

EE461 MICROPROCESSOR-BASED DIGITAL DESIGN

Course Policy

Spring 2008

1 Objective

EE461 Microcomputer-Based Digital Design is a course for students majoring in electrical engineering and for other engineering students interested in the subject. Its purpose is to give students a deeper understanding of digital logic than is accessible through introductory courses. This understanding extends to studying how to include digital computers in larger electronic systems and how to program them to control other equipment. The course emphasizes lab work and requires a course project. The objectives of the course are to: learn how to design state machines to perform complex tasks using programmable logic devices or memories; learn how to embed a high-speed microcontroller with on-chip peripheral devices within a larger system; become proficient at programming a microprocessor using assembly language.

The course syllabus lays out in detail the topics which we shall cover in the course. The course syllabus, this course policy, and other documents pertaining to the course can be found on the course web site at <http://www.usna.edu/EE/ee461/>.

2 Textbooks

1. Sid Katzen, The Quintessential PIC Microcontroller, Springer, 2005.
2. PIC16F87X 28/40-pin 8-Bit CMOS FLASH Microcontrollers, Microchip Technology Inc., 1999.

This textbook will be lent to students and must be returned at the end of the course. It is also available on the world-wide web in portable document format at <http://www.usna.edu/EE/ee461/SupplementaryMaterial/>

3. Stephen Brown and Zvonko Vranesic, Fundamentals of Digital Logic with VHDL Design, 2nd edition, McGraw-Hill, 2005. [optional]

3 Homework and Labs

3.1 Homework

Homework assignments are mandatory. You will need them, along with the dates they are due, on the web at <http://www.usna.edu/EE/ee461/Homework/>. I will grade selected problems. I award zero credit for late homework. Exceptions to this policy will be made in cases of illness or other extraordinary circumstances. (Movement orders do not qualify as extraordinary circumstances.)

Solutions to the homework problems will be posted on the web. Collaboration with your fellow Midshipmen is permitted and encouraged. Such collaboration is a hallmark of all professional officers. However, the assignment you hand in must be your own. Claiming someone else's work as your own is totally unacceptable. List the names of all midshipmen who assisted you with your assignment or lab, sign the list, and include it when you hand in the assignment. Collaboration is not permitted during quizzes, tests, or exams. Homework must be well organized, legible, and self-contained. To be self-contained there must not be any need to look somewhere else to find out what the question was: the question must be reproduced in full, including any diagrams associated with it. Submit your homework on green engineering paper, stapled together, with the name of the course, your section number, your own name, the assignment number, and the number of each problem clearly visible. It is permissible to photocopy the problem statement, if

you prefer, before providing your solution. If I cannot read your solutions, understand them, identify the answer or answers you claim are right, and match all components in your schematic diagrams to symbols in your solutions, then your solutions will not get full or possibly any credit. Include all measurement units (e.g., volts or amperes) where appropriate. If I deem your effort to be inadequate I will award you no credit.

3.2 Labs

This course is heavily dependent on lab work. I expect you to keep a lab notebook with detailed plans, schematic diagrams, ideas, methods, and observations. From such notes you will find it easy to prepare lab reports. Avoid erasing material from your lab notebook. Cross it out, annotate it if necessary, and press on. The lab notebook is not intended to be beautiful: it is intended to be practical and complete. If you have to design a circuit, include a schematic diagram of it, too, along with an explanation of it. Properly labeled schematics include:

1. A name for the circuit or subcircuit.
2. A unique name on or beside each part. It is customary to use prefixes and suffixes, as $R1;R2; ;$ for resistors; $C1;C2; ; ;$ for capacitors; $L1;L2; ; ;$ for inductors; $U1;U2; ; ;$ for integrated circuits; and $D1;D2; ; ;$ for diodes.
3. For integrated circuits, place pin numbers outside the box and internal signal names inside the box. Examples of pin numbers are 1; 2; ; ; ; examples of internal signal names are A1 or D.
4. External signal names appear on wires connecting the components. Examples are Clock or Reset.
5. Electrical quantities which are expected at a certain point should be indicated. For example, if you use a voltage source to provide a five volt DC reference level, mark it as 5 V. If you need to write a computer program, include the output of the assembler--the listing file, with extension .lst-- in your report, along with a clear explanation of its operation. Do not include the input to the assembler--the source file, with extension .asm-- in your report: it is shown in a more useful form in the listing file.

You will be permitted access to the lab after hours. It is unlikely the two hours of scheduled lab time each week will prove sufficient. For a course offering four credit hours, like this one, you should be doing an additional eight hours of work each week outside class time. You will be permitted but not required to work with a lab partner. I encourage you to help and get help from other students in the lab. Partners must submit a single lab report with both their names upon it. In all cases, submit your lab reports at the beginning of the Monday class during the second week following that in which the last scheduled session of the lab is held. For example, the lab on Introduction to PIC has its second and last section on Thursday, 25 January 2007. The report is due on Monday, 5 February 2007. If you get help from other students, acknowledge this help and name those students in your report.

Further details on lab notebooks, lab reports, and software documentation standards are on the web at <http://www.usna.edu/EE/ee461/Lab/>.

4 Quizzes

I will hold short quizzes every week or two. Unless other wise noted, all quizzes will be open-book.

5 Tests and Exams

There will be two midterm tests of one hour and 50 minutes length during the lab period. The final exam will be three hours in length and it, too, will be held in the lab. You may use any books, notes, or computer programs you like during tests and exams. However, any program or device that lets you receive help from anyone else is specially prohibited. Sharing of calculators or any written materials with other students in the class during tests and the exam is also prohibited.

Let me know in advance if you will not be able to attend during an exam. Unexcused absences will result in a grade of zero for that exam. Exams will have a strict start/stop time. You shall immediately place any writing instrument in your hand on the desk/table top and close the exam (cover sheet on top). I shall keep the class apprised of the time remaining.

6 Calculators

Unless otherwise noted, you may use a calculator in every class, lab, quiz, test, and exam. I will not permit you to share calculators during tests, exams, or quizzes. If your calculator doesn't work and you have not brought spare batteries, plan to do arithmetic manually. In the case of tests and exams, when a computer is available, you may use calculator programs on the computer if you wish.

7 Grades

I determine nominal grades using the weightings shown in Table 1. However, I reserve the right to alter course letter grades up or down based on your class participation, performance trends, and my overall impression of your performance.

	6 Week	12 Week	16 Week	Final Grade
Final Exam	--	--	--	25
Lab Project	--	--	15	10
Test 2	--	25	20	15
Test 1	50	25	20	15
Quizzes	20	20	15	10
Homework	5	5	5	5
Lab Reports	25	25	25	20
Class Participation	X	X	X	X

Table 1: Grade Weightings

8 Extra Instruction

For EI, bring your course notes, homework problems, and specific questions or problems confronting you. If you are having trouble learning the material and applying it to solving problems, designing circuits, or designing programs, it would be wise to get extra instruction. Feel free to drop by my office, or set up an appointment to assure that I will be there. I will accept phone calls at home up to 2200 and will do my best to give decent assistance by telephone. I am almost invariably in my office by 0730, if not earlier. Finally, you may ask me questions via e-mail, too.

9 Administrative Matters

9.1 Questions

Feel free to ask questions in class. I would rather clear up a difficulty immediately than see you cease all progress because of a misapprehension. If it is indicated, I may ask you to schedule extra instruction.

9.2 Sleeping/Surfing in Class

Even if you are drowsy, *do not sleep in class*. Stand up quietly and go to the back of the room or take a visit to the restroom. You do not need my permission to do so. When you are ready quietly return to your seat. Also, during lecture time, there will be no computer use allowed. You can use the computers during non-lecture time.

9.3 Omitted Material

I cannot possibly cover everything during class. If some topic or example is not covered, that does not mean it is unimportant. Refer to the EE461 course objectives at URL <http://www.usna.edu/EE/ee461/EE461CourseObjectivesSpring2007.pdf> to make sure you have not overlooked anything.

9.4 E-mail and the Web

I plan to rely heavily on e-mail and the web to communicate with you. Check your e-mail at least daily so you don't miss something I send you. Bear in mind that email is not instantaneous: although the mail may be in my box, I may not read it for some hours.

9.5 Absence/Makeup Policy

You must notify me prior to missing class if you will be absent. Arranging for makeup of exams, quizzes, or labs is your responsibility and must be done within one week.

9.6 Section Leader's Duties

I will appoint a Section Leader and an alternate during the first class. The alternate will fill in for the Section Leader if the latter is absent. I require the Section Leader to call the section to attention and report the names of absent students at the start of class; collect and submit all homework and other assignments to me at the start of class. Separate different assignments into different piles; call the class to attention for dismissal at the end of class; muster the class in the Maury Hall parking lot during emergencies, fire drills, etc., and report absences to me; and contact the EE Department by phone (3-6150) if I am more than 10 minutes late for class to ask my whereabouts. If I am not expected to arrive at all, direct the class in a study period, collect all homework, and deliver it to the EE Office before the close of business that day. Do not dismiss the class early.

I am obliged to report Midshipmen who are late or absent or who leave early.

9.7 Eating and Drinking in Class

Food and covered drink containers are allowed. You are collectively and individually responsible for keeping the classroom clean. Abuse of this privilege will result in food and drinks being banned altogether.

9.8 Contacting the Instructors

Instructor: Assistant Professor Ryan Rakvic
Telephone: (410) 293-6166 (Work)
E-mail: <mailto:rakvic@usna.edu>
Office: Maury Hall 217