University of Victoria  
Department of Physics and Astronomy  
**Physics 323 - Quantum Mechanics I**  
Fall 2019 Syllabus

**General Information**

**Instructor:** Travis Martin  
**Email:** travismartin@uvic.ca  
**Office:** Elliot 402B  
**Office Hours:** Wednesday 3:00-4:00pm, Thursday 1:00-2:00pm  
**Course Webpage:** http://coursespaces.uvic.ca

**Lecture Schedule:**  
Monday and Thursday from 10:00am - 11:20pm in CLE C112.

**Prerequisites:**  
PHYS215 and MATH204. The course is structured assuming you are taking MATH342 at the same time as PHYS323, thus MATH342 is either a prerequisite or corequisite course.

**Required Materials:**  
Textbook: *Quantum Mechanics* by McIntyre - officially, this is the textbook for the course, as it is the superior of the offerings for this level of quantum mechanics. The textbook for this course is for reference material; no homework questions will be assigned from the textbook.  
McIntyre does a good job of balancing formalism with approachability. If students would prefer to get a copy of Griffiths’s *Introduction to Quantum Mechanics*, this would be fine and you will likely be able to keep up with the material. Griffiths has less formalism and does not explore topics in as much detail as I would prefer. For advanced students, I recommend a copy of *Modern Quantum Mechanics* by Sakurai. It is an excellent textbook aimed at an advanced audience that bridges the gap between undergraduate and graduate quantum mechanics.

**Labs:**  

Some notes regarding the labs for this course:

- You must complete all labs to pass the course.
- You must achieve a passing grade in the labs in order to pass the course.
Course Overview

The end goal of this course is to provide all of the necessary tools and methods for understanding the full quantum mechanical hydrogen wavefunction. A rough outline of the course is below.

1. Particle waves and Quantum Formalism
   (a) Introduction (Motivation for Quantum Mechanics)
   (b) Statistics (Expectation values, Variance, Standard Deviation)
   (c) Linear Algebra (Vectors, Inner Products, Matrix Multiplication, Eigenvalues, Eigenvectors, Basis, Change of Basis)
   (d) Hilbert Space (Inner Product/Function Space, Connection to Linear Algebra)
   (e) Quantum Mechanics (Hidden Variables, Copenhagen, Statistical Interpretation)
   (f) Schroedinger’s Equation (Derivation, Operators, Free Particle Wavefunction)
   (g) Functional Example - Infinite Square Well (Quantized States, Calculations in QM)

MIDTERM

2. Quantized Systems
   (a) Time Evolution (Stationary States)
   (b) Functional Example - Finite Square Well
   (c) Functional Example - Harmonic Oscillator
   (d) Functional Example - Scattering and Tunnelling
   (e) Functional Example - Spin & The Stern-Gerlach Experiment
   (f) Angular Momentum, Mixed States, Clebsch-Gordon

3. Hydrogen Atom
   (a) Shroedinger’s Equation in Spherical Coordinates
   (b) Radial Equation
   (c) Angular Equation
   (d) Combining All Components

4. Quantum Peculiarities (if there is time!)

FINAL EXAM
Grading

If the application of this scheme would result in grades that are judged by the instructor to be inconsistent with the University’s grading descriptions (https://web.uvic.ca/calendar2014/FACS/UnIn/UARe/Grad.html), then the instructor will assign percentages consistent with them.

Assignments: 25%

There will be approximately 8 assignments throughout the semester. Assignments will be due at the start of class on the provided due date. Assignments may include questions that have a programming component to them. You will be expected to submit your code along with the results of the code. You may use any programming language you prefer (note: Excel is not a programming language).

Assignment Policy: You are allowed to collaborate on assignments, so long as your work and your solutions are your own. Discussing with a friend is no different from discussing with a professor, except it will likely help your friend learn the material better (teaching someone is the best way to learn material, trust me).

Neatness Policy: You are expected to treat your assignments with respect. All assignments must be submitted with a cover page (provided) and stapled in the upper left corner. Assignments without a cover page or a staple will not be accepted, nor will assignments that use ripped or excessively creased paper. This includes pages torn from a coil notebook.

Laboratory Activities: 15%

The labs with this class are assigned due to logistical reasons, rather than pedagogical reasons. It is department policy that you must pass the labs in order to pass this course.

Midterm Exam: 20%

The midterm is designed to encourage students to summarize their knowledge of the material in the first half of the course. The midterm will be held in-class at a date that will be determined near the start of June.

Final Exam: 40%

The final exam will be comprehensive in that it will require knowledge of all of the material of the course. The final exam will have a greater weight of questions that focus on material after the midterm.

Accommodations:

Accommodations can be made for missed exams/assignments due to illness or other severe affliction, as well as conflicts with classes and religious observances. Accommodations will also be made for issues documented through CAL.

If you miss an exam or assignment, I expect you to contact me as soon as possible. If you anticipate missing a course requirement, you must contact me a reasonable time in advance. If an emergency occurs during a test, please talk to me. I can’t help if I don’t know about the problem.
University Regulations on Academic Integrity

These regulations are reproduced from [http://web.uvic.ca/calendar2011/FACS/UnIn/UARe/PoAcI.html](http://web.uvic.ca/calendar2011/FACS/UnIn/UARe/PoAcI.html). For full information, including procedures for dealing with academic integrity infringement, see the webpage linked above.

Academic integrity requires commitment to the values of honesty, trust, fairness, respect, and responsibility. Any action that contravenes this standard, including misrepresentation, falsification or deception, undermines the intention and worth of scholarly work and violates the fundamental academic rights of members of our community.

Several types of academic integrity violations are covered in brief below.

**Plagiarism**

A student commits plagiarism when he or she:

- submits the work of another person as original work
- gives inadequate attribution to an author or creator whose work is incorporated into the student’s work, including failing to indicate clearly the inclusion of another individual’s work
- paraphrases material from a source without sufficient acknowledgement as described above

Students who are in doubt as to what constitutes plagiarism in a particular instance should consult their course instructor.

**Falsifying Material Subject to Academic Evaluation**

Falsifying materials subject to academic evaluation includes, but is not limited to:

- fraudulently manipulating laboratory processes, electronic data or research data in order to achieve desired results
- using work prepared by someone else (e.g., commercially prepared essays) and submitting it as one’s own
- citing a source from which material was not obtained
- using a quoted reference from a non-original source while implying reference to the original source
- submitting false records, information or data, in writing or orally

**Cheating on Assignments, Tests/Quizzes and Examinations**

Cheating includes, but is not limited to:

- copying the answers or other work of another person
- sharing information or answers when doing take-home assignments, tests and examinations except where the instructor has authorized collaborative work
- having in an examination or test any materials or equipment other than those authorized by the examiners impersonating a candidate on an examination or test, or being assigned the results of such impersonation
- *assisting others to engage in conduct that is considered cheating*