Textbook: "Introduction to Parallel Computing", 2nd Edition; Grama, Gupta, Karypis, and Kumar; Addison Wesley, 2003.

Tentative Course Content:

- Overview & Serial Algorithms (1 lecture) [Chapters 8-12, online resources]
- Architecture (3-4 lectures) [Chapter 2]
- Programming APIs - Part I (4 lectures) [Chapters 6-7, online resources]
  - MPI, pthreads, OpenMP
- Performance analysis (1-2 lectures) [Chapter 5]
- What you need to know to design effective parallel algorithms [3-4 lectures, Chapters 3, 8-12, online resources]
  - Concurrency and decomposition techniques
    - Task, data, speculative, exploratory, and hybrid decomposition schemes.
  - Analyzing tasks and identifying their dependencies
  - Mapping techniques & Static load balancing
  - Identifying and limiting communication overheads
    - Collective communication operations.
  - Dynamic load balancing techniques
- Collective Communication Operations (2 lectures) [Chapter 4]
- Programming APIs - Part II (2-3 lectures) [Chapters 6-7, online resources]
  - Advanced aspects of the programming APIs
  - CUDA
- Dense matrix algorithms (2 lectures) [Chapter 8]
- Sorting algorithms (2 lectures) [Chapter 9]
- Graph algorithms (2 lectures) [Chapter 10]
- Search and discrete optimization problems (2 lectures) [Chapter 11]
- Dynamic programming (2 lectures) [Chapter 12]
- Developing parallel applications (2 lectures) [online resources]

Course Evaluation:

- There are going to be four (4) homework assignments. The assignments will consist of writing parallel algorithms using MPI, pthreads, OpenMP, and CUDA and measuring their performance. Due dates for the homeworks are strict: All homeworks must be uploaded by midnight of the due date in order to receive credit. **There will be no partial credit for late homeworks.** The programming assignments will be in either C or C++.
  - Target due dates for the assignments: 2/13, 3/6, 4/3, and 5/1 (all due dates are on Mondays).
  - The assignments will be given out at least a week in advance.
- There are going to be two midterm exams on 3/2 and 4/13. They will be closed book closed notes.
- **UPDATED:** The final exam is on **May 12th** (10:30am-1:00pm) in **KHKH 3-115**. It will be closed book closed notes. Note that you must take the final on the specified time! **Note that this is no longer in the same room as the normal class lectures.**