



Phys 311: Instrumentation

Fall 2020

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Section ID:	Phys 311 - 002
Instructor:	Dr. Gabriele Belle
Office:	My virtual office in WebEx or zoom
Email:	gbelle@gmu.edu <i>Please note: All communication via email to your instructor must be through your GMU email account. Your instructor may send information to you via Blackboard email. Make sure you check your email account regularly.</i>
Office Hours:	Wednesday, 4:00 to 5:00 pm, and Friday 10:00 am to 11:00 am
Course Material:	The lab manual is made available on Blackboard as a set of handouts.
Meeting Room:	Virtual classroom – zoom
Meeting Time:	Lecture: Friday, 1:30 om to 2:45 pm, Lab from 4:30 pm to 7:10 pm

Course Description

Physics 311 is a laboratory course intended to provide students with practical experience in instrumentation and electronics. The goals and learning outcomes are listed below.

Course Goals

In this course students will –

- Become familiar with circuit CAD and simulation
- Become familiar with virtual instrumentation software
- Understand basic analog and digital electronics
- Become proficient at keeping a laboratory notebook and producing technical notes.

Blackboard Login Instructions

Access to [MyMason](#) and GMU email are required to participate successfully in this course. Please make sure to update your computer and prepare yourself to begin using the online format BEFORE the first lab. In the menu bar to the left you will find all the tools you need to become familiar with this course. Take time to learn each. Make sure you run a system check a few days before class. Become familiar with the attributes of Blackboard and online learning.

Required Textbooks

John Essick: Hands-on introduction to LabView for Scientists and Engineers, ISBN: 978-0-19-085306-8, 4th Edition, Oxford University Press.

Paul Horowitz, Winfield Hill: The Art of Electronics, ISBN-13: 978-0521809269, 3rd Edition, Cambridge University Press

Nature of Course Delivery

The format of this online course is synchronous. During the synchronous session the lecture is recorded. The course is structured around 13 learning units. Assignments must be submitted before or on the due date.

Technology Requirements

Hardware: You will need access to a Windows or Macintosh computer with at least 2 GB of RAM and access to a fast and reliable broadband internet connection (e.g., cable, DSL). A larger screen is recommended for better visibility of course material. You will need speakers or headphones to hear recorded content and a headset with a microphone is recommended for the best experience. For the amount of Hard Disk Space required taking a distance education course, consider and allow for:

1. the storage amount needed to install any additional software and
2. space to store work that you will do for the course.

Software: This course uses Blackboard as the learning management system. You will need a browser and operating system that are listed compatible or certified with the Blackboard version available on the [myMason Portal](#). See [supported browsers and operating systems](#). Online courses typically use [Acrobat Reader](#), [Flash](#), [Java](#), and [Windows Media Player](#), [QuickTime](#) and/or [Real Media Player](#). Your computer should be capable of running current versions of those applications. Also, make sure your computer is protected from viruses by downloading the latest version of Anti-Virus software.

Students owning Macs or Linux should be aware that some courses may use software that only runs on Windows. You can set up a Mac computer with Boot Camp or virtualization software so Windows will also run on it. Watch [this video](#) about using Windows on a Mac. Computers running Linux can also be configured with virtualization software or configured to dual boot with Windows.

Note: If you are using an employer-provided computer or corporate office for class attendance, please verify with your systems administrators that you will be able to install the necessary applications and that system or corporate firewalls do not block access to any sites or media types.

Course-specific Hardware/Software

LabVIEW: This is a system design platform and development environment for visual programming. You can download the software here: <https://www.ni.com/en-us/support/downloads/software-products/download.labview.html#346254>

Installation Instructions can be found here: <http://www.ni.com/tutorial/13413/en/> You will receive a license number to activate the software. It is valid for one year until July 2021.

Multisim: This is a circuit simulation software and you will need it to complete your assignments. You can download a free trial here : <https://www.ni.com/en-us/support/downloads/software-products/download.multisim.html#312060> . To activate the software, you need to provide me with the unique

NI computer ID. You can find it following these instructions:

<https://knowledge.ni.com/KnowledgeArticleDetails?id=kA00Z000000P6xoSAC&l=en-US>

I will collect those number with your email addresses and our NI account manager will create license keys for you.

MS Excel or equivalent spreadsheet software: Spreadsheet software is essential for data analysis.

Google Chrome: The only browser in which Blackboard Collaborate Ultra works well.

Course Schedule

Lab	Week of	Lab Activity
1	08/28	Measurement and Signals
2	09/04	Passive Filter Circuits
3	09/11	Diode Circuits
4	09/18	Transistor Circuits
5	09/25	Midterm Project
7	10/02	Operational Amplifiers 1
8	10/09	Operational Amplifiers 2
9	10/16	Combinational Logic
10	10/23	Sequential Logic
11	10/30	Data Acquisition with Arduino Project 1
12	11/06	Data Acquisition with Arduino Project 2
13	11/13	Data Acquisition with LabVIEW
14	11/20	Final Project Presentations
14	11/27	Thanksgiving Recess
15	12/04	Wrap up and make-up lab

The schedule could change.

Grading:

Grading Scale:

A+	96.7%---100%	A	93.3%---96.7%	A-	90%---93.3%
B+	86.7%---90%	B	83.3%---86.7%	B-	80%---83.3%
C+	76.7%---80%	C	73.3%---76.7%	C-	70%---73.3%
D	60%---70%				
F	Below 60%				

Grade Determination:

Assignment	Total
Laboratory Notebook Checks	15%
Technical Notes	40%
Midterm Project	20%
Final Project	25%

General Information:

Projects will be performed as shown on the lab syllabus but it may be necessary to modify the schedule. Project handouts will be made available on a weekly basis. All labs will include an introductory lecture followed by completion of the laboratory project.

Assignments:

All technical work for this lab course must be kept and maintained in a bound notebook with numbered pages. Notebooks will be checked at the end of each lab session. Students are required to write a report in form of a short technical note which is due the week after the project has been undertaken.

- 1) **Prelab:** In your lab notebook, you must record:
 - a) Title of the project and date.
 - b) A brief statement encompassing the purpose of the project.
 - c) The results of the simulation if applicable.
 - d) Answers to any pre-lab question

- 2) **Results:**
 - a) Circuit diagram.
 - b) Graphs
 - c) Summarized data, including correct units, tables
 - d) Calculations with clear results
 - e) A brief statement about the results and a conclusion summarizing what was done in the project as well as its outcome. In the conclusion, a comparison of the results to the simulation is required.

Table 1: point distribution for each assignment (notebook – does not include the technical note)

Prelab	5 points
Results	10 points
Total:	15 points

Lecture:

There will be an introductory lecture before each lab session. **It is expected that all students arrive on time and not miss any portion of this lecture.** After the lecture, students work on their project. Since the introductory lecture is a necessary part of the lab session, **students who miss the entire lecture WILL NOT be permitted to do the project.** If you are late by 15 minutes, your lab grade will be reduced by 10%. Sessions are taught synchronously and lab attendance is mandatory.

Make-Up Laboratory: If you missed a lab, you can attend the make-up lab.

Course Policies:

Lab Safety: Students must comply with lab safety rules. The lab safety handout is posted on blackboard in the Lab safety content folder.

Lab Equipment: You are responsible for the lab equipment you borrowed from GMU. All parts are necessary to complete your assignments. If you lose a part, you need to replace it so that you can complete all assignments. If you decide to drop the course or withdraw you need to return the equipment to GMU. Contact person for all equipment loans is Dan Thomas. Dthomas2@gmu.edu

University Policies and Resources

- a. **Academic Honesty:** You are expected to be familiar with and abide by the University's Honor Code. The Code can be found [here](#). It is your responsibility to see me if you have questions about these policies. George Mason University has an honor code that states the following:

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this: Student Members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Plagiarism is a violation of the honor code. All work done outside the lab must be completed individually. Any two reports that have identical sentences or have paragraphs with identical structure will be considered plagiarism.

- b. Students must follow the university policy for [Responsible Use of Computing](#)
- c. **Student services:** The University provides range of services to help you succeed academically and you should make use of these if you think they could benefit you.
- d. Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account.
- e. [The George Mason University Counseling and Psychological Services \(CAPS\)](#) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance. Counseling Center: Student Union I, Room 3129, 703-993-2380.
- f. Students with disabilities who seek accommodations in a course must be registered with [the George Mason University Office of Disability Services \(ODS\)](#) and inform their instructor, in writing, at the beginning of the semester. All academic accommodations must be arranged through that office. Please note that accommodations **MUST BE MADE BEFORE** assignments or exams are due. I cannot adjust your grade after the fact.
- g. Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- h. [The George Mason University Writing Center](#) staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing. University Writing Center: Robinson Hall B Room 213, 703-993-1200. The writing center includes assistance for students for whom English is a second language.

- i. **Diversity**: George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth.
- j. **Withdrawal**: If you need to withdraw from this course you must do it within the University established time frame. For Fall 2020 the last day to withdraw with no tuition penalty is September 8. From then on tuition penalties apply.
- k. **Privacy Statement**: Nothing posted in this course is to be posted outside the Blackboard course or passed on to a third party or anyone who is not enrolled in this course. The material posted in this course is copyright protected. Re-posting it on a third-party website is a violation of the copyright act. This includes lab handouts and any video recordings, power points etc.