

# Physics 125, Quantum Mechanics

## Syllabus, Fall 2019

*Last updated: September 4th, 2019.*

*Any minor updates to the syllabus will be available at: [physics.stmarys-ca.edu/courses/Physics125/19F](http://physics.stmarys-ca.edu/courses/Physics125/19F).*

### Instructor

- [Prof. Brian Hill](#) (you are upper division students now — call me whatever you are comfortable with)
- My email, office phone, office location, and office hours are always handy on the web at [physics.stmarys-ca.edu/faculty/brianhill](http://physics.stmarys-ca.edu/faculty/brianhill).

### Outline and Schedule

We will use [Townsend, 2nd edition](#) as our text, and follow the author's recommendation for a one-semester course.

- Unit 1: Appendix A, and Chapters 1-3 (Stern-Gerlach experiment, basis states, rotation operators, angular momentum)
- Unit 2: Chapters 4-6 (time evolution, two-particle states, waves)
- Unit 3: Chapters 7, 9, and 10 (harmonic oscillator, two-body orbit problem, one-electron atom)
- Unit 4: Chapters 11 and 12 (perturbation theory, identical particles, multi-electron atoms)

# Mathematics

Quantum mechanics uses a lot of advanced (upper-division) math. The more upper-division math you've had, the easier the course will be. Do not despair if you don't already know all this math. A quantum mechanics course is a great place to learn it, and then your upper-division math courses will be easier. We will of course use all of differential and integral calculus, including multi-variable calculus. The more advanced mathematical subjects are:

- Linear Algebra
- Complex Variables
- Differential Equations
- Group Theory (just the representations of the rotation group)

## Grading and Honor Code

There will be three midterms and a final. The midterm dates are:

- Friday, September 27th
- Wednesday, October 23rd
- Monday, November 18th

The final date is determined by the College's [final examination schedule](#):

- Wednesday, December 11th, 10:30am-12:30pm

The three midterms are each worth 15% of the course grade. The final is worth 25%. If your percentage score on the final is better than your lowest midterm, then your final percentage will replace that midterm's percentage. (As a corollary of this, if you miss one midterm for

whatever reason, your final percentage will replace that midterm's percentage.)

Homework, including presentation of homework solutions in-class, will be the remaining 30% of the grade. Homework must be neat, clear, organized, and stapled. Late homework is only worth 50% of the possible points. Late homework is worth nothing after the corresponding unit exam.

The Saint Mary's College honor code is applicable to all work that contributes to the course grade. Do not copy anyone else's solutions.

## Advice and Thoughts

The only way to keep up and do well is to be totally on top of the assigned work. The time in lecture is just the tip of the iceberg of the time it will take to study and learn quantum mechanics. Getting behind will result in a fiasco.

I will deliberately stay close to the text so that if you (or I) do an inadequate job on some of the material, you can rely on Townsend's presentation to reinforce what was covered.

Quantum mechanics is the weirdest, most difficult physical theory you have yet encountered. It is so counter-intuitive that many physicists never make their peace with it. In fact, after you have encountered quantum mechanics, the subjects of special and general relativity may even seem normal by comparison. I hope the weirdness of quantum mechanics makes at least some of you enjoy the subject even more.