Texts: None, but some computer manuals will be used, and there will be various papers, book excerpts, and web resources.

Course Overview: The course will survey parallel computing. While the emphasis is on developing efficient parallel programs, some attention will be paid to the basic structure of parallel architectures and systems software since they significantly affect the efficiency of parallel programs. As you will see, parallel systems vary quite widely. We will discuss ways of analyzing, predicting, and improving parallel performance. Issues discussed will include language extensions (such as MPI and OpenMP) for parallelism, synchronization, load balancing, communication minimization, and latency tolerance. Parallel programming paradigms such as divide-and-conquer and master-slave will be taught and applied to various problems. Attention will also be paid to the present and future status of parallel computing.

Grading: Graded work will consist of written homework, programs, and a final project. There are no tests. About 15% of the grade is written homework, about 40% is programs, and about 45% is the project. The percentages may change depending on how easy it is to get adequate access to computing resources. The programs will be run on computer systems here on campus and/or national supercomputing centers. The written homework includes developing very simple algorithms for abstract models of parallel computers, and analyzing their performance. Unless otherwise instructed, you are not allowed to work with anyone else, though you may ask others for help in understanding the problems. For anything that is not an assigned homework problem you are allowed (and encouraged) to talk with others.

The final project is a project of your choosing (though I must approve it). Some students pick the project to reinforce work they are doing elsewhere, e.g., it is something they can use for their thesis. Other students pick the project to try something new, to see if they are interested in pursuing the topic. Final projects must be related to parallel computing, but other than that you have a wide latitude in picking the topic.

For people who turn in all of the assignments the most common grades are A- and B+. Historically there are a few A+ grades, and few grades below B. All grading is relative.

You will not pass the course if your homework programs do not work correctly.

GSI: Yujie An, anyujie@umich.edu

Office Hours: TBD

Class email and announcements: The university’s CTools system will be used. It’s moderated, so you should send email to us, and if we think it is useful for the others then I’ll post it. When you send email to us, preface the subject line with “587”.
Honor Code: The Engineering Honor Code, described at www.engin.umich.edu/students/honorcode/ applies to all assignments in this class. Basically it says that you shouldn’t cheat.

Turning in Homework: The homework must be typewritten, though you can draw figures by hand. LaTeX is a useful system for typesetting technical material, though you may use other systems such as Word.

For problems for which you are to provide an algorithm:

• produce an algorithm optimal for the worst case (unless given other instructions, such as optimal expected case),
• make sure that your algorithm is clearly described,
• show that the algorithm is correct, and
• analyze its worst-case time in generalized O-notation.

You may be unfamiliar with some of these instructions, but they will be explained before you need to apply them. There will only be a few such homework problems.

For programming assignments you need to provide:

• a very short description of the approach you used (you’re writing to us, not a general audience, so you don’t need to provide an overview of the problem since we know what it is)
• a performance analysis of your program, typically analyzing how the time changed as the input size changed, and how the time changed as the number of processors changed.

There will be further discussion of these requirements before the first program is due.

It is your job to make the descriptions and analyses clear, rather than our job to decipher what you have done. You can lose points for unclear write-ups. Further, do not just write down a large body of material in the hope that some of it is relevant.

When homework is due you must turn it in at the start of class. Turn in a hard copy. If you can’t attend the class when it is to be turned in, then you must turn it in prior to the class meeting time.

Homework will be graded by the GSI. If you disagree with the homework grade then you should discuss this with him. I will grade the final project and assign the course grade.