**COURSE OUTLINE**

**EE 445 COMPUTER ARCHITECTURE I**
**2020-21 Fall Term**

**Instructors:**
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**Teaching assistants:**

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**Schedule:**
Asynchronous video lectures
Synchronous Q & A group sessions, Quizzes Tuesday: 13:40 to 15:30, Thursday: 13:40

**Course objective:** Computers are integrated to our daily life and jobs. As a first step in becoming a computer designer or in writing better software, understanding the hardware layers together with software interface of a computer is critical. In this course, we will first review digital design fundamentals and introduce RTL, ASM, HDL concepts. Then we will study the basics of computer system organization, performance and energy issues, and instruction set architectures. We will study macro-coding concepts, hardware and micro programmed control for single- and multi-cycle datapath designs.
EE-446 Computer Architecture II will follow to study more advanced computer architecture concepts such as arithmetic processor design, pipelining, memory and I/O organization, multiprocessors, etc.

**Topics:** RTL. Algorithmic state machines. CPU organization. Arithmetic logic unit. Process control architectures. Instruction modalities. Microprogramming.

**Pre-requisite:** EE348

**Some references:**
Mano & Kime, “Logic and Computer Design Fundamentals”, 4th Ed., Prentice Hall, 2008.
Mano “Digital Design”, 4th Ed., Prentice Hall, 2008.
Mano, “Computer System Architecture”, 3rd Ed., Prentice Hall, 1992
Harris & Harris, “Digital Design and Computer Architecture. ARM Edition”, 1st Ed., Kaufmann, 2015.
Patterson & Hennessy, “Computer Organization and Design” (4th/5th Ed.), Kaufmann, 2014
Stallings, “Computer Organization & Architecture” (7th Ed. or later), Pearson, 2006.

**Grading:**
- Programming and Handwritten Assignments: 30%
- Quizzes: 30%
- Final exam: 40%
- Students who miss all the quizzes or who do not submit any homework will be graded as NA (“Not Available”).

**Homework:** Verilog projects, written assignments will be assigned throughout the term. Details of the homework policy will be announced later.

**Policy:**
We will have proctored synchronous examinations (Quizzes and Final). The examinations will be conducted according to the METU Department of Electrical and Electronics Engineering Principles of Online Exam with Audiovisual Equipment.

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
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| | 12.10.<br>ASM video 1 | 13.10.<br>Synchronous Lecture<br>INTRO | 14.10. | 15.10. | 16.10. | 17.10. |
| 18.10. | 19.10.<br>ASM video 2<br>RTL video 1 | 20.10.<br>Q&A | 21.10. | 22.10. | 23.10. | 24.10. |
| 25.10. | 26.10.<br>RTL video 2 | 27.10.<br>Synchronous Lecture<br>ASM-RTL | 28.10. | 29.10.<br>Public Holiday | 30.10. | 31.10. |
| 01.11.<br>ASM-RTL Assignment Due | 02.11.<br>HDL video 1 | 03.11.<br>Q&A | 04.11. | 05.11.<br>ASM RTL Quiz | 06.11. | 07.11. |
| 08.11. | 09.11.<br>HDL video 2 | 10.11.<br>Synchronous Lecture<br>HDL | 11.11. | 12.11. | 13.11. | 14.11. |
| 15.11. | 16.11.<br>BC video 1 | 17.11.<br>Q&A | 18.11. | 19.11.<br>HDL Quiz | 20.11. | 21.11. |
| 22.11. | 23.11.<br>BC video 2 | 24.11.<br>Synchronous Lecture<br>BC | 25.11. | 26.11. | 27.11. | 28.11. |
| 29.11. | 30.11.<br>BC video 3 | 01.12.<br>Synchronous Lecture<br>BC | 02.12. | 03.12.<br>BC Quiz | 04.12. | 05.12. |
| 06.12.<br>BC Problem Assignment due | 07.12.<br>MP video | 08.12.<br>Synchronous Lecture<br>MP | 09.12. | 10.12. | 11.12. | 12.12. |
| 13.12.<br>BC Verilog Assignment due | 14.12.<br>Arithmetic video 1 | 15.12. | 16.12. | 17.12.<br>BC MP Quiz | 18.12. | 19.12. |
| 20.12. | 21.12.<br>Arithmetic video 2 | 22.12.<br>Q&A | 23.12. | 24.12. | 25.12. | 26.12. |
| 27.12. | 28.12.<br>Arithmetic video 3 | 29.12.<br>Synchronous Lecture<br>Arithmetic | 30.12. | 31.12.<br>New Year's Eve | 01.01.<br>Public Holiday | 02.01. |
| 03.01. | 04.01.<br>ARM ISA video 1 | 05.01. | 06.01. | 07.01.<br>Arithmetic Quiz | 08.01. | 09.01. |
| 10.01.<br>Arithmetic Verilog Assignment due | 11.01.<br>ARM ISA video 2 | 12.01.<br>Synchronous Lecture<br>ARM ISA | 13.01. | 14.01. | 15.01.<br>Last day of lectures | 16.01. |