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Arduino-based Electronics in a Junior-level Advanced Laboratory Course[1] MICHAELA KLEINERT, DANIEL BORRERO-ECHEVERRY, Department of Physics, Willamette University, Salem, OR 97301 — We discuss our experience working with Arduino microcontrollers to develop a project-based alternative to the traditional analog electronics module of our junior-level advanced laboratory course. This module has two parts. During the first part, students carry out tutorial exercises to learn about the basic structure of Arduino programming, as well as a variety of sensors (thermistors, photoresistors, ultrasonic position sensors, etc.), user inputs (switches, potentiometers, etc.), and output devices (LED displays, servo motors, etc.). They also learn how to interface the Arduino with a computer for use as a data-logger. In the second part of the module, students devise, build, and test an electronics project of their own design. Arduinos are an ideal platform for this type of project-based learning due to their low cost, which allows students to experiment without fear of damaging expensive equipment. Examples of student projects include a lightning detector, a Morse code translator, and a variety of interactive games. We present preliminary results from attitudinal surveys administered pre- and post-instruction, which suggest students are more confident in their electronics and programming skills after completing the module. We also discuss ideas for future implementations of the course.

Daniel Borrero
Willamette University

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