Project-Centered Modules in Mechanical Systems Engineering

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Abstract *— This paper presents a description of hardware and software modules used in dynamic systems and co ntrols and related courses in mechatronics, robotics, and automation in the M echanical Engineering curriculum. The modules span across a common set of equipment and are designed for varying degrees of depth, depending on use in a given course . The objectiv e is to infuse a project -centered paradigm into the Mechanical Engineering curriculum . The idea is to coordinate theories taught in the classroom with physical devices and apparatus used in the project experience s to reinforce theoretical concepts and furt her stimulate student interest in M echanical Engineering courses. This will also help to increase Mechanical Engineering undergraduate student retention rates. In this approach, students conduct hands -on exercises with physical hardware and in some cases a lso conduct corresponding simulations. The extent of the hands on -exercises depends on the course and ranges from supplemental "motivational demonstrations" , to laboratory assignments, to individual projects, to larger scale group projects . Thus, the proje cts are developed in a modular fashion with common physical hardware to be used across a range of M echanical Engineering courses and in varying extent. Undergraduate Mechanical Engineering students are primarily served by the project -centered paradigm discussed in this paper , however, some course s are cross-listed for Civil Engineering and Electrical Engineering , so these undergraduate students also benefit. The physical systems are used to create demonstrations, exercises, and projects for the courses ou tlined in the paper. An initial series of project -centered modules are described . By the nature of the proposed paradigm, modules can be continuously developed, updated, and improved. Thus, the established approach represents a beginning of infusion of the project-centered paradigm into the Mechanical Engineering curriculum. It is expected that the hands-on approach to teaching will prove beneficial as the project -centered paradigm is used to complement traditional teaching methods. Methods to evaluate this outcome are also discussed.*

Index Terms *— Dynamic Systems and Controls, Experimental Equipment, Mechanical Engineering*