Required Course:	**ECE 36200 Microprocessor Systems and Interfacing**
Credit and contact hours:	(4 cr.) Class 3, Lab 3
2020-21 IUPUI Campus Bulletin description:	ECE 36200 Microprocessor Systems and Interfacing (4 cr.) P: ECE 27000 and ECE 26300. Class 3, Lab 3. An introduction to basic computer organizations, microprocessor instruction sets, assembly language programming, the design of various types of digital as well as analog interfaces, and microprocessor system design considerations. Laboratory provides practical hands-on experience with microprocessor software application and interfacing techniques. Design and implementation of a simple three-bus computer; detailed study of a particular microcomputer architecture and instruction set (Motorola 6812); assembly language programming techniques; system control signals and I/O port design and handshaking protocols; interrupt control systems; LSI parallel and serial interfaces; analog data and control interfaces.
Prerequisite or corequisite:	P: ECE27000 or ECE20400
Prerequisites by topic:	1. Digital circuits design 2. Hexadecimal and binary number representation, signed and unsigned numbers, ASCII codes 3. Any high-level programming language such as C 4. Electronic measurements using multimeter and oscilloscope
Textbook:	1. Pack, Daniel, Microcontroller Theory and Applications HC12&S12, Pearson Prentice Hall, 2008. ISBN 9780136152057 2. Lecture Notes
Coordinator:	John Lee, Associate Professor of Electrical and Computer Engineering
Goals:	To teach techniques for programming in assembly language and the design of a microcontroller-based embedded system.
Outcomes:	Upon successful completion of the course, students should be able to 1. Write and document assembly language programs including subroutine and macros [1] 2. Write and document assembly language programs with interrupts [1] 3. Design simple computer hardware circuits that include interfacing of CPU, memory, and I/O to system buses [1] 4. Apply interfacing techniques such as polling, interrupts, and handshaking to applications [1] 5. Explain the operation of serial communication [1] 6. Explain program development environment tools such as editors, assemblers, linkers, and debuggers [6] 7. Interface to commonly used peripherals such as LED, DIP switch, stepping motor, and DC motor [1]
Topics:	1. Introduction to microcontrollers (1 class) 3. Assembly programming techniques (13 classes) 4. Interrupts and their programming (3 classes) 5. CPU interface to address, data, and control busses (2 classes) 6. Memory interfacing (4 classes)

	7. I/O peripheral interfacing (4 classes) 8. Exams (2 classes and final exam period)
Computer usage:	PC and 68HC12-based single board computer, 68HC12 assembler and linker, integrated development environment.
Laboratory projects:	Students write 68HC12 assembly language programs and do experiments on computer hardware interfacing. Each lab experiment workstation has a PC and a 68HC12 based single board computer that are used to edit, assemble, debug, and execute the program. A digital voltmeter and an oscilloscope are also equipped with each lab experiment workstation. In an embedded system design final project, students will learn how to design, implement, and test a microcontroller-based embedded system.
ABET category:	Engineering science 50%, engineering design 50%.
Prepared by:	John Lee
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