The University of Texas at Tyler
Department of Electrical Engineering

EENG 3307: Microprocessors (required)

Syllabus

Catalog Description:

Microprocessor architecture, programming and interfacing. Introduction to assembly language programming; Microcomputers, microcontrollers, instruction set, chip interfacing, addressing modes, interrupts, input/output, communication. Three hours of lecture per week with integrated laboratory sessions. **Prerequisites:** EENG 3302 and COSC 1336/1436

Prerequisites: EENG 3302 - Digital Systems, COSC 1336/1436 – Programming

Credits: (2 hours lecture, 3 hours laboratory per week)

Text(s): Ronald J. Tocci and Frank J. Ambrosio, **Microprocessors and Microcomputers: Hardware and Software, 6th ed**. Prentice Hall, 2003
ISBN: 0-13-060904-8, ISBN-13: 9780130609045

Additional Material: Motorola 68HC11 Development Board. Laboratory projects are integrated to provide students with hands-on experience.

Course Coordinator: Mukul V. Shirvaikar, Professor

Topics Covered: (paragraph of topics separated by semicolons)

Microcomputer Fundamentals: number systems, codes, digital circuits, memory devices, and introduction to computers; Microprocessors: elements, structure, operation, memory, bus architecture, and instruction set; Microcomputer Programming: assembly language, arithmetic operations, decisions, loops, tables, lists, subroutines, and interrupts; Microcomputer Interfacing: input/output modes, serial and parallel interfaces, synchronous and asynchronous communication.

Evaluation Methods: (only items in dark print apply):

1. Examinations/ Quizzes
2. Homework
3. Report/ Paper
4. Computer Programming
5. Project/ Model
6. Presentation
7. Course Participation
8. Peer Evaluation

Course Learning Outcomes[1]: By the end of this course students will be able to:

1. Solve problems involving conversions between decimal, binary, octal and hexadecimal number systems, signed numbers, arithmetic operations, floating point numbers and representation standards [1]
2. Understand the operation of basic digital systems in the context of microcontroller design including parallel/serial transmission, tri-state logic, clocking, flip-flops and registers, data bus operation [1]
3. Demonstrate knowledge of memory systems including architecture, operation, types, read/write cycles, timing diagrams, applications and techniques to expand word size and capacity [1]
4. Explain the basic operational principles of microprocessors and microcontrollers including architecture, instruction formats, machine language, program and data sections, firmware, step-wise program execution detail and the fetch-decode-execute cycle [1]
5. Design complete and partial address decoding schemes for the microcontroller using memory modules, memory maps, read/write timing and logic components like decoders and tri-state buffers [1]
6. Identify and explain the microcontroller operation from functional block diagrams including: register section, ALU, timing and control, multiplexed buses, pinout, modes of operation and signals [3]
7. Analyze the various types of microcontroller assembly language instructions including addressing modes, processor condition codes, speed of operation and analysis of programs or code segments [3]
8. Outline the operation of an assembler and implement the entire process of writing, compiling, loading and running an assembly language program [3]
9. Illustrate the following concepts and their implementation on the microcontroller: stack operation, interrupt service routines, reset vectors, memory maps, time delay routines [1]

10. Formulate microcontroller input-output solutions utilizing general purpose I/O, interrupts and the timer subsystem [3]
11. List input/output interfacing solutions for issues like voltage mismatch, implementation technology mismatch, power requirements, isolation from electrical loads, and parallel/serial interfacing [1]
12. Implement microcontroller applications using peripherals like the serial interface and the analog-to-digital convertor (ADC) subsystem [3]
13. Incorporate information gained by independent learning from microcontroller technical reference manuals and other sources to implement projects and enhance reports [3]
14. Utilize modern software and hardware tools and techniques to design, debug and test microcontroller based projects using assembly language programming [4]
15. Perform laboratory experiments utilizing microcontroller systems demonstrating combined hardware-software interaction, co-design and debugging [3]
16. Write laboratory reports with experimental results demonstrating visual and written communication skills [3]

[1]*Numbers in brackets refer to method(s) used to evaluate the course objective.*

Relationship to Program Outcomes (Student Learning Outcomes) [2]: This course supports the following Electrical Engineering Program Outcomes, which state that our students will:
1. have the ability to apply knowledge of the fundamentals of mathematics, science, and engineering; [1, 2, 11]
2. have the ability to use modern engineering tools and techniques in the practice of electrical engineering; [8, 14]
3. have the ability to analyze electrical circuits, devices, and systems; [3, 4, 6, 7, 9]
4. have the ability to design electrical circuits, devices, and systems to meet application requirements; [5, 10]
5. have the ability to design and conduct experiments, and analyze and interpret experimental results; [12, 15]
6. have the ability to identify, formulate, and solve problems in the practice of electrical engineering using appropriate theoretical and experimental methods; [10]
7. have effective written, visual, and oral communication skills; [16]
8. possess an educational background to understand the global context in which engineering is practiced, including:
    a. knowledge of contemporary issues related to science and engineering;
    b. the impact of engineering on society;
    c. the role of ethics in the practice of engineering;
9. have the ability to contribute effectively as members of multi-disciplinary engineering teams;
10. have a recognition of the need for and ability to pursue continued learning throughout their professional careers. [13]

[2]*Numbers in brackets refer to course learning outcome(s) that address the Program Outcome.*

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:		hours
Engineering Sciences and Design:	3	hours
General Education Component:		hours

Grade Replacement:

If you are repeating this course for a grade replacement, <u>you must file an intent to receive grade forgiveness with the registrar by the 12th day of class.</u> Failure to file an intent to use grade forgiveness will result in both the original and repeated grade being used to calculate your overall grade point average. A student will receive grade forgiveness (grade replacement) for only three (undergraduate student) or two (graduate student) course repeats during his/her career at UT Tyler. (2006-08 Catalog, p. 35)

Prepared By:	Mukul V. Shirvaikar	Date:	August 8, 2003
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