**Course outline.** The course is to introduce the students to the basics of theory of quantum computing, as well as to expose them to the current research problems. Topics include, but are not limited to, (1) Mathematical foundations of quantum mechanics and models of quantum computation; (2) Quantum algorithms; (3) Classical simulation of quantum circuits; (4) Quantum lower bounds; (5) Quantum interactive proof systems; (6) Quantum communication complexity; (7) Quantum error-correcting codes, and fault-tolerant quantum computation; (8) Quantum cryptography.

**Schedule.** TTH1:30–3:00, EECS 3427.
**Instructor.** Yaoyun Shi, EECS2233, 764-3308.
**Course home page.** http://www.eecs.umich.edu/~shiyy/598.

**Prerequisites.** Linear algebra at college level. Knowledge on theoretical computer science and quantum mechanics is helpful but not necessary.

**Coursework.** I will lecture for about 3/4 of the meeting time. The students may be required to do

(a) Homework: about 4/semester, each takes an average student 3 hours;

(b) Scribing: taking notes and typeset it in latex, takes an average student 4 hours;

(c) Reading papers: the student can choose either to present 1 paper in class or to write a one-page review for 2 papers;

(d) Course project: requires the students to work on an open problem, that is, to read most relevant papers and try to prove new results. If no new result is proved, it requires the students to write a survey paper on the subject.

To cultivate the students’ ability to communicate and collaborate with others, they will be organized in teams, and collaborate with teammates on (c) and (d).

**Credit.** Upon the request of the students, which to me makes sense, I propose to allow them to take 1, 2, or 3 credits, for each of which the requirements are: (1) 1 unit: attendance, (a), and (b); (2) 2 unit: 1 unit plus (c); (3) 3 unit: 2 unit plus (d).

**Textbooks.** Required:


References:
