Course Description


Course Objectives

This course will introduce students to the underlying organization of modern computing systems, including:

- Microprocessor organization and architecture
- Performance analysis and evaluation
- Arithmetic logic unit and control unit implementations
- Pipelined processor organization and hazards
- Memory hierarchy and storage devices
- Advanced architectures

Students will gain an in-depth understanding of the design and implementation of a modern microprocessor and the trade-offs that are present at the hardware/software interface.

Students will study implementations of the ALU and control unit, with a focus on pipelining (and its associated hazards) as a method for improving system performance. Students will study the memory hierarchy, including cache, primary, and secondary storage, as well as virtual memory and its associated hardware. Students will be introduced to advanced architectures, including multiprocessor systems.

Instructor

Mark McCullen
2142 Engineering
517-355-2354
mccullen@cse.msu.edu

The best way to contact me is via email. Administrative matters which require an interactive dialog will be handled over Zoom by appointment.

Course Website

Information related to the course, including contact information for the teaching assistants, is available at:

http://www.cse.msu.edu/~cse420/

Textbook

Computer Organization and Design: The Hardware/Software Interface, 5th edition
(Patterson and Hennessy; Morgan Kaufmann, 2013; ISBN 978-0-12-407726-3)
Course Grades

Your course grade will be based on the sum of the points you earn in the following categories:

- Examinations (60% of total course points)
- Computer Projects (40% of total course points)

In general, you must receive at least half of the total points available for the examinations and at least half of the total points available for the computer projects to be eligible to earn a non-zero grade in the course.

The following table gives the scale for course grades:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>90% of points</td>
</tr>
<tr>
<td>3.5</td>
<td>85% of points</td>
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<tr>
<td>3.0</td>
<td>80% of points</td>
</tr>
<tr>
<td>2.5</td>
<td>75% of points</td>
</tr>
<tr>
<td>2.0</td>
<td>70% of points</td>
</tr>
<tr>
<td>1.5</td>
<td>65% of points</td>
</tr>
<tr>
<td>1.0</td>
<td>60% of points</td>
</tr>
</tbody>
</table>

The scale will be adjusted at the end of the semester, if warranted.

Examinations

Two midterm examinations and a final examination will be conducted during the semester, and will constitute 60% of the total course points.

- Midterm Exam #1 (18%) Tuesday, 2/23 (1:00 – 2:30 PM)
- Midterm Exam #2 (18%) Tuesday, 3/30 (1:00 – 2:30 PM)
- Final Exam (24%) Wednesday, 4/28 (10:00 AM – Noon)

Make-ups for examinations will be arranged if your absence is caused by documented illness or personal emergency. A written explanation (including supporting documentation) must be submitted to the instructor; if warranted, an alternative to the examination will be arranged. Whenever possible, make-up arrangements must be completed in advance.

Computer Projects

A series of milestones for a semester project will be assigned and will constitute 40% of the total course points. The project will include the design, implementation and testing of milestone solutions using C++ and a class library which supports circuit simulation. Since subsequent milestones depend on the previous milestones, each project milestone must be completed.

To receive full credit, a solution to a project milestone must conform to the specifications stated on the handout for that milestone and must be submitted by the published due date. A 20% penalty will be applied for each day that a solution is late (based on the date when the files were submitted via the Handin system).

Contact the instructor if you are unable to complete a project milestone by the published due date because of illness or personal emergency. If appropriate, the milestone due date will be extended.
Academic Integrity

The Department of Computer Science and Engineering expects all students to adhere to General Student Regulation 1.00, Protection of Scholarship and Grades, which states:

The principles of truth and honesty are fundamental to the educational process and the academic integrity of the University; therefore, no student shall:

1.01 claim or submit the academic work of another as one's own.

1.02 procure, provide, accept or use any materials containing questions or answers to any examination or assignment without proper authorization.

1.03 complete or attempt to complete any assignment or examination for another individual without proper authorization.

1.04 allow any examination or assignment to be completed for oneself, in part or in total, by another without proper authorization.

To summarize: anything which you submit for grading must be your own work.

For the computer projects, you are encouraged to discuss the specifications and problem-solving strategies with the instructor, the Teaching Assistants, and other students from the class. However, once you begin implementing your solution, you must work individually.

Under no circumstances should you share a project solution with another student. Each project solution is electronically compared to all other solutions to identify similar solutions. Students who submit solutions which are essentially identical will receive a penalty grade, such as a score of zero for that assignment or a grade of zero in the course.

Additional information is available at: https://ombud.msu.edu/

Spartan Code of Honor

As a Spartan, I will strive to uphold values of the highest ethical standard. I will practice honesty in my work, foster honesty in my peers, and take pride in knowing that honor is worth more than grades. I will carry these values beyond my time as a student at Michigan State University, continuing the endeavor to build personal integrity in all that I do.

Notes

Any circumstances which impact on your participation in the course should be discussed with your instructor as soon as those circumstances are known (such as absences due to illness or religious observances).

All students are expected to be responsible users of the computer system provided for this course. Account usage guidelines published by the Department of Computer Science and Engineering are posted under:

http://www.cse.msu.edu/Facility/Policies/AUP.php

Commercialization of lecture notes and course materials is not permitted in this course.