Abstract

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A Single Multipurpose Energy Conversion Equipment to Facilitate Interdisciplinary Lab Learning

(approval pending)

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Hands-on lab is vital for learning in the various fields of engineering. However, a great deal of equipment is required to acquire knowledge about the various topologies, controllers, and functionalities. Thus, the cost of establishing suitable labs for such learning is high. To address this matter, the authors have developed a multipurpose energy conversion system (ECS), whose details are given in this paper. This equipment includes reconfigurable hardware and software modules, which can be interconnected to achieve various circuit topologies. Moreover, the software is accessible to users, thereby facilitating quick verification and testing of new ideas. A 500 VA prototype of the ECS was designed, developed, and tested for various possible modes of operation. Several units have been manufactured for implementation in four laboratory courses including control systems, power electronics, mechatronics, and sustainable electric energy systems. This paper describes the development process of this new equipment and its major features; and laboratory modules and the accompanying learning objectives including observations and learning outcomes. The underlying educational values including an outreach activity are discussed.