AC 2007-1403: CAPSTONE DESIGN AND THE REHABILITATION ENGINEERING PROGRAM

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Don Dekker is currently an Adjunct Professor of Mechanical Engineering at the University of South Florida. He is currently teaching Mechanical Engineering Laboratory I, and Capstone Design at USF. Before his retirement in 2001, Don taught at Rose-Hulman Institute of Technology. He first joined ASEE in 1974 and some of his ASEE activities include Zone II Chairman (86-88), Chairman of DEED (89-90), and General Chair of FIE '87. His degrees are: PhD, Stanford University, 1973; MSME, University of New Mexico, 1963; and BSME, Rose Polytechnic Institute, 1961

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Mr. Stephen Sundarrao is the Associate Director of the Rehabilitation Engineering and Technology Program at USF. His undergraduate and graduate education are in Mechanical Engineering and he has nearly 15 years experience as a rehabilitation engineer and nearly 10 years experience managing a statewide program. He is certified by RESNA as an Assistive Technology Practitioner and Rehabilitation Engineer. He is currently on the Board of Directors of the National Mobility Equipment Dealers Association (NMEDA) and the Florida Department of Health's Disability Taskforce on Bioterrorism. He currently teaches the Capstone Design Course that develops 10-15 new innovative technologies for individuals with disabilities annually. His research interests include advanced vehicle modifications, ergonomics and mobility devices for individuals with disabilities. He recently received the Presidential Award from NMEDA and an award from the University of Miami for Course Development and Recruitment for their online training in AT. He is actively involved with the State VR program to develop policy and training for better integration of RT Services. He was recently appointed to the Advisory Board for the University of Michigan Transportation Research Institute RERC.

Capstone Design and Rehabilitation Engineering at the University of South Florida

The Capstone Design course at the University of South Florida (USF) has evolved over the past years into nearly an ideal course arrangement that increases students' practical design experience, cultivates team work skills and benefits the community. The course is based on a 15 week semester which gives the students an opportunity to work on a 'real-world' problem. This includes designing and building a prototype on a fast-track schedule.

Projects for this course are provided by local start-up companies, industries and many are derived from the State of Florida's Rehabilitation Engineering & Technology Program that is based at USF. This program is a unique program that integrates services to individuals with disabilities with education, research and development. Seven field engineers and six technicians deployed throughout the state identify barriers to accessibility for individuals with disabilities and refer projects that do not have commercial solutions to the Capstone students. These projects range from devices for personal hygiene, wheelchair mobility, driving adaptations to recreation and sports equipment. The program helps people with disabilities become independent and have a better quality of life. These projects are ideal projects for mechanical engineering students and several students have proposed their own rehabilitation engineering projects based on a need from a family member or friend. The ASME Design Challenge can also be used.

The student design teams select a project, clarify the goals, do conceptual design, embodiment design, and detail design. These activities are the essential steps in the design process as described by several authors. During each design phase the teams meet with the instructors weekly and both the results and the team processes are discussed. The final detail design is computer generated and taken to the shop. The faculty and the shop personnel discuss the manufacturability of the design with the design team. The shop produces the parts and then the student teams assemble the parts to produce the prototype.

The class notes discuss the design processes, creativity, personality characteristics, and teamwork. The Myers-Briggs Type Indicator And the Herrmann Brain Dominance Instrument are both discussed, and show students that, each individual brings different strength to the design team. Some will find it easier to be creative and others will find it difficult to meet deadlines and plan. Students are introduced to the vocabulary of successful teams and teambuilding, and asked to comment on the teamwork characteristics of their design team. This "soft" information enables the students to observe and discuss how they work together and, ultimately, work better and smarter.

The students on the design teams become aware that they have three goals. One is "design and build a prototype", the second is to "learn the steps of the design processes", and the third is "manage the design steps". The structure of this course allows the students to experience the design processes, learn about creativity, develop interpersonal skills, practice teamwork, and manage the activities of their design team.