

## **Mechatronics at BYU: A New Course for Undergraduate Mechanical Engineers**

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### **Abstract**

In Fall 2015 a required mechatronics course was introduced in the Department of Mechanical Engineering at Brigham Young University as part of a broader curriculum redesign. The course is designed to prepare students to develop smart, microcontroller-enabled products and work in interdisciplinary teams on projects involving mechanical hardware, electronics, and software. Although mechatronics courses often introduce mechanical engineering students to high-level mechatronic design through commercial microcontroller boards, such as the Arduino, our course emphasizes the fundamentals of mechatronics through programming and interfacing single-chip microcontrollers, designing printed circuit boards (PCBs), and low-level system integration. The objective of this approach is to better prepare students to develop real products, which always employ single-chip microcontrollers and custom PCBs. Although this approach requires more intimate knowledge of microcontroller hardware, low-level programming, and electronics than is typically required of mechanical engineering students, our initial results suggest that the level of rigor is appropriate for these students, many of whom excel at mechatronic design by the conclusion of the course. The mechatronics course is part of a required envelope offered in the junior year. The other element of the envelope is a course in system dynamics; the two courses are taken simultaneously and reinforce one another, with system dynamics providing the theoretical background and mechatronics providing extensive hands-on application of those principles through weekly lab assignments and a comprehensive final project that requires student teams to design, build, and program a robot from scratch. In this paper we will describe the development of this course, its structure and relationship to our broader curriculum, and our initial successes and challenges in teaching fundamental mechatronics concepts to mechanical engineering students.