Syllabus (two pages):
PHYS 520 – Introduction to Quantum Mechanics 2014
Class: MW, 9:00 am – 10:15 am, Science Building, Room 135

Instructor: **Dr. Carlos A. Bertulani**, Office Science Bldg-140, Phone 886-5882
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Textbook: **Modern Quantum Mechanics,** J.J. Sakurai, Publisher: Addison Wesley (1994), ISBN: 0-201-53929-2.

Catalog Description: Three semester hours. A course designed to introduce students to quantum mechanics and applications. Depending on time available as the course progresses, we will cover 5 chapters of the book chosen from.

1. ***Basic concepts of quantum mechanics***
2. ***Energy, momentum, bras, kets, operators***
3. ***Schroedinger's equation, Feynman's path integrals***
4. ***Angular momentum, group theory***
5. ***Perturbation theory***
6. ***Spin***
7. ***Identical particles, scattering***
8. ***The atom***

Examination There will be 2 tests, plus a comprehensive final covering all course material. The tests will consist of questions selected from problems at the end of each chapter of the textbook. Each test counts toward 30% of the final score. The comprehensive final will be 40% of the final score.

Pre-requisites This course requires a basic knowledge of classical mechanics, namely, the Newton formulation of mechanics and of basic electromagnetism and thermodynamics from introductory physics courses.

Grades: 90% or above on final average is an "A", 80-89% = "B", etc.

Goals and Learning Outcomes for this Course

This course is an introduction to quantum mechanics at the graduate level, without which one is absolutely unable to understand modern science. It covers the topics which are used to predict and use the behavior of almost all systems in nature. Quantum mechanics has numerous applications to several areas of science. It covers the topics of structure of atoms, molecules, and solids and how particles interact. The course also develops a good knowledge in mathematical physics.

Goal 1: Students will understand the discipline-specific knowledge in quantum mechanics, covering the subjects:

1. ***Basic concepts of quantum mechanics***
2. ***Energy, momentum, bras, kets, operators***
3. ***Schroedinger's equation, Feynman's path integrals***
4. ***Angular momentum, group theory***
5. ***Perturbation theory***
6. ***Spin***
7. ***Identical particles, scattering***
8. ***The atom***

Objective 1: Students will know the concepts of quantum mechanics and demonstrate a proficiency in the fundamental concepts in this area of science.

Objective 2: Students will be able to explain concepts of quantum mechanics and to show a working knowledge of a broad array of physical phenomena that are based upon fundamental concepts of atomic, molecular and condensed matter systems.

Goal 2: Students will have strong physical reasoning and problem solving skills and apply these skills to the solution of theoretical and applied problems.

Objective 1: Students will be able to solve problems using their knowledge and skills in modern physics. They will use critical thinking skills to formulate and solve quantitative problems in applied physics.

Objective 2: This course will offer a curriculum emphasizing physical science to produce professionals capable of applying broad theoretical insight to solution of practical problems**.**

Assessment

The following measures will be used to assess the success of this course in achieving the above objectives:

Student Work: exams.

- The course will have 2 midterm tests, plus a comprehensive final covering all course material.

- The total grade will consist of written exams.

  A typical exam question is shown below. Expect 5 of similar questions in each midterm exam, and 8 in the final exam.

  "Consider a particle of mass m and charge q in an impenetrable cylinder with radius R and height a. Along the axis of the cylinder runs a thin, impenetrable solenoid carrying a magnetic flux Φ. Calculate the ground state energy and wavefunction. "

Student Perception Survey: to determine whether students believe that they have achieved the objectives of the Physics Graduation.

- This survey will be developed in the Fall of 2014, and administered to students at the end of the semester.

- The physics department utilizes an online questionnaire provided via the MyLeo TamuC system with statements regarding various elements of instruction. These comments are given to the instructor and department head soon after the grades are recorded. If students have concerns about the classroom experience during the semester they should inform the instructor of those concerns and failing a satisfactory response may, as a last resort, contact the physics department head with those concerns.

Students with Disabilities

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services