AC 2008-918: ON-LINE GAMES AND SIMULATION TOOLS FOR TEACHING MANUFACTURING ENGINEERING LABORATORY

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Dr. Czajkiewicz joined the RMU faculty in 2004. He is managing CARES – Center for Applied Research in Engineering and Science and developing industry relations and research activities within School of Engineering, Mathematics and Science. His responsibilities, among others, include: •Fostering technology transfer and research commercialization •Facilitating ongoing research, scholarship and creative activities as well as development of new proposals and opportunities •Coordinating development and design of new programs and new technology applications •Mentoring undergraduate and graduate students and assist faculty in developing their research programs. He has served as president of CIS consulting company 2000-2004, engaging in many international projects involving the implementation of automation and large-scale software systems. He previously served as a faculty member at Texas Tech University, the University of Toledo, Wichita State University and California State University-Fresno, where he was professor and coordinator of the industrial engineering program and director of the Computer Integrated Manufacturing Center from 1989 to 2000. In this capacity he oversaw research and consulting projects funded by industry and research foundations. Dr Czajkiewicz chaired the industrial engineering program, developing class schedules and educational programs, supporting faculty development, budgeting, student advising, implementation of university policies, and mentored international students. His International professional consulting experience includes work in England, Kazakhstan, Germany, USA and Poland.

On-line Games and Simulation Tools for Teaching Manufacturing Engineering Laboratory

One of the main expectations of modern students is that their instructors employ contemporary teaching tools that are user-friendly, fast, colorful, multitasking, efficient and interactive. In response to these changing student needs, both the laboratory content and the delivery methods are being modified over the past three years for almost all engineering courses at Robert Morris University. This paper describes the actions taken by the authors in several courses within the Manufacturing Engineering major to accommodate various digital tools (available free or for charge) in their teaching. For example, in a course titled 'Fundamentals of Manufacturing Engineering', student teams enjoyed playing an on-line game continuously for seven days. The game simulated operations of an entire factory over a period of 5.5 months. They were allowed to change re-order point (inventory management, lot sizing, purchasing), re-order quantity (inventory management), the number of machines by buying or selling them (capacity management), the contract type (contract quotations, supply chain management, customer relationship management, queue management), and schedule policy (production scheduling). Their efforts were assessed in terms of the key business results (cash and investments), management information gathering, data analysis, decision making and team work. A second example that relates to this simulation is Analysis and Design of Manufacturing Systems where students use Microsoft Dynamics – Great Planes system. It is a full-scale ERP (Enterprise Resources Planning) system and students have an opportunity to learn how to implement and setup data in real industrial environment. A third example encompasses use of software tools NI LabView and Circuit Design Suite in designing, troubleshooting, and controlling electrical, electronic and mechatronic systems in various courses. Students design and simulate their assignments, build to realize them, troubleshoot through data acquisition, and develop controls if there is a need for closed loop controls. The effectiveness of deploying these contemporary teaching tools in manufacturing education is demonstrated through ABET outcomes assessment, course performance and student feedback.