Syllabus 181
Quantum Mechanics for Everyone
Winter 2023

Coordinates

• This class meets on Mondays and Wednesdays, from 2pm-3.50pm.
• We meet in the Allan Price Science Commons and Research Library (aka the Science Library), in room B040.

Personnel

Instructor

• Dr. Steven van Enk [he/him/his]
• office: 251A WIL
• email: svenenk@uoregon.edu
• office hours: Tuesday and Thursday, 11am-noon

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• Natalie Velez [she/her]
• office: 217 WIL
• email: nvelez@uoregon.edu
• office hours: Wednesday, 11am-noon

What this course is about

• An introduction to some of the important ideas of Quantum Mechanics, meant for non-science majors.
• We’ll discuss some of the crucial experiments that led to Quantum Mechanics.

• We’ll go through some modern technologies that rely on Quantum Mechanics.

**Learning goals**

• Be able to identify the main objects and relations between the objects comprising quantum theory (electron, photon, state, measurement…)

• Be able to explain the difference between measurement in a classical-physics context and in a quantum-physics context.

• Be able to differentiate between a classical-physics and a quantum-physics worldview and to recognize where each worldview is appropriate.

• Be able to recognize, create and test physics models.

• Be able to identify the quantum physics basis of various technologies.

• Be able to use classical probability methods for predicting probabilities of measurement outcomes in a classical context.

• Be able to manipulate diagrammatic methods for predicting probabilities of measurement outcomes in a quantum context.

• Build skills in scientific problem solving (i.e. “thinking like a physicist”).

• Get comfortable being wrong; we learn by trial and error.

**Use of Math**

• You will need to employ some basic math skills—fractions, geometry, exponents and scientific notation, how to use a calculator (or phone app equivalent), and how to draw and interpret graphs, but no detailed algebra will be used. Some new math concepts will be introduced. If you encounter some math you don’t understand, please seek us out for help.

**Prerequisites**

• No formal requirements. Curiosity and enthusiasm are recommended!
Course materials

• Textbook; Quantum Physics: What everyone needs to know, by Michael Raymer.
• There will be additional material posted on canvas. This includes lecture notes, which summarize what was done in class.

Coursework and evaluation

Pre-class reading assignments and quizzes

• There will be readings assigned from the textbook; typically about 30 pages per week. There will be some pre-class questions on canvas about the readings. The reading quizzes are due by 2pm (by online submission), at the beginning of class.

Homework

• Starting in week 2, weekly homework sets will be assigned on Canvas. We encourage you to work together in solving homework problems, but you must write up the solutions on your own, in your own words. Solutions to each homework assignment will be posted soon after it is due. Homework is due Thursday at 5pm on the due date. We will accept late homework no more than 24 hours late (5:00 pm the day after the due date). Up to 24-hour-late homework will have 50% deducted. Homework may be turned in late with no penalty under extenuating circumstances only by prearrangement with at least 24 hours notice before the normal deadline.
• The homework will focus more in what we discuss in class and will let you do “quantum calculations.”

Professionalism points

• Be on time, prepared and willing.
• Submit timely, quality work. Late assignments will not be awarded credit unless arrangements have been made prior to the due date.
• If you are going to be late or need to miss class due to an illness, religious holiday, or emergency, please notify an instructor in advance by email at least 24 hours prior to the class.
• Silence electronic notifications, and refrain from using your phone for non-class related work during class.
• At times in the course, there will be discussions on topics that might be considered sensitive to some people, it is important that we establish an atmosphere of safety and mutual respect.

• We will not always all agree, in fact, we will learn better from different viewpoints, but all discussion should be conducted with civility and integrity. This atmosphere of respect should be extended to any guests we have in class, or any time we visit another area of campus.

Midterm and Final

• We’ll have one Midterm exam during week 7 [on Wednesday, Feb. 22], and one Final [Monday, March 20, at 2:45pm], both of which will focus on “quantum calculations.”

Make-up exams

• None! The exams are pre-scheduled so please confirm the dates. During the first class we will decide whether we have the Midterm on Monday or on Wednesday of week 7. If you have a serious and documented reason for missing the Midterm, the score on your Final will count as your Midterm score.

Grading

• Homework (7 sets in total; 20 points each; your lowest score is dropped): 30%
• Pre-class questions: (15 in total, 4 points each) 15%
• Professionalism points: (10 in total, once a week, 4 points each) 10%
• Midterm: [week 7, 80 points] 20% [one double-sided page of notes permitted]
• Final [100 points]: 25% [two double-sided pages of notes permitted]

Grading scale

• The following letter grades are guaranteed:
  • 400-360 points, [≥ 90%] A(+/-)
  • 359-320 points, [between 90 and 80%] B(+/-)
  • 319-280 points, [between 70 and 80%] C(+/-)
  • 279-240 points, [between 60 and 70%] D(+/-)
• < 240 points, F

• I may also curve grades if that leads to higher letter grades.

Inclusivity

I take my responsibility to create inclusive learning environments seriously. Please notify me if there are aspects of this course that result in barriers to your participation. For more information or assistance, you are also encouraged to contact the Accessible Education Center, 164 Oregon Hall, 346-1155; website: http://aec.uoregon.edu/. If you have a documented need for accommodations in this course, please get in touch with me to discuss accommodations. Also, please request the Accessible Education Center to send me a notification.