Introduction to Computer Organization and Architecture
CS 286-001 - Fall 2018 (CRN: 36640)

Welcome to CS 286!

Instructor: Dr. Hiroshi Fujinoki
Office: EB 2034  
Email: hfujino@siue.edu
URL: www.siue.edu/~hfujino

Office Hours: (1) Mondays: 1:00 – 2:30 P.M.
(2) Tuesdays: 10:00 - 10:30 A.M.
(3) Wednesdays: 1:00 – 2:30 P.M.
(4) Fridays: 10:00 - 10:30 A.M.

Note 1: The above office hours will not be applied to the final exam week. During the final exam, please contact Dr. Fujinoki for your appointment.

Note 2: Office hours may be cancelled, when Fujinoki needs to attend other classrooms or meetings for his committee duties. Office hour cancellations will be announced in the course home of CS286-001.

Class Meeting Room: EB-0165
Class Meeting Days: Monday, Wednesday, and Friday
Class Meeting Time: 9:00-9:50 A.M.

Note: item with "*" symbol means an important item.

* Course Prerequisites:

CS150 (Introduction to Computing II) with a minimum grade of C or the instructor's permission. If you have not completed CS150, please talk to the instructor.

* Grading: Weight: Final Letter Grade:
Weekly quizzes: 15% 100-92: A
Programming assignments (5+5+5%): 15% 91-82: B
Midterm Exam: 35% 81-72: C
Final Exam: 35% 71-62: D
Below 62: F
● Exams:
    • Exams will be closed textbook and closed notes.
    • Makeup exam will be given only for medical emergency (with a signed doctor’s letter).
    • Absence from an exam will result in zero point for the exam (except medical emergencies).
    • If you need any special assistance, you should contact Dr. Fujinoki at least one week before.
    • A calculator is allowed in the exams (however sharing a calculator during an exam is NOT allowed – everyone needs to bring your own calculator).
    • Exams will cover reading assignments and required exercise questions.
    • Any error regarding your graded exams should be reported to Dr. Fujinoki within two weeks (14 calendar days) after your attendance status is posted to the course web site.

● Course Projects:
    • Programming projects using assembly language for MIPS R3000 Processor (we use MIPS R3000 emulator).
    • Course programming projects are all individual project (no collaboration is allowed either for designs and coding).
    • The project specifications will be provided in the class.

● Quizzes:
    • There will be 12 quizzes during this course (each quiz takes 10 to 15 minutes). The quizzes are closed textbook, notebooks and neighbors (you are allowed to use your pens, pencils, blank papers, eraser(s) and a calculator during a quiz). After the last lecture in a week, the questions that will appear in the next quiz will be posted to the CS286-001 home.
    • Makeup quizzes will be provided only for medical emergency (makeup quiz will not be provided for any other reasons).
    • The lowest quiz will be dropped from your course grade at the end of the semester.
    • Any error regarding your quiz grades should be reported to Dr. Fujinoki within two weeks (14 calendar days) after your attendance status is posted to the course web site.
Attendance Policy:

- Attendance will be taken at the beginning of lectures (being late more than 5 minutes may be considered absence).
- No penalty will be given up to two absences in a semester. For each absence beyond the second absence, -2 point penalty (in 100 scale) will be given to your next exam.
- The above penalty will not apply to your medical emergency (however, you need to provide a written proof of medical service to waive the penalty).
- Any error regarding your class attendance status should be reported to Dr. Fujinoki within two weeks (14 calendar days) after your attendance status is posted to the course web site.

컷 Academic Dishonesty:

Following activities (but not limited to them) will be considered academic dishonesty:

I. Weekly quizzes and exams:
   (a) Watching and copying your neighbors' solutions during quizzes and exams.
   (b) Using materials not allowed during quizzes and exams.
   (c) Anyone committing academic misconduct above (I-(a) or (b)) will receive a failing grade for this course and reported to the department chair as well as to the dean of the school of engineering.

II. Homework and programming projects:
   (a) Submitting work totally or partially done by somebody else (this includes any human/electronic sources (such as web sites and even another course at SIUE)).
   (b) Submitting program source code files (for the programming projects) that are developed by collaborations with other people. This includes both program designs and implementations.
   (c) Anyone committing academic misconduct above (II-(a) or (b)) will receive a grade of zero on the assignment plus a warning, if possible, for the first infraction. Anyone committing a second infraction will automatically fail the course and/or be brought up on charges of academic misconduct, which may result in expulsion from the university.
♦ Required Textbook:
  • J. Hennessy and D. Patterson, "Computer Organization and Design (Fifth Edition)", Morgan Kaufmann (ISBN: 978-0-12-407726-3)
  • The lecture notes and the PPT slides presented in the classroom are summaries of the course textbook. The course syllabus specifies the textbook chapters/sections each student should read ideally before each lecture (at least after each lecture).

Other Requirements for this Course:
  • Experience with C/C++ (UNIX environment)
  • Data structure or discrete structure

♦ Disability Support:
  • Students who believe they may need accommodations in this class are encouraged to contact the office of Disability Support Services as soon as possible. It is the students' responsibility to alert the instructor to SIUE sanctioned accommodations. If anyone needs assistance from SIUE Disability Support Services, please contact them.

♦ Other Notices:
  • This course expects each of you to work at least nine (9) hours other than attending lectures (this is also a policy of SIUE).
  • Important announcements will be made at the beginning of a lecture.
  • If you are absent from a lecture, it is your responsibility to find the announcements and the contents in the missed lecture (you are suggested to talk to your classmates).
  • Each of you is expected to check "Weekly Notices" in the web site of this course (you can reach the course web site from http://www.siue.edu/~hfujino) at least once in a week. The decisions regarding which course materials are posted belong to the course instructor. If any promised course material is missing in the course home, it is your responsibility to request such material to the course instructor.
  • Any grading problem should be reported within two weeks (14 days) after their grades are posted or the graded materials are returned in the classroom.
• Any electric device, such as smart phone, laptop PC, and tablet computer (except a calculator), should not be used during lectures and exams.

• E-mails sent to the course instructor during weekends and the break (spring break) may not be responded.
Tentative Class Schedule (subject to change):

This schedule is tentative and subject to change. However, any change will be announced in the class or noticed in the notice page of the instructor.

<table>
<thead>
<tr>
<th>Week #: Day</th>
<th>Topics</th>
<th>Reading Assignments</th>
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<tbody>
<tr>
<td>Week 1: August 20 (M): Introduction to CS286</td>
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<tr>
<td>August 22 (W): Computer Abstractions</td>
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<td>Chapter 1 (1.1 through 1.5)</td>
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<td>August 24 (F): The Role of Performance</td>
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<td>Chapter 2 (2.1 through 2.6)</td>
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<td>Week 2: August 27 (M): Quiz #1, Introduction to Assembly Languages (1)</td>
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<td>August 29 (W): Introduction to Assembly Languages (2)</td>
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<td>Chapter 3 (3.1 through 3.4)</td>
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<td>August 31 (F): Assembly Language using MIPS CPU</td>
<td>Programming project description</td>
<td>Chapter 3 (3.1 through 3.4)</td>
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<td>Project Phase #1 Assigned</td>
<td>Handout</td>
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<td>Week 3: September 3 (M): Labor Day Holiday. University closed</td>
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<td>September 5 (W): Quiz #2, Program Control Structure</td>
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<td>Chapter 3 (3.5 and 3.6)</td>
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<td>September 7 (F): Arithmetic for Computers (1)</td>
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<td>Chapter 4 (4.1 through 4.6)</td>
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<td>Week 4: September 10 (M): Quiz #3, Arithmetic for Computers (2)</td>
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<td>September 12 (W): Data Path and Control (1)</td>
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<td>Chapter 4 (4.7 and 4.8)</td>
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<tr>
<td>September 14 (F): Data Path and Control (2)</td>
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<td>Chapter 5 (5.1 and 5.2)</td>
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<td>Week 5: September 17 (M): Quiz #4, Programming Project #2 discussions</td>
<td>(1) Handout</td>
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<td>September 19 (W): Programming Project #2 discussions</td>
<td>(2) Handout</td>
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<td>September 21 (F): Pipeline Data Path (1)</td>
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<td>Chapter 6 (6.1 through 6.3)</td>
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<td>Project Phase #1 Due</td>
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<td>Week 6: September 24 (M): Quiz #5, Pipeline Data Path (2)</td>
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<td>September 26 (W): Pipeline Data Path (3)</td>
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<td>Chapter 6 (6.1 through 6.3)</td>
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<td>September 28 (F): Pipeline Hazards and code optimization (1)</td>
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<td>Chapter 6 (6.4 through 6.6)</td>
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<td>Week 7: October 1 (M): Quiz #6, Pipeline Hazards and code optimization (2)</td>
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<td>October 3 (W): Pipeline Hazards and code optimization (3)</td>
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<td>Chapter 6 (6.4 through 6.6)</td>
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<tr>
<td>October 5 (F): Pipeline Hazards and code optimization (4)</td>
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<td>Chapter 6 (6.4 through 6.6)</td>
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<td>Week 8: October 8 (M): Quiz #7, Memory sub-system (1)</td>
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<td>October 10 (W): Midterm Exam Review</td>
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<td>Chapter 7 (7.1 through 7.2)</td>
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<td>October 12 (F): Midterm Exam</td>
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Week 9: October 15 (M): Memory basics and memory hierarchy Chapter 7 (7.1 through 7.2)  
October 17 (W): Virtual Memory Chapter 7 (7.4)  
October 19 (F): Memory Segmentation Chapter 7 (7.4)

Week 10: October 22 (M): Quiz #8, Programming Project #3 discussions (1) Handout  
October 24 (W): Programming Project #3 discussions (2) Handout  
October 26 (F): Cache Performance analysis Chapter 7 (7.3)

Week 11: October 29 (M): Quiz #9, Cache Performance analysis Chapter 7 (7.3)  
October 31 (W): I/O Subsystems (1) Chapter 8 (8.1 through 8.3)  
November 2 (F): I/O Subsystems (2) Chapter 8 (8.1 through 8.3)

Week 12: November 5 (M): Quiz #10, I/O Subsystems (3) Chapter 8 (8.5)  
November 7 (W): I/O Subsystems (4) Chapter 8 (8.5)  
November 9 (F): Multi-processor System (1) Chapter 9 (9.1)

Week 13: November 12 (M): Quiz #11, Multi-processor System (2) Chapter 9 (9.2)  
November 14 (W): Multi-processor System: Hyper-Threading Chapter 9 (9.2)  
November 16 (F): NUMA and UMA memory architecture Chapter 9 (9.3)

Week 14: November 19 (M) - 23 (F): Thanksgiving Break. Classes not in session.

Week 15: November 26 (M): Quiz #12, Reliability of Hardware Components  
November 28 (W): Capacity Analysis: Queuing Theory, Project #3 Due  
November 30 (F): Topic TBA

Week 16: December 3 (W): Topic TBA  
December 5 (W): Final Exam Review (1)  
December 7 (F): Final Exam Review (2)

Week 17: Final Exam Week  
December 11 (Tuesday) at 8:00-9:40 A.M.: Final Exam (comprehensive)

- The list of the reading assignment is the minimum requirement. It is expected that each student voluntarily studies not only the required sections but other related sections or materials to maximize the learning during the semester.
- Required reading should be done before the lecture.
- If you have any problem for the above schedule, please contact to Dr. Fujinoki as soon as possible.
- Any question regarding this syllabus should be addressed to: hfujino@siue.edu

Course syllabus last modified at 5:36 P.M., August 19, 2018