Physics 252 - Syllabus, Spring 2021

1 Course Objectives.

The primary purpose of this course is to teach you how to design basic analog electronic circuits for connecting one device to another properly and efficiently: this is generally the function of most lab-built electronic circuits.

Along the way, we will also learn how to do basic analog circuit design and to a lesser extent signal acquisition and detection. More specifically, you will learn about the following essential concepts:

- complex impedance
- amplification
- filters and frequency analysis
- OpAmps applications
- feedback

You will also learn to use the following components and equipment:

- resistors, capacitors, inductors.
- diodes, photo-diodes, transistors.
- Op-amps, comparators.
- Multimeters, oscilloscopes, function generators.
- Breadboards and soldering irons.
- Modern circuit design and lay-out software.

2 Texts.

There is no official textbook for the course. All you need to know to succeed in this class will be posted in a form of lecture slides, and introductory chapters with lab descriptions created specifically for this course. These chapters and labs were originally created and edited by Prof. Jeff Nelson, Prof. Bill Cooke, Prof. Seth Aubin, Prof. Wouter Deconinck and myself. All of it will be available on my website before the lecture.

Supplementary books which you might find useful (no need to buy them unless you want)

- "Basic Electronics: An Introduction to Electronics for Science Students" by Curtis. A. Meyer
  - available at print on demand web service lulu.com (direct link)
  - **Note**: This book has several typos and errors, please visit the Erratum Page
- "Electronic Principles 8th Edition" by Albert Malvino and David Bates
  - ISBN13: 9780073373881

As a **fantastic** reference book for design tips and concepts

- "The Art of Electronics" (2nd Edition, 1989-1999) by P. Horowitz and W. Hill.

  - It is available in the Library under call number TK7815.H67 1989. A copy is also available for reading in the lab.

3 Evaluations.

No lab can be skipped.

Your final grade for the course will be determined from the following grading weight distribution:

- Home works (design exercises): 20%
  - Pre lab prep work (up to 50% will be taken if it is not satisfactory)
  - Submission on Monday 2pm.
- Log books: 50%
  - Submission on Monday 2pm.
- Final Project: 30% (audio amplifier with a 3 channel equalizer and auto gain control)

3.1 Late submission penalties.

For every day behind the submission deadline (the day count starts immediately after deadline) there will be 5% of maximum grade penalty. We will cap penalty to 50% maximum. But we will not accept any submission after a week unless there is a solid reason about which we should be notified in advance.

Final Project: must be done by deadline!

4 Home Works (design exercises).

Home works have two components. Pre lab preparation: you should do a good attempt to solve the problem and think about methods to solve the problem. It does not have to be fully complete, i.e. some values might not be yet known to you, or during the lab you will see that hardware behave differently. So you would get the final answer only after the lab. We will check your attempt at the beginning of the lab. If an attempt of solution is week or missing, there will be a penalty as high as **50%**.

Also note, that if you have not tried your homework, the time to completion of the lab might be **infinite** (yes, I have seen such cases).

At the end of the week, you should submit the final solution.

5 Labs.

We will do what you have designed as a part of the homework and investigate circuits behavior. Keep your notes in the logbook.

5.1 Log books.

Your lab book should be any regular style notebook (**without rings** or other means to discretely remove or add pages) with either line or quadrangle ruling or a computation log/lab book. Alternatively, you can use an electronic notebook - but discuss it with the instructor first.

The log book is the main source of information about the experiment when you are outside the lab, so it is very important to maintain it well, and include as much experimental information as possible, especially if it impossible to recover it without recreating the experiment. Typical lab book contains neat notes or tables with all the raw data, all other relevant experimental parameters that are needed for the data analysis, notes on your experimental methodology, calculations, etc. Everything you do goes into this book and it provides the foundation for your lab reports. You need to bring it every week (if you forget, you will have to run home to get it).

Diagrams, data, graphs, and other notes on separate pieces of paper should be glued, taped, or stapled into the lab book. If something falls out of the lab book during reading/shaking/transporting, it is not the part of the log book and will be discarded. All notes should be written in **pen**. Mistakes and errors in design, data, and analysis will occur, and they should be crossed out neatly.

You should enter you lab notes and data directly into the lab book. A 'scratch' lab book that is neatly copied into the lab book at a later time is a waste of time and often a bad practice. All the information in the log book should be readable - but it does not have to be pretty to look at.

6 Final project.

The last 2 week of classes are reserved for you to complete the final project.

7 Grading.

Grade	Score percentage	Grade	Score percentage	Grade	Score percentage
		A	94-100	A-	90-94
B+	87-90	B	84-87	B-	80-84
C+	77-80	C	74-77	C-	70-74
D+	67-70	D	64-67	D-	60-64
F	<60				

8 Illness.

Please notify the instructor if you are ill, so that arrangements can be made to make up missed labs.