

# Audio/Arduino Club – Fall 2024

Gary Tuttle

[gtuttle@iastate.edu](mailto:gtuttle@iastate.edu)

<https://gtuttle.net/audio> , <https://gtuttle.net/arduino>

In conjunction with ISU IEEE student branch.

**Meeting times:** Mondays at 5:30 p.m. – 7:00 p.m. (or so)

**Meeting places:**

For talking: Coover 3043

For building, Coover 2011

# Why the clubs?

To get better at building real hardware, measuring real things, and making real things work — the stuff that real engineers do, but that sometimes get shorted in our curriculum.

# Why Audio and Arduino?

Both are (relatively) easy. Audio is low frequency (20 Hz – 20,000 Hz) and the circuits for doing simple audio work are not complicated. Arduino is a very gentle introduction to embedded systems applications. Most importantly, both things are fun!

# What is required to participate?

Nothing more than a willingness to learn. There are no expectations or obligations. There is no club fee. If you want to participate, just show up at the meetings. You can simply sit and listen to the discussion of audio and Arduino topics. But you will get the most out of the clubs if you try building and testing some of the projects that are offered. If you want, you can present the results from your own original project at a meeting.

# How do the meetings work?

- The meetings rotate through three “modes”: i) discussion of audio topics, ii) discussion of Arduino topics, and iii) time for building projects. Each week will be devoted to one mode.
- In the discussion weeks, there will be a presentation — usually from GT, but anyone can give a talk — about some general topic or the specifics of some project. This year, the presentations will be in Coover 3043 (conference room on the third floor of the addition).
- In the project weeks, we will meet in the lab room and work on building some hardware. Of course, this requires soldering, and that will be one of the first skills to master.
- There is no attendance required. Usually, the meetings are “stand alone”. However, to get the most out of the club activities, it is probably best to attend as regularly as possible.

# What are some audio activities & projects?

- Learn to solder!
- Build stereo headphone amplifier (Altoids amp).
- Build a desktop amp.
- Build a high-power amp.
- Build a class-D amp.
- Build a set of bookshelf speakers
- Build a sub-woofer.
- Build a graphic equalizer.
- Design a PCB.

# What are some Arduino activities & projects?

- Learn to program the classic Arduino.
- Learn about newer version of Arduino.
- Build a “bare-bones” Arduino from scratch.
- Learn how to interact with the Arduino using input devices and displays.
- Build a digital thermometer / controller.
- Build a capacitance meter.
- Build a simple game.
- Learn about real-time clocks and data logging.
- Learn about surface-mount technology.
- Design a PCB.

# How do the projects work?

- Initial projects are designed by GT, and he will have detailed instructions on how to build them.
- Project kits are obtained from IEEE. They will determine the cost of the kits.
- Alternatively, parts can be purchased directly from Digi-Key (or any other supplier). The project description will include a detailed Bill of Materials (BoM).
- The best time to work on the projects is during the “project-building” meetings in the lab room. There will be someone there to provide assistance if you run into problems. But, you can work on the projects any time or any place where you can find a soldering iron.
- No projects are required — you can do none or you can do them all.

# What knowledge / tools are needed to be effective?

- No prior knowledge is required. (We have had students from the Ag College as past club members.) However, it is helpful if you have studied op amps at the level of EE 201 and had learned some programming at the level of EE 285. Even better is some knowledge of electronics at the level of EE 230.
- To do the projects, you will need to know how to solder. It's great if you already know how to do that. If not, there will be ample time to learn.
- Sometimes, we will discuss topics that are taught in higher level classes — like Fourier Transforms and class A-B amplifiers — but you should still be able to do the projects without having detailed advanced knowledge. There are no exams!
- If you have an EE 201 lab kit, you will likely want some of the tools from that: wire cutters, needle-nosed pliers, wire strippers, small screw-driver, wire kit. Or you can buy these tools on your own.



# About G. Tuttle

- BS & MS from ISU. Ph.D. from UC Santa Barbara
- ECpE faculty member for over 30 years. Retired in 2021.
- Specialized in semiconductors: transistors, optoelectronics, fabrication
- Taught EE 201 and electronics (EE 230 and earlier versions) **many** times.
- Taught EE 432 (semiconductor fabrication) **many many** times.
- Also taught EE 285, 332, 438, 436, 439 at various times.
- And many graduate classes, as well.
- At the same time as the Audio & Arduino Club were first held, I also introduced EE 333 to serve the same purpose: to provide students with the opportunity to design and build real hardware. This time for credit.