

EET 254
Machine Language for Microcontrollers

Department of Technology
Spring 2009

Instructor:	Prof. Vigs Chandra, PhD
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Class schedule:

Section: 001, CRN: 20231; MW 10:10 am - 12:05 pm, Room 407/403

Office Hours:

MW: 8 - 10 am, MTWR: 4 - 6 pm. If my office door is open at other times I will most likely be available for discussion. Come right in.

Credit hours:

3

Prerequisite/Co-requisite:

EET252 (Digital Electronics).

COURSE DESCRIPTION:

Machine language programming for ROM based microprocessor based industrial controllers. Emphasis on software manipulation of I/O control devices in real-time, interrupt driven, process control environments.

TEXTBOOK:

The material covered in-class using a combination of lecture, demonstration and laboratory activities will serve as the main source of information for EET 254.

Miller, G. H. (2004). Microcomputer engineering (3rd ed.). New Jersey: Prentice Hall. (ISBN: 0131428047)

The 2nd edition of the text (ISBN: 0138953686) published in 1999 may be used as well.

COURSE OBJECTIVES:

Upon completing EET 254 the student should be able to:

- A. Explain the fundamental structure of a microcontroller.
- B. Construct circuitry capable of interfacing with a microcontroller.
- C. Develop the list the steps along with a flowchart for solving a problem.
- D. Write and debug software programs for a microcontroller.
- E. List and explain the function of fundamental registers found in a microprocessor.
- F. List and describe commonly used microcontroller addressing modes.
- G. Write machine language and assembly programs that utilize different instruction groups and addressing modes.
- H. Explain operations for the following instructions' groups: data movement, arithmetic/logic, and conditional/unconditional branching, miscellaneous.
- I. Read and understand the specifications for programmable microcontroller I/O ports.

COURSE OUTLINE:

- A. Introduction - Number systems and codes; digital combinational and sequential circuits
- B. Block diagram of a microcomputer
- C. Microcontroller I/O connections and conditioning
- D. High and low level microcontroller programming languages
- E. Flowcharts for documenting the steps needed for solving problems
- F. Programming microcontrollers
- G. Microcontroller internals – registers, accumulator, program counter, memory, I/O, condition code registers.
- H. A machine language debugger
- I. Addressing modes
- J. Data move instructions
- K. Math and logic instructions
- L. Decision making instructions and loops

M. Stacks and subroutines

N. Interrupts and exception processing

O. Parallel and programmable I/O microcontroller functionality

COURSE REQUIREMENTS:

Students are expected to:

- Attend each lecture and laboratory session.
- Complete all assignments, paragraphs and laboratory activities on time.
- Complete the assessments covering material from: homework, labs, and from assigned readings in the text.
- Maintain a 3-ring binder or folder for organizing class materials.

EVALUATION:

Each student will be evaluated as follows:

- Assessments (40%) – 3 assessments including a final.
- Homework (15%) – approximately 6-9 homework assignments
- Lab assignments (35%) – approximately 10-12 laboratory activities including simulations
- Paragraphs (10%) – approximately 3-5 based on topics being discussed in class

1st assessment – In-class, covering lectures and laboratory activities related to number systems; fundamentals of microcontroller hardware, registers, flowcharts, and programs; addressing modes, basic assembly code. To be held during the 6th week (Feb. 16 – 20) of the semester.

2nd assessment – In-class, covering lectures and laboratory activities related to machine and assembly programming, including arithmetic and logic operations; branching. To be held during 12th week (March 30 – April 3) of the semester.

Final Assessment – In-class, comprehensive, covering all class materials, including lectures and laboratory activities. The final assessment will be weighed more than the 1st and 2nd assessment. To be held Wednesday, May 6, 8 am – 10 am.

Paragraphs - Paragraphs related to selected topics related to microcontrollers, are to be submitted every 2-3 weeks. These should cover advances in the field of microcontrollers or embedded digital devices. The articles should be from a recent (2007 onwards) source, preferably a conference paper, or related internet web site. Summarize in your own words the main points of the articles, what you found most interesting, and indicate how it relates to class discussions or laboratory activities. Students will be invited to share their findings with the rest of the class. Complete references about the article on which the paragraph is based should be provided, including information about when it was retrieved from the web, and preferably a copy of the article itself, should be provided. The references should preferably be formatted using American Psychological Association (APA) guidelines available at <http://nutsandbolts.washcoll.edu/apa.html>.

Refer to the online ECU library's Academic Search Premier database (<http://www.library.ecu.edu/new/index.php>), for identifying sources of technical articles. Access the Databases tab on the main ECU libraries page, and select the Academic Search Premier database. An online video tutorial on using the ECU library databases for retrieving articles is available at: http://www.people.ecu.edu/chandrav/Ref/online_search_ECU_libraries.wmv.

You may rework and resubmit your labs, homework, and assessments (excluding the final) for limited partial credit.

Lab hardware:

Students enrolled in EET254 will be issued a parts kit in order to conduct laboratory experiments. Kits will be distributed when related laboratory exercises are assigned. The kits are to be returned at the end of the semester. You may need some of the hardware components from the prerequisite (EET 252, Digital Electronics) course.

Attendance Policy:

After the second unexcused absence, each unexcused absence will cause two percent deduction in the overall percentage. Five (5) and seven (7) unexcused absences will result in one letter grade lower each. Your grade will be an automatic F if you have more than seven (7) unexcused absences. If you have a university accepted excused absence, make-up work is permitted with no penalty. Makeup labs/exams will be permitted only if you had sought and received my approval prior to the absence which caused you to miss the related lab/exam. You will benefit most by way of understanding the content of the course by completing all the assignments in a timely manner. If you know in advance that you will be absent, please inform me at the earliest. Email (vigs.chandra@ecu.edu) usually is the fastest way of contacting me, or you may call (859) 622-1187.

Academic Integrity Statement:

Students are advised that ECU's Academic Integrity Policy will strictly be enforced in this course. The Academic Integrity policy is available at <http://www.academicintegrity.ecu.edu>. Questions regarding the policy may be directed to the Office of Academic Integrity.

Cell Phones:

Cellular phones should be off or on silent ring during class in order to keep classroom distractions at a minimum. Under special circumstances students are permitted to use the phone but should seek my approval prior to class.

Grades:

100-90%	=	A	69-60%	=	D
89-80%	=	B	Below 60%	=	F
79-70%	=	C			

Saturday, March 7 - Mid-term grades will be viewable online using ECU Direct (EKUDirect/StudentService/Midterm Grades - Student records).

Monday, Jan. 19 - End of Add/Drop period: Last day to drop a full-semester course without a "W" appearing on your university transcript; last day to register for or add additional full-semester courses. It is the last day for a full tuition refund. It is also the last day to convert

"Pass-Fail" or "Audit" classes to a normal grade and credit option. Completed forms must be returned to: Registrar's Office (SSB 239), or Corbin, Danville, or Manchester EKU offices.

Friday, Mar. 20: (Friday of the 10th week of semester) – Last day to withdraw full-semester classes or withdraw from the university.

Tuesday, May 12 – Final grade available online (EKUDirect/StudentRecords/Official Grade Report).

STATEMENT OF DISABILITY:

ADA

If you are registered with the Office of Services for Individuals with Disabilities, please obtain your accommodation letters from the OSID and present them to the course instructor to discuss any academic accommodations you need. If you believe you need accommodation and are not registered with the OSID, please contact the Office in the Student Services Building Room 361 by email at disserv@eku.edu or by telephone at (859) 622-2933 V/TDD. Upon individual request, this syllabus can be made available in an alternative format.

☺ The work you do in the laboratory, and the grade you earn, should reflect your personal abilities, and accomplishments. Individual homework and lab reports are required from each student. I encourage you to discuss class assignments with other students. However any work you submit must be your own.

☺ Any suggestions leading to improvements in the content or presentation of the course, especially in the laboratory work, are most welcome.