ME6405
Introduction to Mechatronics
Fall 2005
Instructor: Professor Charles Ume
LECTURE 3
Revision

1. Reading assignment for this week and next week

   Read Chapters 1-4 in Basic Microprocessors and the 6800, by Ron Bishop.

   - Chapter 1  Basic Electronic Principles
   - Chapter 2  Logic Elements
   - Chapter 3  Number Systems
   - Chapter 4  Digital Arithmetic

   There will be questions and answers the rest of this week and next week based on your reading assignment.
2. Why do we teach microprocessor applications (or Mechatronics) in ME?

It used to be taught only in EE.

- Few ME schools/departments were teaching it in early 80's:
  GIT, Stanford, Berkeley, Penn State, University of SC, Rensselaer Polytechnic Institute, British Columbia and etc.

- Reasons: Emphasis in manufacturing and automation

- Today's consumer products (examples: cameras, automobiles, camcorders, sewing machines, TVs) incorporate electronics and micro-controllers
APPLICATION OF MICROCONTROLLERS in Mechatronic Systems/Devices

- Micro-controller is at core of our mechatronic courses as discussed earlier.

- Therefore, it makes sense to discuss its various applications in mechatronic systems or mechatronics devices.
Automobile Industry

• The main application at GM is in the Engine Control Module (ECM) for:
  – controlling the spark, fuel, and air going to the engine to minimize emissions and maximize fuel economy and performance
Automobile Applications Cont’d

Other applications at GM include:

- the new Body Computer Module (BCM)
- entertainment system
- theft deterrent systems
- climate control
- dashboard display
- lighting
- traction control
- navigation systems
- other control functions like transmission, diesel, suspension and power steering controllers.
Automobile Applications Cont’d

Windshield wiper:

- M68HC11-based micro-controller was developed to implement and test smart wiper concept for a car.

- Standard intermittent windshield wiper is concept of smart wiper that automatically turns itself on or off and adjusts its wiping cycle according to intensity of rain.
Factories

- Temperature controls
- Timing functions (various types), e.g., hoppers for measuring flours, sugar, etc.
- Product counting
- Speed control of conveyor belts/chains
- Robot control
- Process monitoring and control
- Humidity Controls
Homes

Smart houses:

- Burglar alarms page you/call police
- Garage door opener
- Temperature control
- Program your thermostat or stove to turn on an hour before you return
- Program light/TV control to turn on at different times during your absence
- Turn a stove/oven on to start cooking/baking before you leave your office
LABS

• Data acquisition systems

• Automating experiments
Consumer Products

- Camera, camcorder, VCR, washing machine, dryer, TV, microwave oven, oven, video games, children’s toys etc.
Sports

US Olympic Committee Rowing Data Acquisition System (RDAS)

- at core of RDAS onboard electronic unit is 68HC11 microcontroller
- current RDAS monitors oar angle, oar torque (force about the oar lock), boat speed, and boat acceleration on four athletes and transmits data to receiving unit integrated with IBM laptop on coach's launch (a small motorboat or a large boat that operates from a ship).
Other Applications

- Flaps in airplane wings, and airplane control surfaces
- NC machines