.
- II. If you have any difficulty or a complaint which is related to this lab, your first action should be to discuss it with me. If such a discussion would be uncomfortable for you or fails to resolve your issue, you can discuss it with Mr. Dennis Hite (EB217K, dennis.hite@uah.edu).
- III. Turn in assigned lab work (pre-labs/lab reports) **on due dates**. Late assignments will not be graded without a legitimate excuse provided prior to the due date. **You will turn in all assignments on CANVAS in pdf format.**
- IV. No makeup mid/final exams except in the case of a fully documented legitimate excuse.
- V. Put your phone on silent or vibration mode.
- VI. Each student is responsible for properly storing components and equipment at the end of each lab session (This is part of your lab performance grade).

Grade Scale:

100 - 90% = A 89 - 80% = B 79 - 70% = C 69 - 55% = D <55% = F

Grading Policy:

Pre-Lab Assignments	20%
Lab Reports	30%
Mid Term	10%
Lab Attendance and Lab Performance	20%
Final Lab Exam	20%

*The University of Alabama in Huntsville (UAH),
Electrical and Computer Engineering Department*

Tentative Lab Contents:

- Lab 1:** Part A: Introduction to instrumentation: oscilloscope, function generator, and power supplies
Training on Multisim 11.0. Part B: Introduction to KCL, KVL and verification of Norton and
Thevenin equivalent circuits
- Lab 2:** Inverting and non-inverting operational amplifier circuits using 741op-amp
- Lab 3:** Integrator and differential circuits using 741op-amp
- Lab 4:** Digital to analog converter using 741 op-amp
- Lab 5:** Basic filters and frequency response (low pass, high pass, and band pass)
- Lab 6:** AC signals, transformers, and rectifier
- Lab 7:** BJTs (NPN and PNP transistors) Characteristics (Q-point operating behavior in active region)
- Lab 8:** Small signal amplification with BJTs
- Lab 9:** JFETs using P-channel/N-channel configurations
- Lab 10:** Small signal amplification with JFETs
- Lab 11:** MOSFETs using P-channel/N-channel configurations
- Lab 12:** Small signal amplification with MOSFETs

**The lab schedule is tentative and may change if classes are canceled for any reason such as snow/weather. Any changes will be communicated in the laboratory or through CANVAS.*

Feel free to contact me via email: mb0194@uah.edu or you may visit me during office hours.

Lab	Experiment Name	Date	Pre-Lab due date (by midnight)	Lab Report due date (by midnight)
Part – I: Electrical				
1	Part 1: Introduction to lab equipment and training on Multisim 11.0 Part 2: KCL/KVL, Ohm's Law and Thevenin & Norton Theorems	1/19	No Prelab	1/26
2	Inverting & Noninverting Op-Amp	1/26	1/26	2/2
3	Integrator & Differentiator using Op-Amp	2/2	2/2	2/9
4	Digital to Analog Converter	2/9	2/9	2/16
5	Filters (Behavior of a signal in RC circuits)	2/16	2/16	2/23
6	Full Wave Bridge Rectification	2/23	2/23	3/2
MID TERM EXAM March 2, 2021				
Part – II: Electronics				
7	Operating Characteristics of BJTs	3/9	3/9	3/16
8	Small signal amplification with BJTs	3/16	3/16	3/24
9	Operating Characteristics of JFETs	3/23	3/24	3/30
10	Small signal amplification with JFETs	3/30	3/30	4/6
11	Operating Characteristics of MOSFETs	4/6	4/6	4/13
12	Small signal amplification with MOSFETs	4/13	4/13	4/20
FINAL EXAM April 20, 2021				

EE316 (03) Pre-Lab and Lab Report Preparation Guidelines

1. Your prelab and lab report must be uploaded as a PDF file to Canvas before the next lab begins.
2. Your pre-labs are the simulation part of the lab handouts. A tutorial for Multisim 7 is provided on CANVAS, but we will use Multisim 11, which is very similar. Your pre-lab must have your Multisim simulation including circuit and results (tables, plots, etc.). A discussion is not required for pre-labs.
3. Corrected pre-labs (due with lab reports) will be regraded for up to full credit.
4. Basic format requirements for your report are listed below. An example lab report is provided on Canvas

Cover Page

Provide report title, course number and name, author's name, and date.

Introduction

- a. Provide essential relevant background information (half page minimum, 2 pages maximum)
- b. Brief overview of your report (1 paragraph)

Calculations or analytical work

The theory behind the lab experiment should be described. Mathematical formulae should be properly identified (i.e. Ohm's Law) and uncommon variables identified. If necessary, you may **make your own figures** to help explain concepts. **All data should be tabulated.** All tables and figures must have a label (i.e. figure 1, Fig. 1.) and caption/description.

Experimental Setup and Procedures

This section should include figures and/or block diagrams of the experimental setup whenever possible. It should explain the experimental apparatus, measurements, measurement accuracy, and extraneous inputs that might influence the experiment. The measurement techniques should be explained. It should describe the process rather than give step-by-step procedures. Write in paragraphs (do not copy from the lab instructions or textbook).

Results and Discussion

Experimental results are presented in this section. Based on the knowledge you learned so far, a discussion should be provided in this section to justify the results obtained for theoretical calculations, simulations, and experiment. The experimental, simulation, and theoretical results should be compared with each other. Experimental errors should be analyzed. Any agreement or disagreement among the results should be discussed, and the reasons for the agreement and/or disagreement should be provided. Include tables and figures of your data to help you make your points. Answer all questions included the lab instructions.

Compare and discuss theoretical (hand calculations), simulation (Multisim), and experimental results.

Conclusion

Any significant results of the experiment should be pointed out in this section. This section includes highlights/ comparison of theoretical, simulation, and experimental results (usually in percent difference). Positive or negative statements concerning the results should be made.

Experimental Results

You are required to document your experimental results by hand in lab. Your hand recorded experimental results must be scanned in and attached as the final page(s) of your lab report. Failure to do so will result in an automatic 5% point deduction from your lab report grade.

*The University of Alabama in Huntsville (UAH),
Electrical and Computer Engineering Department*

Safety:

1. The University of Alabama in Huntsville is committed to providing a safe teaching and learning environment for student and faculty members. In order to enhance your safety, it is necessary for you to abide by all safety requirements provided by your instructor. In the unlikely case of a campus emergency make sure that you know where and how to quickly exit your classroom and how to follow any emergency directives.
2. As a student at the University of Alabama in Huntsville you must recognize that practically all accidents are avoidable. It is your responsibility to prevent accidents by taking common precautions such as:
 - Identifying safety problems and reporting them immediately
 - Taking personal accountability for your workspace in labs, shops, and classrooms and ensuring they are clean, tidy, and usable for the next student
 - Effectively communicating safety concerns and broken equipment to your major professor and or laboratory supervisor
 - Being respectful of your work / learning environment and the people within it and the people who will occupy it after you have left
 - Review safety information and resources as required by your instructor prior to working with potentially hazardous materials and or equipment
 - Ask yourself what are the potential scenarios that can cause injury to myself and others during each assignment and extracurricular activity
 - Ask what-if questions concerning new environments and hazards