

**Department of Mechanical & Materials Engineering
COLLEGE OF ENGINEERING & APPLIED SCIENCE**

**SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN**

APPLICATION DEADLINE: March 9, 2015

The IMS Center in the Department of Mechanical & Materials Engineering is pleased to offer the following research project for the summer of 2015. Interested students are urged to contact the faculty member(s) directing the project that most interests them. By contacting the faculty member, you can discover more about the project, learn what your responsibilities will be and, if possible, develop a timetable for the twelve-week research period.

**Technologies for Improving the Mobility, Safety and
Independence of Beechwood Home Residents**

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Project Description

Students accepted to this REU program can expect to participate in ongoing efforts in the area of developing technologies for improving, as well as enhancing, the mobility, safety and independence of residents of the Beechwood Home. The Beechwood Home is a not-for profit long-term care nursing facility in Cincinnati, Ohio specializing in providing high quality long-term care together with advanced rehabilitation and restorative services, as well as therapeutic and recreational activities that assist in optimal functionality. Residents of the Beechwood Home live with a number of degenerative neurological and neuromuscular conditions—such as Huntington's, ALS and Cerebral Palsy, among others—all of which result in limiting their physical activity.

The IMS Center is currently focused on three specific areas of research: improving wheelchair safety and mobility; improving residents interaction with their environment through advanced connectivity and autonomous technologies; and resident tracking, both in terms of location and current health condition. Preliminary work is underway by senior design students and a former WISE student in the development of wheelchair safety and resident tracking systems. REU participants will be expected to study existing work in these areas by other organizations, as well as the work of the current students, with the goal of having the REU participants continue this work once members of these teams graduate. REU participants may also consider graduate education with the Center to continue research and work in this area. Graduate researchers from the IMS Center will be available as projects leaders, guides and mentors.

Specifically participants will acquire experience in performing state-of-the-art literature review; understanding and assisting in the design of mechanical and electro-mechanical systems; the principals of data acquisition and analysis; crafting project reports and technical documentation; developing web-based applications; exposure to LabView and practice with MATLAB; exposure to new programming languages, such as PHP, MySQL, HTML/CSS, Arduino; and direct collaboration with a not-for-profit organization. Participants will also gain an understanding of the conditions affecting residents of the Beechwood Home and how engineers and engineering research can bring about positive impacts for members of the community. A list of goals for this project include:

- Integration of senior design student's work into existing tracking system.
- Testing of the developed system at Beechwood Home
 - Build and optimize design of additional prototypes of the RFID-based tag strips
 - Install readers/GPS on wheelchairs
 - Optimize design
 - Collect data
 - Develop/begin implementing a plan to improve if necessary
- Improvement of tracking website
 - Debug indoor mode
 - Optimize code
 - Work with IMS Center researchers on mobile application