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When Will I Ever Use This? Providing a Unifying Theme in the Electronics Laboratory Through Fluid Mechanics Experiments DANIEL BORRERO, Department of Physics, Willamette University, Salem, OR 97301 — We discuss the transformation of a junior-level instrumentation laboratory from a sequence of cookbook labs to a semester-long, project-based course. In the original course, students conducted a series of activities covering the usual electronics topics (amplifiers, filters, oscillators, logic gates, etc.) and learned basic LabVIEW programming for data acquisition and analysis. Students often see these topics as disconnected and not immediately related to "real" lab work. To provide a unifying theme, we restructured the course around the design and construction of a simple fluid dynamics experiment called a Taylor-Couette system where fluid is sheared between rotating coaxial cylinders, leading to a variety of interesting phenomena. The electronics labs were reworked to guide students from fundamental electronics through the design and construction of a stepper motor driver to drive the cylinders. Some of the legacy labs were replaced with a module on computer-aided design (CAD) in which students designed parts for the apparatus, which they then built in the departmental machine shop. Signal processing topics like spectral analysis were introduced in the context of time-series analysis of video data acquired from flow visualization. The course culminated with a capstone project in which students conducted experiments of their own design on a variety of topics in rheology and nonlinear dynamics.

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