EC 713 – Advanced Computing Systems and Architecture – Fall 2021

Instructor: Prof. Ayse Coskun

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Office Location	PHO 338
Office Hours	By appointment. Please include your availability for the following 3 days in your email.

Schedule: Mon-Wed 12:20pm-2:05pm
Location: PHO 207

Course Description:
This class is designed to enable students to follow the latest developments in computer systems and architecture, especially those related to novel multi-core, heterogeneous, or large-scale systems. The course is particularly useful for those who wish to do research related to computing systems, architecture, embedded systems, data centers, high-performance computing, and cloud computing. In addition, the course aims to expand students' background and skills in the design and analysis of computing systems, especially for those who would like to work in industry in related areas.

The lectures will cover a broad array of recent subjects, including memory/cache management in multi-core systems, hardware multi-threading, tiled architectures, heterogeneous systems, modern OSes and system management policies, large-scale system architectures, virtualization and hypervisors/containers, data center management, energy awareness in computing systems, system reliability/resiliency, and emerging areas such as quantum and neuromorphic computing. The concepts will be reinforced with research paper readings and also with homework and project assignments that involve system design and analysis. The assignments will involve the use of micro-architectural and/or cluster simulators as well as development and experiments on real-world systems.

Prerequisites:
- Programming experience (C, C++ or Python)
- One (or more) of the following classes: EC513, EC535, EC527
- (Some) Experience with Linux

** Please discuss with the instructor if you have any questions about the prerequisites.*

References:
There are no mandatory textbooks for this class, but we will be regularly reading papers and book chapters. Any required reading will be listed on Blackboard. A reading list as well as a list of selected books and resources will be provided.

Grading:
Paper evaluations and participation (discussions, scribes, etc.): 20%
Paper presentations: 15%
Mini projects (tentatively 3): 40% *(e.g., 12.5 + 15 + 12.5)*
Project: 25%

Lecture Scribes:
In each lecture, a student will scribe the lecture content. A brief but clear list of discussion items, covered topics, key insights, and important questions is sufficient. Another student will review the lecture scribes

for accuracy. Lecture scribes can be written in any editing tool but should be submitted as pdfs. The final pdf should be emailed to the instructor before the next lecture (with a subject line "EC713 Lecture Scribes <Date>"). Scribes will be shared with the class.

Paper evaluations:
We will be reading research papers from top-tier conferences and journals every week as part of the class. These papers will be essential supplements to the lectures and to the projects. Each student will be submitting 1-2 paper evaluations every week. The evaluations should be brief (1-2 sentence per question) but specific and technical, and should answer the following questions:

- What is the problem described in the paper?
- Why is it an important problem?
- What is the hypothesis or solution in the paper and what is the acclaimed novelty?
- Strengths?
- Weaknesses?

The evaluations are due at the beginning of the lecture that is associated with the given paper. *Late submissions will not be taken into consideration.*

Paper presentations:
Each student will select a paper from the course paper reading list (first-come first-serve) and present that paper during a lecture in a 20-minute conference-style talk. The presentation will be followed by technical discussion. Students may select 1-2 papers depending on the class size.

Mini Projects:
There will be (tentatively) three mini projects during the class. These projects will involve implementations on various simulators and experiments with real-life systems. You will have around 2 weeks to complete each mini project. Deadlines will be strictly enforced, and late submissions will be penalized as follows:

- 10% penalty if submitted within 24 hours and 20% penalty if submitted within 48 hours of the deadline. Submissions that are delayed for more than 48 hours after the deadline are not accepted.

Project:
Instead of a final exam, this class has a final project, which will involve analysis, implementation, and a well-polished presentation of the project details and outcomes (both as a report and an in-class presentation). You will have around a month to complete your project. Projects will be completed individually or in teams of 2 students.

Academic Honesty:
All students are responsible for reading Boston University's academic conduct policy. If you are unclear about any item related to academic honesty, you should immediately ask the professor. Dishonesty in representing one's academic work is a serious ethical violation and will be reported according to university policy.

Course Website and Communication:
You are required to periodically check the course website on BU Blackboard Learn and your e-mail. Blackboard will have the course schedule, slides, links to reading materials, projects, announcements, and a discussion board.

Please use the discussion board for your class-related questions. When you email the instructor, please put "EC713" in the subject line to ensure timely response.