CoE 163

Computing Architectures and Algorithms

Course Information

Academic Period: 2nd Semester AY 2021-2022
Units: 3
Prerequisites: Math 40, EEE 121, EEE 153
Workload:

- 3 hours lecture per week
- 1-3 hours quiz/exercise per week

Instructors:

- Isabel M. Austria [isabel.austria at eeemail]
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Course Goals: This course aims to (1) present the connection between algorithms, implementation, and computer architecture, (2) provide tools needed to write and apply fast numerical code, and (3) present representative fundamental numerical algorithms.
Delivery Method: Video lectures and digital materials
Online Platforms: UVLe, Google Meet, Zoom.

Course Outline

Week	Date	Topics	Student Workload
0	Feb 7 - 11	Release of Course Syllabus	-
1	Feb 14 - 18	• Review of CS problem-solving paradigms • Problem identification	Short quiz
2	Feb 21 - 25	• Review of asymptotic analysis • Amortized analysis • High-level code translation to memory	Software exercise
3	Feb 28 - Mar 4	• Comparison of programming languages • Matching problems with programming language • Introduction to x86 assembly	Software exercise
4	Mar 7 - 11	• Cache behavior of linear algebra algorithms • Review of linear algebra operations	Short quiz

		• Solving problems using linear algebra	
5	Mar 14 - 18	• Memory optimization of matrix-matrix multiplication • Automatically-tuned linear algebra software	Software exercise
6	Mar 21 - 25	• Gaussian elimination • Matrix inversion	Software exercise
7	Mar 28 - Apr 1	• Sparse linear algebra • Matrix decomposition	Short quiz
8	Apr 2 - 8	READING BREAK	-
9	Apr 11 - 16	LENTEN BREAK	-
10	Apr 18 - 22	• Parallel computing concepts • Limits of parallel computing	Short quiz
11	Apr 25 - 29	• Parallel computing algorithms	Software exercise
12	May 2 - 6	• Single instruction multiple data vectorization • OpenCL/OpenMP	Software exercise
13	May 9 - 13	• GPU programming basics	
14	Apr 29 - May 5	READING BREAK	
15	May 16 - 20	Buffer Week for Capstone Project	Capstone exercise
16	May 23 - 25	Buffer Week for Capstone Project	
17	May 28 - June 4	Finals Week	

Grading Rubric

Sources of grading for the course are broken down into the following:

- 32% Short quizzes (SQ)
- 48% Software exercises (SE)
- 20% Capstone exercise (CE)

Each grading component's total will be divided equally between the number of items in the category. For example, if by the end of the semester, four SQ's have been released, each SQ will be worth 32/4 = 8% of your final grade.

Aside from the basic division of grades above, students should have submitted at least half of the SQs, half of the SEs, and the CP to pass the course. In addition, students are

required to achieve at least a grade of 50% for each of the total SQ component and the total SE component. Failure to do so will result in a grade of INC.

Students who receive a failing grade or did not meet the requirements stated above may be marked with an DRP instead annotated with “due to COVID-19 pandemic”. It is a University policy to not give a failing (5.0) or conditional (4.0) grade this semester.

Min (inclusive)	Max (exclusive)	Numerical Grade
92	+∞	1.00
88	92	1.25
84	88	1.50
80	84	1.75
76	80	2.00
72	76	2.25
68	72	2.50
64	68	2.75
60	64	3.00
0	60	INC/DRP

Academic Requirements Submission Guidelines

Basic Information

- All academic requirements will have a deadline at the earliest a week (7 days) after the day of release. Weekends and holidays are included in the count.
    - Each of the requirements will have details when the deadline will be.
    - Deadlines will always be at 11:55 PM, GMT+8 (Philippine Standard Time) of that date
    - All academic requirements should be submitted via UVLe unless otherwise stated in the specifications,
        - A submission bin will be provided to upload the requirements, which instructors will give a grade to that at the earliest a week after submission
        - A submission platform for a real-time judgment of your own code may be imposed during the latter parts of the course

Late Submissions

- Late submissions may be entertained
    - Students should contact their instructor, who shall take note of the late submission and decide on what action to take. Valid excuses will merit full points regardless of submission date.
    - With the deadline for submission of grades scheduled on 13 June 2022, we can only accept late submissions until Wednesday, 8 June, 2022. Any submissions after that date will not be entertained and will not be factored into your total grade.
    - Under normal circumstances, instructors may impose the following deduction scheme for late submissions.
        - Guidelines for late short quizzes and machine exercises
            - If requirements are submitted shortly after the deadline (i.e. less than 7 days), scores will be reduced to 90%.
                - For example, if you got a perfect score in an SQ, you only get 90%.
            - If requirements are submitted at least one week (i.e. 7 days or more) late but before the CE is released, your score will be computed as follows:
                - $g_{late} = s(1 - \frac{w}{2c})$, where s is your original score, w the number of weeks late, and c the number of weeks between the deadline of the said requirement and the CE
                - One week is equivalent to seven (7) days, including weekends and holidays.
                    - For example, if a quiz was submitted 13 days after the deadline, it is counted as one (1) week late.
                    - If it was submitted 14 days after (i.e. after 11:55PM of the 14th day), then it is two (2) weeks late.
                - A day is counted once 11:55 PM, GMT+8 (Philippine Standard Time) of that day has passed.
            - If requirements are submitted late but at the time or after the capstone exercise is released, scores will be reduced by half.
                - For example, if you got a perfect score in an SQ, you only get 50%.
            - An equation best describes the score once late is as follows
                - $g_{late} = 0.9s\delta(w) + s(1 - \frac{w}{2c})[u(w - 1) - u(w - c)] + 0.5u(w -$
                - $\delta(x)$is the Dirac delta function (impulse) and $u(x)$ the right-continuous Heaviside step function ($u(0) = 1$)
        - Guidelines for late CE submission

- If the exercise is submitted after the deadline, scores will be reduced to 75%.
    - For example, if you got a perfect score in the CE, you only get 75%.

Academic Dishonesty

- Academic dishonesty is strictly frowned upon.
    - This includes one-to-one copying of segments or whole source codes from other colleagues from the past, present, and future.
        - There is no problem with collaborating among colleagues, but note that it is totally different from copying.
        - Note that it is better to cite where you got your code snippets so that instructors may be informed. Up to 25% of the source code may be derived from outside sources.
    - By taking this course, you consent to the instructors having the right to upload your anonymized source codes to a third-party similarity checker.
    - Allegedly dishonest students will be subject to an investigation and possible delay in grade receipt if the investigation happens after the final exams.
    - Guilty students will face a case with the Student Disciplinary Tribunal (SDT) if strong evidence has been collected.

Others

- Students have the obligation to inform the instructors if they have any difficulties fulfilling the requirements due to material problems, overloaded academic work, and others.