CS 1645/2045: Introduction to High Performance Computing (Spring 2020)

Department of Computer Science, University of Pittsburgh

Course Reference Number: 26749 (CS1645)

When: Spring 2020

What & Where:

Lectures: Monday & Wednesday, 6:00 pm – 7:15 pm @ 5129 Sennott Square

Instructor: Dr. Constantinos Costa

Email: costa.c@cs.pitt.edu

Office: 5425 Sennott Square

Phone: -

Web: https://cs.pitt.edu/∼costa.c/

TA Grader:

Nathan Ackerman

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Office: TBD

Office Hours: Instructors and TA's office hours are listed on the class web site.

Course Description: This course is an introduction to the architecture of and software techniques for parallel and high performance computing systems. The content includes fundamental aspects of vector processing, shared-memory, and distributed-memory systems. Specific applications in parallel processing paradigms will be covered.

Prerequisites: A grade of C or better in CS 0447 and CS 0449 and CS 1501 is required. Working knowledge of C and familiarity with Unix are assumed.

Class Web Page: http://db.cs.pitt.edu/courses/cs1645/current.term
All handouts and class notes will be published on the class web page. You are expected to check this page frequently (at least twice a week).

Textbook: *An Introduction to Parallel Programming* by Peter Pacheco (Morgan Kaufman, 2011, ISBN:978-0123742605)

Textbook (Optional): *Structured Parallel Programming: Patterns for Efficient Computation (1st ed.)* by Michael McCool, James Reinders, and Arch Robison (Morgan Kaufmann ISBN-13: 978-0124159938 & ISBN-10: 0124159931)

Note on Email & Communication: The instructor will periodically post announcements to the course website. It is every student's responsibility to regularly monitor these announcements. The instructor will periodically email enrolled students with announcements. Students must check their Pitt email at least once per day to ensure these announcements are received. Email subject should be prefaced with the appropriate prefix (e.g., "[CS16XX]").

Course Grading:

Homework Assignments	20%	
Term Project	15%	
Midterm Exam	30%	Mar. 2
Final Exam	30%	TBD
Recitation & Class Participation	5%	

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Grading Policy: The grade scaling will be computed based on the performance of the undergraduate students only. Graduate students will then be graded on this undergraduate scale.

Attendance and participation in lecture and recitation may be used to decide borderline grades.

Unless explicitly noted otherwise, the work in this course is to be done independently. Discussions with other students on the assignments should be limited to understanding the statement of the problems. Cheating in any way, including giving your work to someone else will result in an F for the course and a report to the appropriate University authority.

Marks can be appealed up to two weeks after they have been posted, after that no appeals will be considered.

Submission & Late Policy: All written assignments must be submitted electronically and **there is no late submission**. An assignment which is late will be accepted *only* under special circumstances with the instructor's permission prior to its deadline. In such a case, the instructor will determine any penalty in a fair manner.

Make-up Policy: Students are expected to take both midterm and final exams. Make-up exams will only be given in the event of a medical situation or an emergency, and only if this is documented and the instructor is notified *immediately if in advance is not possible*. Missing an exam will result in a zero for the exam.

Students with Disabilities: If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services, 140 William Pitt Union, 412-648-7890 or 412-383-7355 (TTY) as early as possible in the term.

Religious Observance: In order to accommodate the observance of religious holidays, students should inform the instructor of any such days within the first two weeks of the term by email (**Jan 20**).

Audio/Video Recording - Use of Cell Phones To ensure the free & open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use. Also, any use of Cell Phones during lectures is disruptive and is not permitted.

Copyrighted Material All material provided through this web site is subject to copyright. This applies to class/recitation notes, slides, assignments, solutions, project descriptions, etc.

You are allowed (and expected!) to use all the provided material for personal use. However, you are strictly prohibited from sharing the material with others in general and from posting the material on the Web or other file sharing venues in particular.

Outline: Tentative Syllabus

1. High performance computing systems
2. Parallel programming patterns
3. Multiprocessor architectures
4. Cache coherence in symmetric multiprocessors
5. Shared memory programming with OpenMP
6. Accelerators programming with OpenMP extensions
7. Models of parallel processing
8. Performance metrics
9. Distributed memory programming with MPI
10. Parallel algorithms
11. Map Reduce

[Last updated on Sun Jan 5 08:46:34 EST 2020]