EE 460N - Computer Architecture
Unique Numbers: 17820, 17825, 17830, 17835

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Office Hours: MW 6:30 to 7:30 PM, plus by appointment
Course Title: Computer Architecture.
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First, a word about Covid, the elephant in the room

Covid is still with us so we need to pay attention so as to not put ourselves at undue risk. I plan on lecturing in-person Monday and Wednesday in ECJ 1.202 for several reasons: (1) I think education in-person is far better than doing so over Zoom. (2) ECJ 1.202 is a particularly good classroom that will accommodate all the students attending with acceptable social distancing. (3) If you have been vaccinated and wear a mask, even better. I am considering additional measures to make our learning environment safer which I will share with you from time to time. If you are concerned about any of the above, please speak to me about it. I will do my best to provide an environment where you can learn best.

Course Overview

This course, in my view, represents a serious introduction at a senior undergraduate level into how computers work. I believe that computing involves architecture at many levels. We will focus on the instruction set architecture level (sometimes called the machine architecture) and the microarchitecture level (often called the implementation architecture or computer organization). We will review to some extent the level below the microarchitecture (the logic design level), relying mainly on knowledge you already have obtained, and we will cover to some extent the level above the instruction set architecture (program translation) in order to demonstrate our understanding of some of the concepts. The intent of the course is to provide a comprehensive understanding of how the various levels play together, and remove a good part of the mystery pertaining to how the machine works.

A separate handout contains a lecture by lecture outline of the course, along with dates for all assignments, quizzes and the final exam.

What I expect: I expect to assign a substantial number of homework problems and in addition six programming assignments. I hope to cover most of the material one should expect in an introduction to computer organization, but I expect to not read to you from any textbook. You should consider my lectures and the corresponding treatments in various textbooks as different approaches to learning the same material. The problem sets are a way for you to check to see if you are getting it.

I will not take attendance, and attendance will not be considered in the grading. At this point in your education, I believe it is for you to decide how to allocate your time. You must decide whether I am providing enough that is useful in class to justify your coming to class.

I encourage you to study in groups, and to come to my "office" in groups. That usually will result in all of you understanding the material better. You are encouraged to ask questions. You are encouraged to challenge assumptions. Computer Science and Engineering deals with "nature" that is man-made (person-made, actually, but that is awkward) and so we the people may have made it wrong. I tend to respond thoroughly (usually too thoroughly, I am often told) to questions, using the question as an opportunity to introduce new material. You, working with other members of your study group, can often unravel my response to the benefit of all members of the group much better than one person can, working alone.

If you are part of a study group, you will need to turn in only one copy of a solution to a problem set for the entire group. The front page should contain the names of all members of the study group who have contributed to the solution. Each student will receive the same grade for that problem set.

In the spirit of learning from each other, **you are invited to work together with one other person on the first two programming labs.** If you choose that option, only one copy of the program solution should be turned in, but both of your names should be clearly stated on your submission. You will both receive the same grade on those two programming labs.

Although I encourage you to study together, **examinations and your work on programming lab assignments 3, 4, 5, and 6 must be your own individual work**.

Meeting Info

The course consists of three hours of lecture plus a 1 1/2 hour discussion session each week. Lectures will generally take place MW, from 5pm to 6:30pm in Room ECJ 1.202. The compile-time schedule of lectures and discussions can be found in the Course Syllabus, although it could change depending on how rapidly (or slowly) we cover various topics. When faced with answering a student question or staying on schedule, I almost always opt for answering the question. Thus, the dynamic schedule of my lectures will probably not be known until run-time, since we are likely to adapt the schedule where it seems to make sense.

There will be three discussion sections each week. Right now, the Class schedule lists four discussion sections, but it looks like one of these will be cancelled.

> 17820: Friday, 1:00 - 3:00pm @ EER 1.512
> 17825: Friday, 3:00 - 4:30pm @ EER 1.512
> 17830: Thursday, 3:30 - 5:00pm @ PMA 6.112
> 17835: Thursday, 5:00 - 6:30pm @ PMA 6.112

You are free to attend any discussion section you choose, or more than one if you wish. Also, you are free to switch discussion sections as often as you wish during the semester.

Teaching Assistants

Kayvan Mansooshahi, Michael Chen

Course Home Page

`http://www.ece.utexas.edu/~patt/20f.460N`

Textbook

There is no required textbook for the course. I will make available as appropriate copies of notes I will use throughout the course. I am in the process of writing a textbook for 460N, which will become the required textbook when (if ????) it gets done. If I have chapters ready for you, I will distribute them to you.

Over the years, my TAs have noted terms that I have used in class, and I have compiled definitions of all of them into a file, which is located on the course web page under Handouts, as **Glossary of Buzzwords.** I admit that this is not a textbook. However, I have been told by students that it is a very useful reference for the various concepts discussed in class. Each semester, my TAs bring me any terms (buzzwords) I have used for the first time, and I create entries for those terms in the Glossary.

In addition, **three textbooks are identified below as containing useful information** on the material covered in the course. If you find it useful, you may want to obtain a copy of one of them and share it with other members of your study group. In that way, each student can benefit from more than one author's interpretation of the material. Some students have successfully completed this course without ever looking at any textbook. Others have found it useful to purchase several textbooks. They are available on the web at very little cost. You should use your own best judgment on this.

The three textbooks are:

> Harvey G. Cragon, Computer Architecture and Implementation, Cambridge University Press, 2005, ISBN-13: 978-0521657051.

> Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian Computer Organization, 6th Edition, McGraw Hill, Jan. 2011, ISBN-13: 978-0073380650.

> Andrew Tanenbaum, Todd Austin Structured Computer Organization, 6th Edition, Prentice Hall, Aug. 2012, ISBN-13: 978-0132916523.

Prerequisites

The prerequisites for the class are EE 312 and EE 319K, with a grade of C- or higher in each class. It is also assumed that you can probram in C. If you are not conversant in C, it is assumed that you are willing and able to pick up what you need to know to be able to

complete the six programming lab assignments. You should feel very comfortable asking either TA any question about C.

Additional course resources

As noted above, class handouts will be supplied when necessary to supplement the concepts discussed in lecture. I have also prepared a number of .ppt presentations on individual topics. They are available in the Handouts section of the course website. Other information will be downloadable from the course home page.

Homework policy

Problem sets will be assigned as specified in the syllabus. Additional problems may be assigned whenever I feel it is appropriate, based on something that came up in class. Usually, you will have between one and two weeks to complete a problem set. You are strongly encouraged to form study groups to work homework problems. Only one copy of a problem set per group should be turned in.

Cheating

Although I strongly encourage you to form a study group to work together on the problem sets and to study together to prepare for each exam, and although I also want you to work with your (one) partner on the first two programming labs, collaboration does NOT extend to the programming lab assignments 3, 4, 5, and 6, or to the two mid-terms and final exam. These programs and the examinations you take MUST be your own work. Providing information to another student where prohibited, or obtaining information from anyone other than the instructor or one of the TAs where prohibited is considered cheating. This includes the exchange of any information during an examination and any code that is part of a solution to a programming assignment. Allowing another student to read something on your paper during an examination is considered cheating. In fact, leaving information unprotected so it can be compromised by another student is considered cheating. This includes sheets of paper lying about in an examination room or in your home, and computer files that are not properly protected. If you cheat, you violate the soul of the University, which I take very seriously, and I will deal with in the harshest possible way. If you have any question as to what is permitted and what is not, ask the instructor or a TA FIRST. If you don't ask first, and you do something that is not allowed, the response "I thought it was okay" is not an acceptable justification.

I am told that the programming labs from previous years are available to anyone who wants them on the web. I strongly urge you to not avail yourself of these lab solutions for several reasons: (a) It is not permitted (i.e., it is cheating). (b) The course is an elective, so presumably you are enrolled because you want to master this material. Looking at old solutions does not help accomplish that objective. (c) Cheating scripts have gotten pretty sophisticated over the years, and we do compare your lab solutions with those we find on the web, which almost always results in cheating being caught. (d) Anyone caught cheating will be dealt with severely. The penalty I will recommend to the Dean of Judicial Services is most likely an F in the course. Please do not force my hand on this. You will

not be happy with the result.

I am embarrassed to have to bother all of you with the above paragraphs since for most of you, they are totally unnecessary. But, every semester there are a few who feel it is okay to cheat, and I have to turn them in to the Student Judicial System. It is one of the most unpleasant things I do as a professor. In fact, last semester I had to turn in three students for cheating on the second midterm and five students for cheating on the programming labs. In an attempt to deter these few from cheating, I apologize for having to waste all this time of the rest of you.

Quiz and Exam policy

There will be two exams during class time, the first on October 12, the second on November 16. There will be a final exam during the normal final exam period, on Friday, May 9, unless the Registrar changes the date. Please be sure to check the Registrar's schedule as we get closer to May 9. All exams will be closed book, with two exceptions:

(1) You may bring to each exam three sheets of paper on which you are free to write anything you wish. All three sheets must be original sheets in your own handwriting.

(2) You may bring to each exam any handouts that have been expressly permitted by me prior to the exam.

Final Exam

Probably Friday, December 9, 7 to 9pm.. (TENTATIVE). See above.

Grading mechanics

Nominally, grades are based on the following percentages:

Problem sets: 8% (2% each, times 4 assignments)
Programming Lab Experiments: 30% (5% each, times 6 assignments)
Midterms: 15% each (two of them)
Final exam: 25%
My subjective evaluation of your work: 7%

Policy on problem sets: Problem sets are due on the date and at the time specified.

Policy on programming labs: Programming labs are due on the date and at the time specified, EXCEPT you will have 5 discretionary days to use as you wish with the following constraints: (a) no more than two of the five days can be used on any one lab, (b) the five days are the total available for all six labs, and (c) using discretionary days will change the due date of that specific lab for you at no penalty.

Policy on make-up exams: Make up exams will be given only in extraordinary situations. Excused absence from an exam must be obtained in advance except under very rare circumstances.

Additional details

The CIS evaluation forms will be used to evaluate me and my TAs in this course.

The deadline for dropping a class without possible academic penalty or changing registration to/from pass/fail is October 25 for undergraduate students.

Allegations of Scholastic Dishonesty will be dealt with according to the procedures outlined in Appendix C, Chapter 11, of the General Information Bulletin, `http://www.utexas.edu/student/registrar/catalogs/`

The University of Texas at Austin provides, upon request, appropriate academic adjustments for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 512-471-6259, 512-471-4241 TDD, or the College of Engineering Director of Students with Disabilities, 512-471-4321. If you have been designated to recieve academic adjustments, please let me know at your earliest convenience so I can be sure to accommodate your special requirements.

For those of you who decide to continue in this course, Good Luck. I hope you find the experience an important part of your computer engineering education. I also hope you have a good time doing it.

Finally, I have been asked by the University to add these three items to the Course Descriptor:

1. On academic dishonesty. Please see the UT Honor Code:
http://catalog.utexas.edu/general-information/the-university/#universitycodeofconduct

2. On accommodations for religious holidays. By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence."

3. On emergency evacuation (from the Office of Campus Safety and Security, 512-471-5767, http://www.utexas.edu/safety/:

* Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.

* Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.

* Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.

* In the event of an evacuation, follow the instruction of faculty or class instructors.

* Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.

* Behavior Concerns Advice Line (BCAL): 512-232-5050

* Link to information regarding emergency evacuation routes and emergency procedures can be found at: http://www.utexas.edu/emergency.