

# CENG 331 - Computer Organization

● Middle East Technical University  
Department of Computer Engineering



Section 1  
**Course Syllabus**  
Fall 2023  
Ver 1.0

- **Course Description:** The course will cover the following topics: Introduction to computer organization, data and information representation and processing, machine-level representation of programs, instruction set architecture, pipelining, optimizing program performance, memory hierarchy, cache memories, virtual memory.  
Prerequisites: CENG 232.

- **Instructor:**

Erol Şahin  
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- **Teaching Assistants:**

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- **Lecture hours:** Mondays 10:40-12:20 and Thursdays 13:40-15:30 in G111 Faculty of Economic and Administrative Sciences - B (New) Building  
(Note: Lectures are going to be in-class. In person participation is encouraged and the quizzes are going to be only in-class.)
- **Online Resources:** Even though our coverage might be different, the authors of our textbook have lecture videos posted here.
- **Textbook:** Computer Systems: A Programmer's Perspective by Randal E. Bryant and David R. O'Hallaron Prentice Hall, **Third Edition**, 2015
- **Reference Textbooks:** Computer Organization and Design: Hardware/Software Interface by D.A. Patterson and J.L. Hennessy, MK, 5th Edition, 2013
- **Grading:** The grading policy is listed below:

Midterm	30%	
Final	36%	
Quiz	10%	
Lab Assignments (×4)	24%	(6% × 4)
Total	100%	

**Important:** You will not be allowed to take the final exam if you fail to accumulate 10/24 points in total from the assignments and will automatically get NA grade.

- **Midterm and Final Examinations:** Midterm and Final examinations are going to be on campus, closed books, notes.
- **Lab Assignments (Homeworks):** There will be 4 lab assignments. All are individual work except the last one which you can do with a team of at most 3 people. For the 1st and 2nd labs, your final lab grade will be the weighted sum ( $0.6 * lab + 0.4 * quiz$ ) of the Lab and quiz grades. You can only attend quiz of the respective lab if you collect at least half of the full lab grade.  
The lab assignments are going to be announced on odtuclass.
- **Quizzes:** Quizzes will be random and have one or two short questions. They will be graded in *ternary*. Quizzes will count as attendance in grading. No other means of attendance will be used.
- **Grading algorithm**

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**Algorithm 1** Lab Grading

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1:  $l : \{Bomb, Attack, Architecture, Performance\}$ 
2: procedure LAB( $l$ )
3:    $H \leftarrow$  Your grade from lab homework, out of 100 + bonus
4:   if  $l \equiv Bomb \vee l \equiv Attack$  then                                ▶ Bomb and Attack labs have quizzes
5:     if  $H < 50$  then
6:        $Q \leftarrow 0$                                                 ▶ Not allowed to take the quiz
7:     else
8:        $Q \leftarrow$  Your grade from lab quiz, out of 100
9:        $L \leftarrow 0.6 * H + 0.4 * Q$                                 ▶ Your final grade from the lab
10:  else                                                            ▶ Architecture and Performance labs have no quizzes
11:     $L \leftarrow H$                                                 ▶ Your final grade from the lab

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**Algorithm 2** Course Grading

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1: procedure COURSEGRADING
2:    $MT \leftarrow$  Your grade from Midterm, out of 100
3:    $Att \leftarrow$  Your grade from attendance and online quizzes, out of 100
4:    $Labtotal \leftarrow Lab(Bomb) + Lab(Attack) +$ 
5:      $Lab(Architecture) + Lab(Performance)$ 
6:   if  $0.06 * Labtotal < 10$  then                                ▶ Not allowed to take the final
7:      $LetterGrade \leftarrow NA$                                     ▶ Failure with no Resit exam option
8:   else
9:      $Final \leftarrow$  Your grade from Final, out of 100
10:     $Total \leftarrow 0.3 * MT + 0.36 * Final + 0.1 * Att + 0.06 * Labtotal$ 
11:     $LetterGrade \leftarrow$  Letter based on  $Total$                 ▶ Letter grades FF to AA

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- **Communication:**
  - Announcements about the course will be made on odtuclass and during the class.
  - Questions that are generally beneficial to others should be posted on odtuclass general forum or should be raised during the class.

- If you have a specific question you can send an e-mail to the instructor or to your teaching assistants. However make sure that the subject line starts with *CENG331* [capital letters, and no spaces] to get faster reply. Please state your name and student ID number in your message.
- **Academic Integrity:** Discussions about the high level design issues and explaining how to use systems or tools are encouraged. However, unless otherwise stated your submissions must result from your own work. Midterm and final exams must be also your own work. Violation of these principles will be handled based on the university regulations and will result in disciplinary action.

- **Schedule (tentative)**

Week	Topics	Book Chapters
1	Overview	Chapter 1
2	Data representation - 1	Chapters 2.1-3
3	Data representation - 2	Chapter 2.4
4	Machine language - 1	Chapters 3.1-5
5	Machine language - 2	Chapters 3.6-7
6	Machine language - 3	Chapters 3.8-10,12
7	Processor architecture - 1	Chapters 4.1-3
8	Processor architecture - 2	Chapters 4.4-5
9	Optimization - 1	Chapter 5
10	Optimization - 2	Chapter 5
11	Memory Hierarchy -1	Chapters 6.1-2
12	Memory Hierarchy - 2	Chapters 6.3-6
13	Virtual Memory	Chapters 9.1-6
14	Exceptional control and link to OS	-