KENNESAW STATE UNIVERSITY

SYLLABUS
COLLEGE OF SCIENCE AND MATHEMATICS
DEPARTMENT OF PHYSICS
PHYS4260: QUANTUM MECHANICS II
SPRING 2025

Course Information

CRN: 13042, Sec 51
Class meetings: Tue, Thu, 2pm – 3:15pm.
Modality and Location: In person; Academic Building, Room 250, Marietta Campus.
Syllabus: posted in D2L and on Instructor's website.

Instructor Information

Name: Dr. Marco Guzzi
KSU Faculty Website: http://facultyweb.kennesaw.edu/mguzzi/
Office: SC 436 - Kennesaw Campus (4th floor Science Bldg)
Phone: (470) 578-4583
email: mguzzi@kennesaw.edu (When e-mailing, please put "PHYS4260" in the subject line along with the subject of your message. Please Do Not use D2L to send emails, you will not get a reply.)
Preferred method of communication: e-mail
Office hours: by appointment.

Course Description

Prerequisites: Grade of "C" or better in PHYS 4210. **3 Class Hours, 0 Laboratory Hours, 3 Credit Hours.**

This course is a continuation of Quantum Mechanics I, PHYS4210. Students will learn time-independent and time-dependent perturbation theory, the variational principle, and scattering theory. This course also introduces techniques of field quantization and their applications. Students will revisit perturbation theory in the context of interacting quantum fields. Students will be exposed to applications of quantum mechanics and field theory techniques that are used in many areas of modern physics (e.g., particle physics, quantum optics, and condensed matter physics).

Course Materials

Required Texts:
``Introduction to Quantum Mechanics' by David Griffiths. Pearson Prentice Hall.
In addition, notes may be provided by the instructor.

Technology requirements: none

Learning Outcomes

1. Use perturbation theory to predict energy levels of quantum systems.
2. Describe the variational principle and its applications.
3. Use scattering theory to calculate cross sections.
4. Describe symmetries and their implication at the level of conservation laws in physics.
5. Interpret the concept of quantum field.

Course Requirements and Assignments

Students are expected to attend all lectures, take all tests and exams, and complete all homework assignments.

Evaluation and Grading Policies

Three tests will be given during the semester. Grades will be determined according to student's performance on the three tests.

Homework: **10%**
Tests: **60% (3 tests, 20% each)**
Final Exam: **30%**
Grading Scale: **A: 90% - 100%; B: 80% - 89%; C: 70% - 79%; D: 60% - 69%; F: 0 - 60%.**

Tests and exams are graded by assigning points for:

- Correctly identifying the physics of the problem.
- Setting up correctly all the equations (and/or graphs/diagrams) for the specific physics situation described in the problem and commenting when necessary or relevant.
- Correctly identifying all unknown physical variables/observables to be determined.
- Correctly working out all the symbolic and differential calculus-based operations.
- Correctly working out all the algebraic calculations to determine the solution.

Course Policies

1. Regular lecture attendance is essential for success in this class. If students must miss class, it is their responsibility to get notes from another student.
2. Be on time for the lecture (students coming in later than 15min from the beginning of the lecture will not be let in).
3. Cellular telephones, pagers, and similar devices must be turned off or placed in silent mode during class. Use of cell phones should be restricted to emergencies.
4. The usage of calculators able to calculate derivatives and integrals of functions (similar to TI-84 Plus) is strictly forbidden. That is considered cheating. Students are allowed to use ONLY standard scientific calculators.
5. During lectures, students must avoid conversations and other disruptions that may distract other students from listening and learning. If students have a question or comment, they should direct it to the instructor.
6. Occasionally, it may be necessary for the instructor to make corrections or changes to the syllabus. Corrections or changes to the syllabus will be announced on the KSU D2L website and in class: students are expected to check D2L for announcements at least once or twice a day.

Homework Assignments

Homework will be assigned during the lectures. Solutions to problems will be discussed in class during lectures and will be posted on D2L.

Withdrawal, Last day of class, and Final Exam

- First day of class: Tue, Jan 07, 2025.
- Last day to withdraw without academic penalty: Fri, Mar 28, 2025, at 11:45pm.
- The last day of Class: Mon, Apr 28, 2025.
- Final exam: Thu, May 01, 2025, 2pm – 3:15pm.

(This must be double checked again on the KSU office of registrar website.)

Department or College Policies

The university's withdrawal policy is explained at:

http://registrar.kennesaw.edu/student-records/registration-policy.php

The Academic Standing Appeal policy is explained at:

https://appeals.kennesaw.edu/withdrawal_appeal.php

Students are solely responsible for managing their enrollment status in a class.
Nonattendance does not constitute a withdrawal.

Make-up Exams policy

Make-up exams will not be given. If students know ahead of time that they have a conflict, they have to let the instructor know. If students miss an exam because of an illness (student or a family member) or some other unforeseeable event, students must contact the instructor as soon as possible. They can e-mail the instructor or call the Physics Dep. Office at 470-570-4205. Students must provide documentation showing the reason for missing the exam. Final make-up exam is **ONLY** for documented and excused emergencies or for scheduling conflicts with other final exams.

Institutional Policies

Federal, BOR, & KSU Course Syllabus Policies:
http://curriculum.kennesaw.edu/resources/federal_bor_ksu_student_policies.php

Student Resources:
http://curriculum.kennesaw.edu/resources/ksu_student_resources_for_course_syllabus.php

Academic Integrity Statement:
http://scai.kennesaw.edu/codes.php

Students with Disabilities

Any student with a documented disability or medical condition needing academic accommodations of class-related activities or schedules must contact the instructor immediately. Written verification from the KSU Student Disability Services (http://sds.kennesaw.edu/) is required. No requirements exist that accommodations be made prior to completion of this approved University documentation. All discussions will remain confidential.

KSU Student Resources

This link contains information on help and resources available to students:
https://curriculum.kennesaw.edu/resources/ksu_student_resources_for_course_syllabus.php

Course Schedule (very tentative)

Week 1-2
Symmetry and Conservation Laws
Time-Independent Perturbation Theory

Week 3-4
Variational Principle

TEST 1 Tue, Feb 11, 2025

Week 5-6
Time-Dependent Perturbation Theory

Week 7-8
Scattering Theory

TEST 2 Tue, Mar 11, 2025

Week 9-10
Introduction to Quantum Fields

Week 11-12
Applications I

TEST 3 Thu, Apr 3, 2025

Week 13-14
Applications II

Week 15
Introduction to Gauge Theories

Final exam: Thu, May 01, 2025, 2pm – 3:15pm.