Physics 451 Introduction to Quantum Mechanics

"In quantum mechanics, one can know everything about a system and nothing about its individual parts" Leonard Susskind, physicist.

Instructor: Dr. Cecille Labuda Class time/location: MWF 09:00 – 09:50, Lewis 109 Office hours: T 02:00 – 02:45 and by appointment, on Zoom: Meeting ID: 956 6327 6776 Passcode: 495699

Books

- <u>Griffiths and Schroeter. Introduction to</u> <u>Quantum Mechanics 3rd Edition. Cambridge</u> <u>University Press, ISBN: 978-1107189638.</u>
- <u>Susskind and Friedman. Quantum Mechanics:</u> <u>The Theoretical Minimum. Basic Books, ISBN:</u> <u>978-0465062904</u>

Description

An introduction to nonrelativistic quantum mechanics; the Schrodinger equation and its application to simple systems.

Prerequisites

Math 353. Physics 308, Physics 318.

Course Objectives

On completion of this course, students should be able to:

- Solve Schrodinger's equation for various quantum physical systems
- Describe various interpretations of quantum mechanics

Grading Scale

Plus-minus grades may be assigned.

- $90\% \le A \le 100\%$
- $80\% \le \mathbf{B} < 90\%$
- $70\% \le C < 80\%$
- $50\% \le D < 70\%$
- **F** < 50%

Email: cpembert@olemiss.edu Phone: +16629153945 Syllabus version 3: 08/24/2021

Evaluation and Calculation of Course Grade <u>Class Exercises and Summaries (10%) [c]</u>

In-class exercises, class summaries and blackboard presentations of problem solutions during class meetings. Graded for completion; no make-ups.

Exams (45%) [i]

3 closed-book exams weighted as follows:

- 2 exams highest grades: 17.5%+17.5%=35%
- 1 exam lowest grade: 10%

<u>Homework (20%) [c].</u> Note that the homework grade will only count if the exam average is >50%. Otherwise the homework grade will be computed as zero.

- Homework sets must be turned in at the beginning of class when due. [c]
- Students are encouraged to work together in class and on homework. However, all exams are individual assignments.
- Homework solutions must be presented according to the homework rubric or it may not be graded.

Final exam (25%) [i]

• The final exam will be comprehensive. The format will be similar to the tests.

Examination Dates

Test dates and topics are subject to change. The final exam date is fixed and cannot be changed. Test 1: 09/22 Test 2: 10/20 Test 3: 11/17 Final Exam: Wednesday December 08, 08:00 am.

Policies

Covid-19-Related Policies

- Current COVID-19 guidelines require that <u>everyone</u> wear face masks properly inside university buildings. Protocols can be found at <u>https://coronavirus.olemiss.edu/</u>.
- If you have a diagnosed health concern that interferes with the wearing of face masks, seek an accommodation with the Student Disabilities Services Office. <u>https://sds.olemiss.edu/</u>
- Students who refuse to wear masks properly in the classroom or otherwise fail to comply with COVID-19 guidelines will be asked to leave the classroom.
- Failure to adhere to COVID-19 health requirements will lead to disciplinary action enforced following the Academic Conduct and Discipline procedures. The disciplinary protocol is maintained by the Office of Conflict Resolution and Student Conduct. <u>https://conflictresolution.olemiss.edu/covidu</u> <u>pdates</u>.
- If exposed to someone with COVID-19, contact the Student Health Center to get tested 3 to 5 days following exposure. If you are not fully vaccinated, follow quarantine protocols described at https://coronavirus.olemiss.edu/students/.
 - If you test positive for COVID-19 at any health
- care facility, contact the Student Health Center at 662-915-7274 so they can do contact tracing.
- If you contract COVID-19, seek medical attention at the Student Health Center or elsewhere and contact me to let me know that you will be missing class due to a healthrelated issue.

<u>Attendance</u>

Class attendance is **required**. If a student is absent for more than 3 classes during the semester, the final calculated grade will be **reduced by a letter grade** at the time grades are officially assigned. If you must be absent for exams, you must speak to me before the exam to determine whether the absence will be excused and whether the exam will be rescheduled. For unexpected exam absences, you must contact me by email or telephone within 24 hours after the absence or the exam will not be rescheduled. Allowances will be made for non-attendance due to covid-19 health concerns.

Academic Integrity

By choosing to be part of the University of Mississippi community, every student agrees to abide by the University of Mississippi Creed and the UM Academic Integrity Policy. Cheating is forbidden and, in this course, will result in a zero grade on the given assignment. If a second case of cheating occurs, this will result in an F for the entire course.

Unless explicitly permitted by the instructor, distribution of materials provided in this class via the internet or otherwise. Accessing such materials for your own use is also in violation of the UM Academic Conduct Code. Additionally, the distribution of your own class notes is strongly discouraged except for occasional loaning of notes to students also enrolled in the class.

University of Mississippi Access and Inclusion

The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Students should also contact Student Disability Services at 662-915-7128 so that office can 1) provide you with an Instructor Notification form, 2) facilitate the removal of barriers and 3) ensure you have equal access to the same opportunities for success that are available to all students.

Audio and video recording

Audio and/or video recording of class lectures is not allowed unless explicit permission is given by the instructor. Permitted recordings may not be distributed online or elsewhere and all must be deleted at the end of the semester.

Important Dates

Please see the UM academic calendar (<u>https://registrar.olemiss.edu/fall-2021/</u>)

[c] – collaborative [i] - individual

Schedule of Topics (very subject to change)

Week	Торіс		Textbook Sections
01:08/23-08/27	The wave function		Ch 1
02:08/30-09/03	The wave function; The time dependent wave function		Ch 1, Ch 2
03:09/06-09/10	The time-dependent wave function		Ch 2
04:09/13-09/17	The time-dependent wave function		Ch 2
05: 09/20 – 09/24	Formalism	09/22: TEST 1	Ch 3
06:09/27-10/01	Formalism		Ch 3
07: 10/04 - 10/08	Quantum mechanics in dimensions	three	Ch 4
08: 10/11 – 10/15	Quantum mechanics in dimensions	three	Ch 4
09: 10/18 – 10/22	Quantum mechanics in three dimensions	10/20: TEST 2	Ch 4
10: 10/25 – 10/29	Identical particles		Ch 5
11: 11/01 - 11/05	Identical particles		Ch 5
12: 11/08 – 11/12	Time-independent perturbation theory		Ch 6
13: 11/15 – 11/19	Time-independent perturbation theory	11/17: TEST 3	Ch 6
14: 11/22 – 11/26	THANKSGIVING BREAK		
15: 11/29 – 12/03	Interpretations of quantum mechanics; Entanglement		