ME 4370(5370) Mechatronics and Intelligent Machines Engineering

2007 Catalog Data: ME 4370(5370) Mechatronics and Intelligent Machines Engineering. Lec. 2. Lab 2. Credit 3. Prerequisites: ECE 3810, ECE 3860, ME 3050, ME 3060. Mechatronics; number systems; microcontroller technology and architecture of 8-bit microcontrollers (e.g. Motorola MC68HC110); assembly language programming; A/D and D/A conversion; parallel I/O; programmable timer operation; interfacing sensors and actuators; applications; team project on design and implementation of a mechatronic system. [Elective Course]

Prerequisites by Topic:
1. Analysis and synthesis of mechanical systems
2. Electrical circuit analysis
3. Computer programming ability

Textbook and Resources:
Introduction to Mechatronics and Measurement Systems, 3rd Ed., Histand and Alciatore, 2007, McGraw-Hill
An Introduction-Software and Hardware Interfacing, Han-Way Huang, 1996, MC 68HC11, West Publishing Company
Microcontroller Technology - The 68HC11, 3rd Ed., Peter Spasov, 1999, Prentice-Hall
Mechanisms and Dynamics of Machinery, 4th Ed., Mabie and Reinholtz, 1987, Wiley
Theory of Machines and Mechanisms, 2nd Ed., Shigley and Uicker, 1995, McGraw-Hill

Course Objectives: This course provides a significant experience learning about and working on mechatronic systems; systems that integrate mechanical, electrical, control and computer engineering knowledge in design and manufacturing. It expands on the mechanical engineering student's background in both mechanical and electrical circuits courses and provides the opportunity to design integrated mechanical/electrical systems. This course presents the basic tools necessary to develop systems with embedded microprocessor control and to interface appropriate sensors and actuators. Finally, the course offers significant experience working in multidisciplinary teams, primarily with electrical engineering students.

Course Topics:

T1. Introduction to mechatronic systems	(5%)
T2. Circuit analysis	(14%)
T3. Digital devices and logic families	(18%)
T4. Data acquisition and signal conditioning	(9%)
T5. Microcontroller, architecture, programming, implementation	(41%)
T6. Sensors and Actuators, review, application	(13%)

Class/Lab Schedule: Minimum student contact time – 3660 minutes

Course Outcomes: Upon completion of this class, the student will:
C1. Recognize the role of mechatronics in product design and manufacturing [h,i,j,l]
C2. Be able to analyze and design simple analog circuits [a,e]
C3. Be able to analyze and design simple digital circuits, demonstrate this knowledge through application [a,e]
C4. Be able to perform simple data acquisition with signal conditioning [b,k]
C5. Investigate the basic architecture of a common commercial microcontroller [k,l]
C6. Be able to construct programs to use the various functionalities of a common microcontroller, either via assembly or a higher-level language [k,l]
C7. Be exposed to a wide variety of sensors and actuators [j,l]
C8. Gain experience creating a mechanical engineering system that integrates multiple sensors and actuators, and provides supervisory autonomous control through an embedded microcontroller unit [a,c,d,e,I,k,l]
C9. Gain experience working as part of a team on a project or other assignment. [d,g,k,l]

Professional Component: This course is an elective for Mechanical Engineering students taking the mechanical systems or Energy systems Area of Concentration (AOC). It provides experience in the design of mechatronic systems and advanced skills in integrating embedded control in mechanical engineered systems.

Contribution of Course to Meeting the Professional Component:

Math and Basic Science:
General Education:
Engineering: 3 credit hours. This course contains significant design.
Other:

Relation to Program Objectives: This course provides fundamental skills in synthesizing mechatronic systems. It introduces students to the aspects of designing integrated, embedded control systems common in today's society. It provides students with hands-on experience in using a microcontroller to control an integrated system with a variety of sensors and actuators. Finally, the course provides mechanical engineering students with significant opportunities to work closely with students from other engineering disciplines.

5000-Level Credit: Students registered for 5000-level credit will be given additional assignments commensurate with a graduate-level course. The exact nature of these assignments will be specified by the instructor in the Course Policy for that semester.

Course Coordinator: Undergraduate Program Committee

Prepared by: Stephen L. Canfield **Date:** 1-15-08