Instrumentation & Interfacing:
"LabVIEW"
(Phys 363)
Fall 2023

What am I doing here? LabVIEW is a graphical programming environment and language used to create data acquisition and control interfaces. In other words, it is used to enable a computer to control other real-world hardware. As a result of completing this course, you will be able to create control and acquisition programs using LabVIEW, and you will be able to interface the LabVIEW computer to external hardware using at least three protocols. We are using LabVIEW 2022.

Where can I get a textbook? The LabVIEW software comes with strong internal documentation, which we will consult in place of a textbook. If you want a book of your own, you might try this one:

LabVIEW for Scientists and Engineers, by John Essick

You can get a one year student license of LabVIEW for free from CIT to install on your Windows laptop. Mac users will have to use a windows emulator, such as "Bootcamp".

How will I be graded? That depends on the track *you* choose. At the beginning of the semester, you are in the "Homework" Track. You may request to change to the "Project" Track by sending me an email on or prior to October 17, 2023. Staying with the Homework Track ensures that you are exposed to as many hardware types as possible. Choosing the Project Track means that you will have a chance to express some creativity, and to learn about the struggles associated with project conception and its expression, redesign, and implementation. Once you choose the Project Track, you cannot pass the class unless you earn at least a "D" grade for project stages 6 and 7. All late assignments lose up to 1.5 points per day.

Graded Activity	Homework Track	Project Track
Weekly Assignments 1 through 7	-	50%
Weekly Assignments 1 through 10	80%	-
Quizzes 1 through 5	20%	15%
Project Stages 1 through 5	0%	15%
Project Stages 6 and 7	0%	20%

How will I submit assignments? You must drag/copy the code for your weekly assignments into my inbox: \\files\Inbox\Physics\Pogo. You can get there from the RUN… menu on your PC if you have VPN installed (CIT has a help page). Assignments **must** be titled **##-LastnameFirstInitial.vi**. So, my third assignment would be called "03-PogoE.vi". Sometimes, you will have to include extra files, too. If you have multiple files, use the same naming rules to create a personal folder. You may never submit .zip files.

Schedule of Deadlines

Date	Homework Track	Project Track	Notes
Tuesday, September 5, 2023	**Assignment #1**	**Assignment #1**	
Thursday, September 7, 2023	**Quiz #1**	**Quiz #1**	in class
Tuesday, September 12, 2023	**Assignment #2**	**Assignment #2**	
Tuesday, September 19, 2023	**Assignment #3**	**Assignment #3**	
Thursday, September 21, 2023	**Quiz #2**	**Quiz #2**	in class
Tuesday, October 3, 2023	**Assignment #4**	**Assignment #4**	Requires hardware!
Thursday, October 5, 2023	**Quiz #3**	**Quiz #3**	in class w/ hardware
Thursday, October 12, 2023	**Assignment #5**	**Assignment #5**	Requires hardware!
Tuesday, October 17, 2023	**Deadline to request change to Project Track**		
Tuesday, October 17, 2023	**Quiz #4**	**Quiz #4**	in class w/ hardware
Tuesday, October 24, 2023	**Assignment #6**	**Assignment #6**	Requires hardware!
Thursday, October 26, 2023		**Stage 1**	Abstract
Tuesday, October 31, 2023	**Assignment #7a**	**Assignment #7a**	Requires hardware!
Tuesday, October 31, 2023	**Quiz #5**	**Quiz #5**	in class w/ hardware
Thursday, November 2, 2023		**Stage 2**	Full proposal
Thursday, November 9, 2023		**Stage 3**	Hardware Checklist
Thursday, November 16, 2023	**Assignment #8**		Requires hardware!
Thursday, November 16, 2023		**Stage 4**	Basic hardware demo
Thursday, November 30, 2023	**Assignment #9**		
Thursday, November 30, 2023		**Stage 5**	Software Milepost
Monday, December 11, 2023		**Stage 6**	Working Prototype
Monday, December 18, 2023	**Assignment #10**		Requires hardware!
Monday, December 18, 2023		**Stage 7**	Public Demonstration

What are these "stages" for the project? Projects will be completed and submitted in stages.

Stage 1: An abstract for your project. It is *your* responsibility to find an idea, not mine! You must use the submission form on the course home page.

Stage 2: A complete written proposal. The project proposal must be a short professional report describing the scope of your project. It must include (a) a new abstract, incorporating any revisions; (b) a detailed hardware list including DAQs, resistors, tape, screws, wood blocks, wires, etc.; (c) sketches of all the custom hardware you will build (or 3D print); (d) an example screenshot showing the GUI; (e) a discussion of other user interfacing (i.e., does the user need to adjust a voltage?); (f) a description of the measurement(s) to be made, including frequency, magnitudes, and units; (g) a description of what data will be permanently saved during each trial; (h) a description of what you want to be graded in stage 5 (allowing you to create a significant deadline for yourself), (i) a detailed flowchart diagramming the flow of information in the system, explicitly showing the necessary feedback with arrows between your blocks.

Stage 3: A detailed checklist (see also stage 2b) verifying that all the equipment has been obtained.

Stage 4: An in-class demonstration that each individual element of external hardware can, at a minimum, send or receive data from the computer, as appropriate.

Stage 5: A demonstration of your software so far, as defined by *you* in stage 2h.

Stage 6: A **complete** working prototype. Everything must work, but there may still be small glitches.

Stage 7: A public demonstration of your working project ("The LabVIEW Fair").

Learning Outcomes

At the end of this course, students will:
- Be able to design, create, and debug instrument control and acquisition programs using LabVIEW
- Be able to use LabVIEW to interface your computer to instruments using at least three protocols (analog DAQ, digital DAQ, and RS-232 serial). In addition, you may learn other protocols (e.g., GPIB, USB).
- Design, create, and debug complex systems of instruments combining data input and output to work with your computer.
- Have an opportunity to install and activate software drivers for hardware components.

Also, the college provides information at the following URL relating to a variety of topics:

https://wiki.geneseo.edu/display/PROVOST/Syllabus+Resources+Related+to+Student+Success