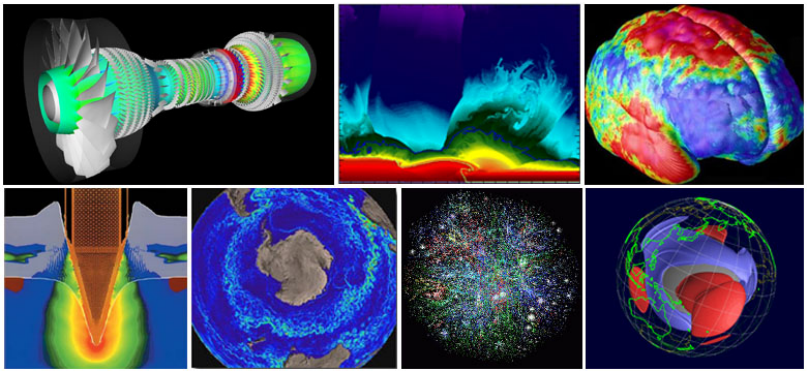

CENG478 - Introduction to Parallel Computing - Spring 2017

Hours: Friday 9:40 - 12:30 A101

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Office Hours:	TBD

Motivation: Today parallel computing is everywhere, it is not only the fastest computers, but also from your laptop to cellphone, most devices contain parallel processors. While the fastest computers are large parallel clusters today, programming them remains a challenge. Programmer needs to consider multiple issues like how to load balance and how to effectively use multiple levels of caches and the communication network which are not independent from the architecture being used. This course will start with high performance aspects of sequential computing, and continue with parallel computing platforms, parallel algorithms and their applications.

Image source: `https://computing.llnl.gov/tutorials/parallel_comp/`

Outline:

- Introduction and an overview of architectural features of parallel processors and their memory hierarchy
- Performance of sequential algoirthms and efficient implementations
- Parallel platforms and programming models
- Principles of parallel algorithm design and performance analysis
- Basic communication operations and their implementation on various network topologies
- Parallel algorithms and applications

Prerequisites:

Mathematical skills to understand the algorithms and their analysis, and conventional (sequential) programming skills in at least one language (C, C++, etc.).

Take-home programming exams:

There will be 4 take-home programming exams. The objective is to provide you with some hands on experience in parallel computing. All exams are expected to be your individual work but discussion of ideas or concepts are allowed and encouraged. When writing your code or report, however, you should not look at other people's work. If you use a source (online or offline) you are expected to cite it and state how you used it in your report. We will be using the parallel computing platforms that are available in our department. Delayed submissions are accepted with a penalty of $-5 \times d^2$ where d is the number of days in which the solution is submitted late.

Midterm and Final:

Midterm and final examinations are closed book and notes, all electronic devices (cell phones, laptops, tablets, etc.) must be turned off. Only one page (no larger than A4) and **hand written** (i.e. no photocopies, no printouts) cheatsheet is allowed.

Attendence and Participation:

Attendence and participation in the class and online discussions and office hours are encouraged. I will check attendance in class (randomly) and in my office hours and I may use it in your favor when assigning letter grades.

Grading:

Take-home programming exam ($\times 4$)	40%
Midterm exam ($\times 1$)	30%
Final exam ($\times 1$)	30%
Total	100%

Course Policy and academic honesty:

All take-home, midterm and final exams are expected to be individual work. Any Violation of the general principles about the homeworks and the exams will be handled based on the university regulations and may result in disciplinary action.

Makeup policy:

In case of an official medical or family emergency that prevented you from attending the midterm or the final, you should contact the instructor as soon as possible and provide documentation. Makeup will be comphrensive and will take place after the final exams.

Textbook

Introduction to Parallel Computing, by Grama, Gupta, Kumar, and Karypis, Addison Wesley. 2003

Some other references:

Introduction to Hight Performance Computing for Scientists and Engineers, by Hager and Wellein, Chapman & Hall/CRC Computational Science. 2010
The Sourcebook of Parallel Computing, Dongarra, Foster, Fox, and Gropp, Kaufmann. 2002
Parallel Programming for Multicore and Cluster Systems, Rauber and Runger, Springer Verlag, 2010.
Introduction to Parallel Computing: A Practical Guide with Examples in C , Petersen and Arbenz, Oxford University Press, 2004.