GE 423 - Mechatronics

Instructors:
The course has been taught by Dan Block who is also the lecturer for ECE 486

Prerequisites:
For this course it is recommended that you have taken a controls course and have had C programming. However there have been students that have taken this class without an equivalent controls class and still did well. C programming is a necessity as the labs heavily involve programming embedded devices with C.

When to Take It:
It is recommended that you take this class sometime your late sophomore year (For those with a good technical background) or later.

Class Content:
This particular class covers a variety of materials that range from basic I/O with embedded programming to making a robot with computer vision. A semi-complete list is shown below.

- Microcontroller Programming (MSP430 and Dual Core ARM/DSP hybrid chip)
- Timers and Digital I/O Registers
- Scheduling: Single Process Application, Hardware Interrupt Scheduler, Real-Time OS, DSP/BIOS Scheduler
- Time Loading Diagrams
- Priority Structure
- Serial Communication
- ADC and DAC Usage
- Shared Memory & Cache
- Misc Hardware
- Usage of Optical Encoder
- PCB Design
- Servo Motor Usage
- Digital Compass Usage
- Rate Gyro Usage
- IR Sensor Usage
- LADAR (Laser Range Finder) Usage
- Ultrasonic Sensor Usage
- Soldering and Prototyping
- CMOS Camera Usage
- Controls Topics
- Implementation of Dead-Reckoning
- Coordinate Transforms
- Dealing with drift from sensors
- Landmark Finding
- Kalman Filtering
- Path Planning
- Obstacle Navigation
- Vision Topics
- Color/Brightness Following
- Centroid Calculation
- BAYER Format
- Distance Finding
- Landmark Recognition
- Obstacle Recognition
- Misc Topics
- Interfacing Robot with Computer and iPodTouch/iPhone
- Using a “Retro” version of Visual Basic

Work:
It's a good deal of work requiring many hours of work outside of lab at times. Homework have hardware components that requires construction on your own time plus a written portion that focuses on math and theory is given as well. Mileage may differ depending on your technical skills.

Life After:
After taking this class you should be familiar with the above topics to the point where you can use them as tools for another project/problem. This class also teaches you how to pick things up fairly quickly and implement solutions to solve a variety of problems.