

ECE 4670

Communication Laboratory

Spring Semester 2026

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<https://faculty.uccs.edu/mwickert/ece-4670-communications-laboratory/>

Office Hrs: Tuesday 12:00–1:30pm (always make an appointment at least 1 hour prior to your requested time, available at other times via appointment if necessary)

Course Description: This is a lab offered in conjunction with (or after) taking Communication Systems 1. The goal for this lab is to gain hands-on experience implementing many of the topics covered in the Communication Systems class. Since testing basic communication systems requires the use of various pieces of equipment, the labs are designed to introduce their function as well.

The course text for ECE 4625, Principles of Communications, serves as the theory reference for this course. Individual Lab experiment reader docs and support software, one per lab, can be downloaded from the course Web site.

Grading: The labs plus reports constitute 90% of your total grade. A final lab quiz will be given for 10% of the grade. Grading for the labs will be a mixture of subjective (report format, clarity, etc.) and objective (correct answers) criteria. In order to ensure that partners contribute equally, class participation is required and will be reflected in grading. Lab reports are due one week after the assigned lab time is up. Penalties may be assessed for late lab reports.

Teams: Students will pair up and each partner is expected to participate in the lab work. The ability to work with others in a lab environment is one of the implied goals of this type of class. I may periodically pose questions to students in order to gauge whether or not they are contributing equally.

Topics	Weeks
Lab 1: RF spectrum analyzer and network analyzer	2
Lab 2: Spectrum analysis	2
Lab 3: Mixers and Amplitude Modulation	3
Lab 4: Radio Receivers for Analog and Digital Modulation	2
Lab 5: Frequency modulation, demodulation, and phase-locked loops	2
Lab 6: Software defined radios and the RTL-SDR	3
Lab 7: FieldFox measurement campaign with log-periodic ant.	1
Final Communications Laboratory Exam	1

Important: If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to register with Disability Services and provide them with documentation of your disability. They will work with you to determine what accommodations are appropriate for your situation. To avoid any delay, you should contact Disability Services as soon as possible. Please note that accommodations are not retro-active and disability accommodations cannot be provided until a Faculty Accommodation Letter has been given to me. Please contact Disability Services for more information at Main Hall, 3rd floor, Room 324, (719) 255-3354, or dservice@uccs.edu.

Setting up Python via miniconda

To set up Python alone but with the advantage of virtual environments, miniconda works very well (on Windows install for Powershell). The helper document [new_python_virtual_environment.pdf](#) is provided. To run real-time DSP code in Jupyter Lab or vs code using [pyaudio_helper](#). `pyaudio_helper` runs under Python 3.13.

vs code

Microsoft Visual Studio Code (vs code) is great for writing and debugging Python and Julia code source code files or Jupyter Lab notebooks. *Extensions* are available for Python, Julia, and Jupyter Lab, and many others. See the `Julia_with_Python_Setup` doc linked below for vs code setup info

Export Jupyter Lab Documents to PDF

The easiest and best way to publish your lab reports is to do all of your work in Jupyter Lab making heavy use of Markdown cells for all of your writing. When you are ready to publish to a report *export* the Jupyter Lab document as HTML (*under the file menu choose Save and Export Notebook as...*), then open the HTML file in a Chrome or Edge browser and save as PDF.

Typst

Typst is a new writing tool, similar to LaTeX, but it has a very nice cloud-based interface with real-time preview and one click PDF export. For Lab reports it would give you maximum flexibility in your writing once you export the Markdown and then import the Markdown file into a New Typst document using the Markdown converter. The SVG graphics files that are in the Markdown export zip can be moved directly to Typst and linked as files with custom captions.