DS642: Parallel Computing

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DS 642: Applications of Parallel Computing

Monday: 6pm - 8:50pm
NJIT@JerseyCity (101 Hudson St.)
CRN: 15935
Instructor: Distinguished Professor David A. Bader (https://t.e2ma.net/click/2rb85v/elurcjac/aeu3u6)

Course Description

This course will teach students how to design, analyze, and implement, parallel programs for high performance computational science and engineering applications. The course focuses on advanced computer architectures, parallel algorithms, parallel languages, and performance-oriented computing. Students will develop knowledge and skills to efficiently solve challenging problems in science and engineering, where very fast computers are required either to perform complex simulations or to analyze enormous datasets.

Prerequisites: Proficiency in (non-parallel) programming in a high level procedural language.

Topics include:

- Introduction to Single Processor Machines and Parallel Computing
- Optimizing/Tuning Matrix Multiplication
- Shared-Memory Programming, Memory Hierarchies, Multicore and Many core
- An Introduction to GPGPU Programming with CUDA
- Distributed Memory Machines and Programming, Advanced MPI and Collective Communication
- Parallel Matrix Multiply, Dense Linear Algebra, Sparse Matrix-Vector Multiplication
- Fast Fourier Transform
- Parallel Graph Algorithms
- Partitioning Applications for Heterogeneous Resources, Dynamic Load Balancing
- Machine Learning, Cloud Computing and Big Data Processing
- Measuring Performance, Identifying Bottlenecks
- Advanced Topics in Parallel Programming
- Project Presentations

Teaching Assistant

- **A M Muntasir Rahman**, ar238@njit.edu
  Office Hours: Tuesday, 11:30 am to 1:00 pm
  Webex: https://njit.webex.com/meet/ar238 (https://njit.webex.com/meet/ar238)

Evaluation

Grading components:

Participation	10%
Homework	10%
Project	20%
Midterm	30%
Final Exam	30%

Late Policy

Students are expected to complete work on schedule. Late work is not accepted unless prior arrangements are made with the instructor.

Academic Integrity and Student Conduct:

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf (https://t.e2ma.net/click/7xcjqfb/7td9novf/vc0hkjx) .

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu (mailto:dos@njit.edu) "

Proctoring of midterm and final exams

NJIT policy requires that all midterm and final exams must be proctored, regardless of delivery mode, in order to increase academic integrity. In this course you will be required to use an online proctoring module to ensure academic integrity for exams.

Course Summary:

Date	Details	Due
Mon Jan 22, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73129&include_contexts=course_33870)	6pm to 8:50pm
Mon Jan 29, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?	6pm to 8:50pm

Date	Details	Due
	event_id=73130&include_contexts=course_33870)	
Mon Feb 5, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73131&include_contexts=course_33870)	6pm to 8:50pm
Mon Feb 12, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73132&include_contexts=course_33870)	6pm to 8:50pm
Mon Feb 19, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73133&include_contexts=course_33870)	6pm to 8:50pm
Mon Feb 26, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73134&include_contexts=course_33870)	6pm to 8:50pm
Mon Mar 4, 2024	DS 642 Lecture and Midterm Exam (https://njit.instructure.com/calendar?event_id=73135&include_contexts=course_33870)	6pm to 8:50pm
Mon Mar 18, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73137&include_contexts=course_33870)	6pm to 8:50pm
Mon Mar 25, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73138&include_contexts=course_33870)	6pm to 8:50pm
Mon Apr 1, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73139&include_contexts=course_33870)	6pm to 8:50pm
Mon Apr 8, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73140&include_contexts=course_33870)	6pm to 8:50pm
Mon Apr 15, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73141&include_contexts=course_33870)	6pm to 8:50pm

Date	Details	Due
Mon Apr 22, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73142&include_contexts=course_33870)	6pm to 8:50pm
Mon Apr 29, 2024	DS 642 Lecture (https://njit.instructure.com/calendar?event_id=73143&include_contexts=course_33870)	6pm to 8:50pm
Mon May 6, 2024	DS 642 Final Exam (https://njit.instructure.com/calendar?event_id=73144&include_contexts=course_33870)	6pm to 8:50pm