

# Quantum Mechanics

PHYS 5115, Fall 2019

## Basic information

**Lecturer:** Prof. Dima Krioukov

**Office:** 177 Huntington Ave, 2<sup>nd</sup> floor, office 227

**Email:** dima@northeastern.edu

**Lecture hours:** Mon, Wed, 2:50AM-4:30PM

**Classroom:** Richards Hall 275

**Office hours:** Wed, 11:11AM-2:22PM by appointments only. Appointments must be made at least 24hrs in advance. You should bring your ID when coming to 177 Huntington – the building is secured.

**Textbook:** *A Modern Approach to Quantum Mechanics*, 2<sup>nd</sup> Edition, by John S. Townsend, University Science Books, 2012

**Background reading:** *Philosophy of Physics: Quantum Theory*, by Tim Maudlin, Princeton University Press, 2019

**Course description and objectives:** Lays out the basic axioms of quantum mechanics, and the complementarity between the wave function and matrix mechanics approach to quantum systems. Considers systems of spins in static and dynamical settings, deriving the algebra for addition of angular momenta. Introduces the notion of time evolution and coherent states/wave packets. Demonstrates the solution to numerous one and three-dimensional problems, including the harmonic oscillator and hydrogen atom. Time permitting, advanced topics include perturbation theory, path integral and groups of symmetries.

## Grading

The grades will be based on the following components:

- Homework 30%
- Midterm Exam 30%
- Final Exam 30%
- Proof of TRACE Evaluation 10%

The scores on these components will be weighted as indicated above to determine the average weighted total score in the class. The difference between this score and 82.5 (mid-B) will then be added to all individual weighted total scores. The resulting scores will be used to determine the individual grades according to the following table:

- A 92-100
- A- 88-92
- B+ 85-88
- B 80-85
- B- 70-80
- C+ 68-70
- C 65-68
- C- 60-65

**Homework:** Homework assignments will be announced in the class and via blackboard after a chapter is finished in the class. The assignments will be due typically in one week after the announcement and will be collected in the class. No late homework assignments will be accepted. One lowest homework score will be dropped. Homework assignments will be problems from the textbook. Some homework problems will be based on the material in the textbook not covered in the class.

**Midterm:** There will be one in-class midterm exam in October. The exact date is TBD.

**Final:** There will be one take-home final exam distributed during the last class. The exams will have to be returned to 111DA by a TBD date during the week of finals. The problems in the midterm and final exams will be based on the material covered in the class *and* in the homework assignments. All other midterm- and final-related details will be announced in the class and via blackboard.

**Proof of TRACE evaluation** (e.g. a submission screenshot) must be emailed to [dima@northeastern.edu](mailto:dima@northeastern.edu) by a TBD deadline. All the TBD dates and deadlines will be announced in the class and via blackboard.

## Reading and material covered

Not all the chapters in the textbook will be covered, and no covered chapter will be covered in full. Since some homework problems will be based on the textbook material not covered in the class, reading the corresponding parts in the textbook will be required. Reading a chapter in full *before* it is covered in the class is strongly encouraged. This way you can focus on asking questions during the class to clarify concepts you did not understand in the textbook. Such questions are strongly encouraged. Some extra material not contained in the textbook will be also covered in the class. Keeping good notes is thus strongly encouraged, especially because the exams may contain problems based on this material. The foundations/interpretations of quantum mechanics will be mentioned but not covered at any depth. Students who find these matters interesting are encouraged to read the excellent background reading book mentioned above (by T. Maudlin).

## Class and exam policies

No phone, tablet or laptop use is allowed in the class. Everything else is allowed in the class and at the exams. That is, the textbook, class notes and homework solutions are all allowed at both the midterm and final exams.

## Need Help?

1. Come to the office hours, Wed 11:11 AM – 2:22 PM at 227 177 Huntington.
2. The Physics Workshop offers free help sessions by physics doctorate students. You can drop in at the times indicated on the Physics Workshop Schedule available at <https://web.northeastern.edu/ipl/the-ipl-experience/physics-workshop/>
3. Peer tutoring by undergraduate students is available on a first-come/first-serve basis. Follow the instructions at <https://undergraduate.northeastern.edu/peer-tutoring/>

## Academic Integrity Policy

The Northeastern University Policy on Academic Honesty can be found at:

<http://www.northeastern.edu/osccr/academic-integrity-policy/>