

Course outline for Physics 141: Quantum Physics I

Francis N. C. Paraan*

National Institute of Physics

(Dated: January 29, 2020)

I. COURSE INFORMATION

Description: Wave packets and uncertainty principle, the Schrödinger equation, simple one-dimensional systems, three-dimensional systems, quantum particle in an external field, the postulates and mathematical formalism of quantum mechanics

References: Griffiths (GR), Gasiorowicz (GA), Cohen-Tannoudji, Diu, Laloë (CT), Sakurai (MQM)

Prerequisites: Physics 104, 112

Credits: 3.0

Section: WFQ (WF 7:00–8:30 AM).

Location: F208

Web: sand.nip.upd.edu.ph/physics141

II. CLASS POLICIES

Attendance: University Rules state that students that accumulate six or more absences may be given a failing grade (5.0) if they do not drop the course.

Quizzes: Quizzes will be given to check attendance.

Raw score x	Point grade
$90\% \leq x \leq 100\%$	1.00
$85\% \leq x < 90\%$	1.25
$80\% \leq x < 85\%$	1.50
$75\% \leq x < 80\%$	1.75
$70\% \leq x < 75\%$	2.00
$65\% \leq x < 70\%$	2.25
$60\% \leq x < 65\%$	2.50
$55\% \leq x < 60\%$	2.75
$50\% \leq x < 55\%$	3.00
$45\% \leq x < 50\%$	4.00
$x < 45\%$	5.00

* fparaan@nip.upd.edu.ph

Long Exams: There will be three long examinations of equal weights. These exams constitute 3/4 of the final grade. One make up exam replaces an exam missed due to an excused absence. Further missed exams and unexcused missed exams will be given a grade of zero. Absences must be documented and justified as excused within one week of the student's return to class.

Problem Sets: Problem sets and quizzes make up the remaining 1/4 of the final grade. Late sets will not be given any credit. Solutions to all problem sets must be submitted: a grade of INC will be given if any problem set is not turned in.

Academic honesty: Any form of cheating in examinations or any act of dishonesty in relation to studies, such as plagiarism, shall be subject to disciplinary action.

III. LECTURE PLAN

First day of classes : F 10 Jan 2020.

0. Administrative.
1. Schrödinger equation. [GR 1]
2. Infinite square well potential. [GR 2]
3. Harmonic oscillator potential. [GR 2]
4. Ladder operators and commutators. [GR 2]
5. Free particle. Wavepackets. [GR 2]
6. Dirac-delta potential. Scattering and bound states. [GR 2]
7. Finite square wells. Potential steps. [GR 2]
8. **First long exam:** F 21 Feb 2020.
9. Linear vector spaces and operators. [CT]
10. Wavefunctions and state vectors. [CT]
11. Postulates of QM. Uncertainty principle. [MQM, CT, GR 3]
12. Spherically symmetric potentials. Radial equation. Spherical harmonics [GR 4]

13. Spherical wells and hydrogen-like atoms. [GR 4]
 14. Commutators. Complete sets of commuting observables.
 15. **Second long exam:** W 1 Apr 2020.
 16. Spin and angular momentum.
 17. Identical particles.
 18. **Third long exam:** F 8 May 2020.
- Last day of classes :** W 13 May 2020.