

# Mechatronics at CSU

## -New course sequence-

The following courses are the core of an upcoming focus area in mechatronics offered by the Mechanical Engineering Department at Cleveland State University.

Mechatronics, or the study of intelligent machines, has been defined as *“the synergistic combination of precision engineering, electronic control and systems thinking in the design of products and manufacturing processes. It is an interdisciplinary subject that both draws on the constituent disciplines and includes subjects not normally associated with one of the above”*.

Typical mechatronic systems include humanoid robots, autonomous vehicles, photocopy machines, sensor arrays, microelectromechanical systems (MEMS) and artificial organs. Mechatronics is a highly multidisciplinary subject. As its name indicates, it combines electronics and mechanics; however software engineering and outside areas like material science, biology and human factors could also be involved in a mechatronic system.

### **MCE403/503: Modeling and Simulation of Mechatronic Systems (Fall 2005)**

In this course, we will learn how to obtain accurate dynamic models of mechanical, thermal, electrical and mixed systems using modern tools. The Bond Graph methodology will be used, together with the latest concepts in object-oriented modeling and automatic equation generation. The course is 75% theoretical and 25% project work in the laboratory. The Mechatronics Instruction Lab is equipped with a computer-controlled, high-precision linear positioning stage, which will be used as a tool for validating a complete model obtained with the methods presented in class.

Prerequisites: MCE44I or graduate standing.

### **MCE6XX: Interfacing and Control of Mechatronic Systems (Spring 2006)**

In this course we will apply the modeling, simulation and model validation skills learned in the previous course to specific mechatronic sensors and actuators, as well as extended systems. A variety of sensing and actuation technologies will be explored: piezoelectric, capacitive, magnetostrictive, magneto-rheological and others. An introduction to digital control and transducer interfacing will be offered to enable students to realize practical project work in the laboratory. This course is 50% theory and 50% laboratory. A descriptive introduction to micromechatronics will also be offered.

Prerequisite: MCE503.

### **MCE6XX: Data Acquisition and Control for Mechatronics (TBA)**

A detailed examination of techniques, equipment and associated theory for the acquisition and conditioning of sampled data. Introduction to digital filtering and digital control using personal computers and microprocessors.