Syllabus:

Quantum Theory (PHYS 551)

Instructor: Prof. Guy D. Moore
Rutherford Physics 313
email: guymoore@physics.mcgill.ca
Office hours: 11:00–12:00 MTWRF

Course structure: This will be a lecture-and-homework based, advanced course in Quantum Mechanics. The course will be graded based on weekly homework assignments and a take-home final.

Course details: **Meetings**: Mon/Wed 4:00-5:30PM in Rutherford 115
Book: Sakurai and Napolitano, "Modern Quantum Mechanics"
Webpage: http://www.physics.mcgill.ca/∼guymoore/ph551/
Grade: 70% Homework, 30% Final Exam.
TAs: Alexandre Belin (RPHYS 314), Leesa Fleury (RPHYS 308).
Prerequisites: Graduate or U3 Honours undergraduate standing, or instructor permission. Solid underpinnings in quantum mechanics and linear algebra.

Intended Syllabus: (not necessarily in order)

- Brief review of Hilbert space, Dirac notation, *etc.*
- WKB approximation
- Harmonic Operator, coherent and squeezed states
- Symmetries in Quantum Mechanics
- Rotation group, addition of angular momenta, Wigner-Eckart theorem
- Path integrals
- Density matrices, measurement, Schrödinger's Cat
- Bell inequalities
- Electromagnetic fields, Aharamov-Bohm effect
- Time dependent perturbation theory, adiabatic evolution
- radiation from atoms
- Scattering theory, partial waves
- **Time permitting**: Lorentz group, Dirac equation

TAs will grade assignments but will also lead weekly tutorial sessions.

Homework: Homeworks will be posted online Fridays, due the next Friday in hard copy in my mailbox (preferred) or as email attachment in `.pdf` format, by 5:00 PM. The schedule of homework handouts may slip; but there will never be homeworks more often than once weekly and homeworks will always be due a week after they are posted. Late homeworks will be accepted but marked down 25% on Monday or Tuesday, but on Wednesday I will post the solution key and the assignment cannot be handed in for a grade. Discussion and collaboration on homework assignments is allowed within reason, but ultimately students' submissions should reflect their work.

Final exam: The final will be a 24-hour take-home which is open-book but closed-internet and to be done strictly individually. I will post it in the morning on a date chosen and announced well in advance based on students not having another exam that day. Don't turn it in late.[1]

Grading: As standard at McGill, 85% and above is an A, $84.\overline{9}$–80% is an $A-$, $79.\overline{9}$–75% is a $B+$, *etc.* Recall that, for graduate students, any grade below $B-$ is converted into an F. It is possible that my homeworks and final will be too difficult, in which case I reserve the right to curve the grades *up*; however I will *not* curve them down.

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism, and other academic offences under the Code of Student Conduct and Disciplinary Procedures: see `www.mcgill.ca/students/srr/honest/` for more information.

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

[1] I will accept late finals but I will grade them down by 5% *per hour* by which they are late.