CoE 163

Computing Architectures and Algorithms

Course Information

Academic Period: 2nd Semester AY 2020-2021
Units: 3
Workload:

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

Instructors:

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- Nestor Michael C. Tiglao [nestor at eeemail]

Synopsis: 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, Piazza, Google Meet, Zoom, other quiz platforms.

Course Outline

Week	Topics	Expected Academic Requirements
1	• Review of CS problem-solving paradigms • Problem identification	• Short quiz
2	• Review of asymptotic analysis • Amortized analysis • Comparison of programming languages • Matching problems with programming language	• Short quiz
3	• High-level code translation to memory • Introduction to parallel programming • Introduction to x86 assembly	• Machine exercise
4	• Cache behavior of linear algebra algorithms • Review of linear algebra operations • Solving problems using linear algebra	• Short quiz

5	• Memory optimization of matrix-matrix multiplication • Automatically-tuned linear algebra software	• Short quiz
6	• Gaussian elimination • Matrix inversion	• Machine exercise
7	• Sparse linear algebra • Matrix decomposition	• Machine exercise
8	• Parallel computing concepts • Limits of parallel computing	• Short quiz
9	• Single instruction multiple data vectorization • OpenCL/OpenMP	• Machine exercise
10	• GPU programming introduction	• Machine exercise
11	• Parallel computing algorithms	• Short quiz
12		• Capstone exercise

Grading Rubric

~~40% Short quizzes (SQ)~~
~~35% Machine exercises (ME)~~
~~25% Capstone exercise (CE)~~
55% Short quizzes (SQ)
45% Machine exercises (ME)
10% Capstone exercise (CE)

Numerical Grading Scheme

For them to have another chance at accomplishing tasks for this course, students who receive a failing grade will be marked with an INC instead. Additionally, it is an internal policy to not give a failing (5.0) or conditional (4.0) grade this semester.

Min (inclusive)	Max (exclusive)	Numerical Grade
92	111	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

Academic Requirements Submission Guidelines

- Quizzes and machine exercises 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
    - Short quizzes are delivered via UVLe
    - Machine exercise source codes should be submitted via UVLe
        - A submission bin will be provided to upload source codes, which instructors will give a grade to that at the earliest a week after submission
        - A real-time submission platform to check your own code may be imposed during the latter parts of the course
- Late submission of quizzes and machine exercises may be entertained, but will have deductions
    - 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 a short quiz, you only get 90%.
        - If requirements are submitted at least one week (i.e. 7 days or more) late but before the capstone exercise 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 quiz/exercise and the capstone project
            - One week is equivalent to seven (7) days, including weekends and holidays.
                - 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 <u>at the time or after</u> the capstone exercise is released, scores will be reduced by half.
        - For example, if you got a perfect score in a short quiz, you only get 50%.
    - An equation best describes the score once late is as follows
        - $g_{late} = 0.9s\delta(w) + s(1 - \frac{w}{2c})[u(w-1) - u(w-c)] + 0.5u(w-c)$
        - $\delta(x)$is the Dirac delta function (impulse) and $u(x)$ the right-continuous Heaviside step function ($u(0) = 1$)
- Guidelines for late capstone exercise submission
    - If the exercise is submitted <u>after the deadline</u>, scores will be reduced to 75%.
        - For example, if you got a perfect score in the CE, you only get 75%.
- With the deadline for submission of grades scheduled on 26 June, 2021, we can only accept late submissions until <u>Wednesday, 16 June, 2021</u>. Any submissions after that date <u>will not be entertained</u> and factored in in your total grade.

- Academic dishonesty is strictly frowned upon.
    - This includes one-to-one copying of segments or whole source codes.
    - Allegedly dishonest students will be given a diagnostic test and interview.
    - Guilty students will face a case with the Student Disciplinary Tribunal (SDT) if strong evidence has been collected.
- 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.