

ME 601 – Mechatronics in Control & Product Realization Syllabus

Instructor:

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Course objective is to develop a working knowledge of:

- Fundamentals of electromechanical control systems
- Using microcontrollers in products for control and how to create intelligent interfaces
- Motor & sensor interfaces
- C programming
- Control computer system architecture
- Software and hardware principles for computer control

Locations:

- Lecture: ME2145 T 1:00 PM
- Lab: ME2145 W 1:20 PM

Course Pre-Requirements:

- Some high level programming experience, C/C++/Java/Matlab
- Beneficial: - some familiarity with op-amps and digital circuits

Reading and viewing:

- Embedded C Programming & the Atmel AVR 2nd Ed. (Required)
Barnett, Cox, & O'Cull, Delmar Learning, ISBN: 1418039594
- Mechatronics An Integrated Approach (Highly Recommended)
Clarence W. de Silva, CRC Press, ISBN: 0849312744
- Analog Interfacing to Embedded Microprocessor Systems (Recommended)
Stuart R. Ball, Elsevier, ISBN: 9780750677233
- Recommended reading and lecture handouts are on the course homepage

Labs & Homework:

- Homework and Lab Report submissions MUST adhere to the format posted on the course website
- Use of MATLAB may be required in homework problems and labs
- CVAVR & AVRStudio are available on many of the computers at CAE.
- Labs and any homework will not be accepted late without prior agreement.
- You are responsible for fully understanding any homework problems assigned.
- You are responsible for fully understanding the lab assignments.
- You are responsible for increasingly in-depth understanding of lab equipment over the semester.

Contributions to final grade:

50% - Labs & Homework, 20% - Midterm, 30% - Final

The following absolute standards of achievement will guarantee at least these grades:

A	90.00-100%	AB	89.00-89.99%
B	80.00-88.99%	BC	79.00-79.99%
C	70.00-78.99%		
D	60.00-69.99%		
F	59.99-And Below		

Course website: <http://mechatronics.me.wisc.edu/me601>

Notes:

- You are responsible for the lecture notes, labs, any homework, and integrating and extending ideas.
- Understanding of this material, through means appropriate to you, is a requirement.
- This understanding can be achieved through reading, viewing, discussions, labs and problem solving.
- You are responsible for choosing and pursuing the necessary means.
- Plan to spend at least 9-12 hours per week on this course.
- Some students will need to devote more time, some will need less.
- E-mail is the most efficient way to communicate outside of office hours.

Course Weekly Breakdown:

Week #	Lecture Material	Lab Material
1	Passive Circuits, Filters, & Op-Amps	Op-Amp Signal Conditioning
2	Transistors, Solid State Devices, & Relays	Biasing a Transistor and Driving A solenoid
3	Microcontrollers, C Programming Fundamentals	AVRStudio, CodeVision AVR, & JTAG-ICE mkII
4	C Programming Fundamentals, Digital I/O, Digital Logic & Computer Math	MCU Input/Output & Solenoid Driver
5	Interrupts, Timers, & Advanced C Concepts	Timers, Interrupts, & Datastructures
6	Stepping Motors, Fixed Point DDA	DDA Technique Stepper Motor
7	State Transition Diagram Techniques, Keypad & LCD	Keypad Driver & LCD
8	Midterm Exam	Hydraulic/Pneumatic Systems (Program a Press)
9	A/D, Sampling Theory, D/A, Reconstruction	A/D-D/A Lab with Aliasing
10	Encoders, Encoder Counters, LVDTs	Encoder counter Driver lab - Encoder to LCD
11	Communication Interfaces, U(S)ART, SPI, TWI, I2C, USB, Firewire, 1-Wire	Serial Port Communication with a PC/Labview
12	Close Loop Position Servo Control	Motor Control Lab with Data Logging
13	Fixed Point Math	Fixed Point Position Controller
14	PWM, H-Bridges, Mini Sumo Robot	MiniSumo or Other Project
15	Wireless Communications & RTOSes	MiniSumo or Other Project