Introduction to Computer Organization and Architecture

CS 286-001 - Fall 2020 (CRN: 35234)

Synchronous-Online Course

Welcome to CS 286!

Instructor: Dr. Hiroshi Fujinoki
Office: EB 2034
Email: hfujino@siue.edu
URL: www.siue.edu/~hfujino
Office Phone: (618) 650-3727
Office Hours: Monday: 10:00 A.M.-12:00 P.M.
Tuesday: 10:00-12:00 P.M.
Wednesday: 10:00 A.M.-12:00 P.M.
Thursday: 10:00 A.M.-12:00 P.M.
Friday: by appointment (please make an appointment 24 hours prior to the time you want to meet the instructor).

Note1: The above office hours will not be applied to Thanksgiving break week. During the break week, please contact Dr. Fujinoki for your appointment.

Class Meeting Room: online (no classroom assigned to this course)
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:

<table>
<thead>
<tr>
<th></th>
<th>Weight</th>
<th>Final Letter Grade</th>
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</thead>
<tbody>
<tr>
<td>Quizzes</td>
<td>10%</td>
<td>100-92: A</td>
</tr>
<tr>
<td>Programming projects</td>
<td>15%</td>
<td>91-82: B</td>
</tr>
<tr>
<td>(5%+5%)</td>
<td></td>
<td>81-72: C</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>37.5%</td>
<td>71-62: D</td>
</tr>
<tr>
<td>Final Exam</td>
<td>37.5%</td>
<td>Below 62: F</td>
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))/(p

\( n = \frac{1}{p} \) 

Exams:
- Exams will be **closed textbook** and **closed notes**.
- Makeup exam will be offered only for medical emergency (with a signed doctor’s letter). Makeups for any other reasons will not be provided (no exception).
- Absence from an exam will result in zero point for the exam (except medical emergencies).
- 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.

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

I. Exams:
   - (a) Watching and copying your neighbors’ solutions during exams.
   - (b) Using materials not allowed during 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. 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 failing grade for this course and reported to the department chair as well as to the dean of the school of engineering.

♦ Required Textbook:
  - 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:
(1) This course expects each of you to work nine (9) hours other than attending lectures (this is also a policy of SIUE).
(2) Each of you is expected to check “Weekly Notices” in the web site of this course at least twice 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 (the course instructor will post such materials within at most one week since the request).
(3) Any grading problem should be reported within two weeks (14 days) after your grades are posted to the course home or the graded materials are returned in the classroom.
(4) Any electric device, such as smart phone, laptop PC, and tablet computer (except a calculator), should not be used during exams.
(5) E-mails sent to the course instructor during weekends and the break (spring break) may not be responded.

(6) Any special arrangement agreed between you and the course instructor (Dr. Fujinoki) should be documented. Any promises or agreements orally made between you and the course instructor may not take effect without a documentation (it is your responsibility to document any such promises and agreements).

(7) Ask your questions to the course instructor whenever you have anything you do not have a clear answer for. Please do not make your own assumptions (if you do, you are responsible for any assumptions you make when they are not correct).
### 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><strong>Week 1:</strong> August 24 (M): Introduction to CS286, Computer Abstractions</td>
<td>Chapter 1 (1.1 through 1.5)</td>
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<td>August 26 (W): The Role of Performance</td>
<td>Chapter 1 (1.6)</td>
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<td><strong>Week 2:</strong> August 31 (M): Introduction to Assembly Languages (1)</td>
<td>Chapter 2 (2.1 and 2.2)</td>
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<td>• Quiz #1 assigned</td>
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<tr>
<td>September 2 (W): Assembly Language using MIPS CPU Programming project description</td>
<td>Chapter 2 (2.3)</td>
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<tr>
<td>• Project Phase #1 assigned</td>
<td>Appendix-A</td>
<td>Handout #1</td>
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<tr>
<td><strong>Week 3:</strong> September 7 (M): Program Control Structure</td>
<td>Chapter 2 (2.7)</td>
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<tr>
<td>• Quiz #1 submission due (11:59:59 p.m.)</td>
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<td>September 9 (W): Arithmetic for Computers (1)</td>
<td>Chapter 2 (2.4 and 2.6)</td>
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<td>• Quiz #2 assigned</td>
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<td><strong>Week 4:</strong> September 14 (M): Arithmetic for Computers (2)</td>
<td>Chapter 3 (3.1, 3.2, 3.5)</td>
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<td>Data Path and Control (1)</td>
<td>Chapter 4 (4.1 and 4.2)</td>
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<tr>
<td>• Quiz #2 submission due (11:59:59 p.m.)</td>
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<tr>
<td>September 16 (W): Data Path and Control (2)</td>
<td>Chapter 4 (4.5)</td>
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<td>• Quiz #3 assigned</td>
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<td><strong>Week 5:</strong> September 21 (M): Programming Project #2 discussions</td>
<td>Handout #2</td>
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<tr>
<td>• Quiz #3 submission due (11:59:59 p.m.)</td>
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<tr>
<td>September 23 (W): Pipeline Data Path (1)</td>
<td>Chapter 2 (2.8 and 2.9)</td>
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<tr>
<td>• Project Phase #1 Due (11:59:59 p.m.)</td>
<td>Chapter 4 (4.5)</td>
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<td>• Quiz #4 assigned</td>
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<tr>
<td><strong>Week 6:</strong> September 28 (M): Pipeline Data Path (2)</td>
<td>Chapter 4 (4.5)</td>
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<td>• Project #2 assigned (asynchronous)</td>
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<td>• Quiz #4 submission due (11:59:59 p.m.)</td>
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<td>September 30 (W): Pipeline Hazards and code optimization (1)</td>
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<td>• Quiz #5 assigned</td>
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<tr>
<td><strong>Week 7:</strong> October 5 (M): Pipeline Hazards and code optimization (2)</td>
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<td>• Quiz #5 submission due (11:59:59 p.m.)</td>
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<tr>
<td>October 7 (W): Pipeline Hazards and code optimization (3)</td>
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<td>• Quiz #6 assigned</td>
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Week 8: October 12 (M): Memory sub-system (1)  
- Quiz #6 submission due (11:59:59 p.m.)  
October 14 (W): Midterm Exam (synchronous: 9:00-10:15 a.m.)

Note: anyone who will NOT be able to take the exam for 75 minutes on 10/14, please contact Dr. Fujnoki as soon as possible.

Week 9: October 19 (M): Memory basics and memory hierarchy  
- Virtual Memory  
October 21 (W): Memory Segmentation  
- Quiz #7 assigned

Chapter 5 (5.1)

Week 10: October 26 (M): Programming Project #3 discussions  
- Quiz #7 submission due (11:59:59 p.m.)  
- Project #2 Due (11:59:59 p.m.)  
October 28 (W): Programming Project #3 discussions  
- Project #3 Assigned  
- Quiz #8 assigned

Handout #3

Week 11: November 2 (M): I/O Subsystems (1)  
- Quiz #8 submission due (11:59:59 p.m.)  
November 4 (W): I/O Subsystems (2)  
- Quiz #9 assigned

PPT slides

Week 12: November 9 (M): I/O Subsystems (3)  
- Quiz #9 submission due (11:59:59 p.m.)  
November 11 (W): I/O Subsystems (4)  
- Quiz #10 assigned

PPT slides

Week 13: November 16 (M): Multi-processor System (1)  
- Quiz #10 submission due (11:59:59 p.m.)  
November 18 (W): NUMA and UMA memory architecture  
- Quiz #11 assigned

Chapter 6 (6.1 and 6.3)

Week 14: Thanksgiving Week (November 23 and 25)

Week 15: November 30 (M): Reliability of Hardware Components  
- Quiz #11 submission due (11:59:59 p.m.)  
- Project #3 Due (11:59:59 p.m.)

PPT slides

December 2 (W): Final Exam (synchronous: 9:00-10:15 a.m.)

Note: anyone who will NOT be able to take the exam for 75 minutes on 12/2, please contact Dr. Fujnoki as soon as possible.
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