Instructor. **Prof. Kamesh Madduri**, 343E IST Building, [madduri at cse.psu.edu](mailto:madduri at cse.psu.edu), 814-865-0883. Office hours: TR 2.30–4.00 PM (343E IST), or by appointment ([madduri.org/cal](http://madduri.org/cal)).

**Class Overview and Topics.** This is a graduate class on the design, analysis, and implementation of parallel algorithms for solving computational science problems. This class will also provide students hands-on experience programming current and emerging high-performance computing systems. Topics to be covered this semester include:

- **Parallel Algorithm Design and Analysis:** Models for algorithm analysis, Sources of concurrency, Overview of current parallel systems.
- **High-performance Parallel Programming:** Programming models and libraries (MPI, OpenMP, CUDA), Optimizations for serial performance, Memory locality.
- **Parallelization Techniques:** Divide and conquer, Balanced trees, Pointer jumping, Pipelining, Randomization.
- **Applications:** Dense linear algebra, Sparse matrix computations, Sorting, FFT, N-body methods, Graph Analytics.

**Prerequisites.** Students should have taken undergraduate classes on Algorithms, Data Structures, and Computer Architecture. Students should also be comfortable in sequential programming in a general-purpose language such as C, C++, Java, or Fortran. Undergraduate students and non-CSE graduate students should get the instructor’s consent before registering for the class.


**Class Material.** All class presentations, lecture notes, and homework assignments will be posted on Penn State’s Angel CMS. Please send me email through Angel. We will also be using Piazza for class discussions, announcements, and for clarifications regarding homeworks and exams.

**Evaluation and Grading.** The final grade will be based on class participation (5%), two homeworks (20%), an individual term project with graded milestones (30%), an in-class midterm exam (Feb 27, 20%), and a final exam (25%).

**Attendance Policy.** I strongly encourage students to attend all the lectures. Please let me know if you will be missing multiple classes for legitimate, unavoidable reasons.

**Academic Integrity.** Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception.
Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others. Students must abide by the administrative policy for academic integrity (please see http://www.psu.edu/oue/aappm/). For this class, students must independently perform the homework assignments and term project. Avoid plagiarism (http://tlt.its.psu.edu/plagiarism/tutorial), and please contact me first if you are in doubt.

**Educational Equity.** Penn State welcomes students with disabilities into the University’s educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at http://equity.psu.edu/ods/ In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at http://equity.psu.edu/ods/guidelines/documentation-guidelines). If the documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.