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LABORATORY LEARNING MODULES ON CAD/CAM AND ROBOTICS IN ENGINEERING EDUCATION

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Abstract. *This paper presents how the manufacturing laboratory facilities, and design/automation hardware and software available at Mercer University School of Engineering (MUSE) are effectively integrated to teach CAD, CAM, integration of CAD/CAM and robotics, and measurement and inspection with appropriate hands-on experiences to engineering students. Some of the laboratory learning modules developed and taught in the manufacturing and robotics courses such as CAD/CAM, robotics and CMM modules and a typical senior design project integrating CAD/CAM and robotics are presented. Selected results obtained on these learning modules from the student team projects are also presented, analyzed, and discussed.*

Keywords: Engineering education, Laboratory learning modules, CAD/CAM, Robotics and automation, Measurement and inspection

1. **Introduction.** The advancement of industrial applications of process technology, computers, and automation demands continuous improvement in the quality of engineering education both in classroom theory and in hands-on practice in design, computer simulation, and manufacturing laboratories. There is a growing need for preparing students both in theory and practice so that they are well prepared to meet the challenges of the job market, especially in the manufacturing industries of the 21st century. A strong multi-disciplinary background is required of new engineering graduates because of increased automation and data networking on the shop floor as well as the globalization of most industries. Assessment of student achievement in engineering design is an important part of engineering education and vital to engineering program accreditation. Systematic assessment of design is challenging yet necessary for program improvement.

Several educators, design researchers and designers from industry have studied and addressed the importance of goals for design engineering education [1], engineering design process [2-4], design considerations and constraints in the design course sequence [5], visualization skills [6], freshman engineering design [7,8], senior capstone design [9-11], and multi-university design project [12].

The objectives of manufacturing engineering education, possible ways of introducing the subject into an undergraduate curriculum, and the urgency for improving it in the educational system that supply industry with engineers have been discussed [13,14]. An integrated reverse engineering and design graphics project for the freshman design [7] and computer-based teaching of a manufacturing process laboratory [15] have been tried and found to be successful.