WASHINGTON STATE UNIVERSITY
VANCOUVER
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School of Engineering and Computer Science

Mech 405: Introduction to Microcontrollers

Catalog Data:	**Mech 405 Introduction to Microcontrollers**; 3 credits Microcontroller architecture, microcontroller programming, mechanical system design with embedded microcontrollers.
Class Schedule:	Three 50-minute lectures per week, for one semester.
Laboratory Schedule:	Lecture sessions converted into laboratory sessions as needed for demonstrations and hands-on activities.
Prerequisites by Course:	CS 251, Mech 304
Prerequisites by Topic:	1. Basic electrical circuits knowledge 2. Basic understanding of computer programming (preferably knowledge of C programming language) 3. Understanding of transducers and hardware interfacing
Required Texts:	Han-Way Huang, *MC68HC11 An introduction, Software and Hardware Interfacing,* 2nd Edition, Delmar Thomson Learning, 2001.
Course Coordinator:	Dr. Hakan Gurocak
Course Objectives:	1. Understand microcontroller architecture 2. Gain experience with microcontroller programming and debugging tools 3. Interface electromechanical systems to a microcontroller 4. Understand microcontroller timing subsystems and their functions 5. Develop real-time sensing and control algorithms
Topics Covered:	1. Introduction to microcontroller architecture 2. Number systems and conversions (decimal, binary, hexadecimal) 3. Basics of microcontroller assembly language 4. Monitor commands, memory map, registers and stack 5. Microcontroller programming in C (data types, operators, expressions, flow control, I/O, functions and program structure, pointers and arrays) 6. Port and register blocks, bit masking and I/O access 7. Hardware interfacing (switches, LEDs, transistor as a switch, relays, H-bridges, stepper motors, servo motors, transducer interfacing) 8. Timer systems (input capture, output compare, pulse accumulator) 9. Interrupt events and polling 10. A/D and D/A system 11. Basic control system implementation using a microcontroller (temperature controller, DC motor speed controller)
Lab Experiments and Activities:	Lecture sessions converted into laboratory sessions as needed for demonstrations and hands-on activities.

Course Outcomes:	Students will be able to:			
	Assessed for Program Outcomes	D-1. Contribute to the team work by sharing responsibilities. D-2 Create conceptual designs for the team project. J-1. Describe the impact of microcontroller technology in a contemporary issue, such as healthcare, environmental, etc. K-2. Program a microcontroller to provide solutions for practical problems.		
	Other	C-2. Design a system with an embedded microcontroller following a design process. C-3. Design a system that will meet realistic constraints such as economical, manufacturability, safety, etc. C-4. Build a system prototype that meets design specifications. G-2. Deliver project presentations.		
Required or Elective Course:		Elective		
Contribution to Professional Component:		Engineering Topics		
Relationship of Course to Program:		Meets: Educational Objectives 1, 2, 3, 4 Program Outcomes C, D, G, J, K		
Prepared by:		Dr. Hakan Gurocak	Date:	October 10, 2008
Approved by CAC:				