BLG 322 Bilgisayar Mimarisi/BLG 322E Computer Architecture

Spring 2017

	CRN: 21948	**CRN: 21946**
Instructors:	Feza Buzluca http://akademi.itu.edu.tr/buzluca EEB 4318, 2211	Sanem Kabadayı http://akademi.itu.edu.tr/kabadayi EEB 3311
Classrooms:	EEB 5104	EEB 5204
Office Hours:	Tuesday 2-5 PM	Monday 4-5 PM Thursday 3-4 PM
TAs: (both sections)	Mahiye Uluyağmur muluyagmur@itu.edu.tr Ezgi Yıldırım yildirimez@itu.edu.tr Hakan Gündüz hakangunduz@itu.edu.tr	

Course site: http://ninova.itu.edu.tr/Ders/22/Sinif/25057
Course time and location: Thursday 9:30-12:30 PM, EEB 5104 - EEB 5204 (depending on section, check the table above)

Description: Pipeline structure. Input-output organization: data transfer methods, interrupts and direct memory access. Memory hierarchy, virtual memory, cache memory, memory management. Interconnection networks and multiprocessor systems.

Prerequisites: BLG 222E Computer Organization with a grade of at least DD. To understand the more advanced topics in computer architecture, you will also need to remember what you learned in BLG 231E Digital Circuits and BLG 212E Microprocessor Systems.

Required texts:

- *Computer Organization and Architecture*, William Stallings, Prentice Hall, 2015. 10th ed.
- *Computer Architecture, A Quantitative Approach*, John L. Hennessy and David A. Patterson, Morgan Kaufmann, 2011. 5th ed.
- *Motorola, MC68000 16-bit Microprocessor User's Manual*

For each lecture, you should read the relevant sections in the lecture slides as listed in the weekly course schedule on the last page of this syllabus.

Homework: There will be four homework assignments. You are expected to make an honest, independent attempt to solve and turn in your answers to each homework question. You must turn in your complete solutions to the homework. Computer architecture can only be mastered by solving problems, not just by listening to a lecturer. Therefore, doing the homework assignments is crucial to performing well in this class. If you are having considerable difficulty with the early assignments, this is a sign that you may be in over your head - you should come see us immediately. The assignments will require a substantial time commitment over several days (several hours per week outside of class should be expected). Be sure to budget sufficient time to complete assignments before the deadline. You may not copy solutions from a classmate or from the Internet. This is considered cheating! Homework is individual. There are no group assignments in this course.

Attendance: It is imperative that you come to class each day and pay attention. You are not allowed to work on your laptop or read anything not related to the class during the lecture. You must attend the section for which you have officially registered. Please check your actual section by logging into http://www.sis.itu.edu.tr. You are required to attend 70% of the lectures in order to be allowed to take the final exam. (Since this semester has 14 weeks, you have to attend at least 10 lectures). Those who do not meet the attendance requirement will fail the course with a grade of VF (Article 23, Undergraduate Education Regulations, http://www.sis.itu.edu.tr/

tr/yonetmelik/lisansyonetmelik.html). Attendance may be taken at any point in the lecture. No additions can be made to the attendance list after that point. If you do miss class, it is your responsibility to find out (from a classmate) what you missed, including class notes, announcements, and worksheets. No make-up exams will be given. Absences from a midterm or final will result in a grade of zero for that exam. Check the exam dates and make sure you will be able to attend class on exam dates. The first midterm will be on Thursday, March 16, 2017 in class. The second midterm will be on Thursday, April 27, 2017 in class.

Evaluation: The distribution of percentages for the course grade will be as follows:

Homework	10 %
Midterm 1	25 %
Midterm 2	25 %
Final	40 %

Eligibility to take the final exam: Students must meet the following criteria to take the final exam:

- Students must attend 70% of lectures.
- Students must have a mid-semester average grade of at least 35/100.

The average mid-semester grade is computed using the formula below:
Avg. mid-semester grade = (0.10 × Assign. + 0.25 × 1st Midterm + 0.25 × 2nd Midterm)*100/60

Any student who gets a grade lower than the required grade on any of these assessments will fail the course with a grade of VF and not be allowed to take the final exam.

Announcements on course site and by e-mail: You are expected to check the Ninova web site and your ITU e-mail for homework and announcements. In addition, you are responsible for all announcements that may be made on the course web site and in class (that may or may not be included in this syllabus).

E-mail etiquette: Your full name must appear in the e-mail. The e-mail subject must be "BLG 322E". Do not send the same e-mail repeatedly. Your e-mails may be in English or Turkish. Regardless of which language you use, use proper grammar, lowercase/uppercase letters, and punctuation. You e-mails should not look like chat messages.

Academic honesty: You are expected to read the Undergraduate Education Regulations (http://www.sis.itu.edu.tr/tr/yonetmelik/lisansyonetmelik.html) and ITU Academic Honesty Pledge (http://www.sis.itu.edu.tr/tr/yonetmelik/AkademikOnurSozuEsaslar.html) and behave accordingly. Cheating on the exams or on homework will be punished in the most severe manner, resulting in failing the course with a grade of VF, as well as disciplinary action. Every piece of work that you turn in with your name on it must be yours and yours alone. No coworking is allowed on any test or homework. You must not turn in work that is not yours. Specifically, you are not allowed to copy someone else's homework. This is plagiarism. You must not enable someone else to turn in work that is not his or hers. Do not share your work with anyone else.

Final: The final exam will be given during the final exam period (May 29-June 9, 2017), at the time and location determined by the University.

Tentative course schedule (subject to change):

	Date	Subject	Slides
1	9-Feb	Introduction: layered logical model of a computer system, CPU, computer evolution	1.1-1.34
2	16-Feb	Pipeline: general structure, space-time diagram, throughput, speedup, instruction pipeline, hazards (conflicts)	2.1-2.21
3	23-Feb	Pipeline: Solutions for data conflicts, dealing with branches (branch prediction)	2.22-2.42
4	2-Mar	Pipeline: RISC pipeline Floating-point numbers: scientific not., exponential notation, IEEE 754	2.43-2.54 3.1-3.8
5	9-Mar	Input-output (I/O) organization and bus operations: CPU–I/O interface, data transfer modes, 68000 bus operations	4.1-4.24
6	16-Mar	Midterm Exam 1	
7	23-Mar	Interrupts: Priority interrupt controllers, 68000 privilege modes, 68000 exceptions	5.1-5.24
8	6-Apr	Interrupts: 6800 interrupts Direct Memory Access (DMA): overview, controllers, transfer modes	5.25-5.36 6.1-6.7
9	13-Apr	Direct Memory Access (DMA): steps of data transfer, 3-wire DMA, I/O processor, indivisible bus cycle	6.8-6.30
10	20-Apr	Memory organization (internal / external): magnetic disk, Redundant Array of Independent/Inexpensive Disks (RAID)	7.1-7.18
11	27-Apr	Midterm Exam 2	
12	4-May	Memory organization: RAID4,5,6, error detection/correction Cache memory: associative memory, full associative mapping	7.19-7.26 8.1-8.19
13	11-May	Cache memory: Cache memory-main memory interactions, access time Memory management, virtual memory: paged mapping	8.20-8.35 9.1-9.5
14	18-May	Memory management, virtual memory: segmented and paged mapping Multiple processor organizations: cache coherence, MESI protocol	9.6-9.17 10.1-10.36
	29-May - 9-Jun	Final (Tentative)	

Last day for add/drop: The add/drop period ends on February 10, 2017.
You may withdraw from the course between February 13, 2017 and February 17, 2017.
There is no way to drop or withdraw from a course after February 17, 2017!