

# PHYSICS 6309 Syllabus

## Advanced Quantum Mechanics (Fall 2009)

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**Schedule:** TR, 11:00-12:20 in Sci 112

**Instructor:** Mahdi Sanati

**Office hours:** open door policy, 46 Science Building, [m.sanati@ttu.edu](mailto:m.sanati@ttu.edu), Phone: 742-3759

### **Course Description**

Advanced Quantum Mechanics is the third semester of a three-semester graduate level sequence of quantum mechanics course. Its goals are to explain the concepts and mathematical methods of quantum mechanics, and to prepare students to solve quantum mechanics problems in different physical applications. The emphasis of the course is equally on conceptual grasp of the subject as well as on problem solving techniques. This course begins where ordinary quantum mechanics leaves, the topics like relativity, second quantization, and path integral. This quantum mechanics courses builds the foundation for more advanced courses such as Many-Body or Field Theory, besides graduate research in theoretical and experimental physics.

### **Coverage**

- Scattering
- Second Quantization
- Charge Particle Interactions
- Many-Particle systems
- Relativistic Quantum Mechanics
- Path Integral

### **Expected Learning Outcomes**

After completing this course students should:

- (1) have a working knowledge of the foundations, techniques and key results of quantum mechanics;
- (2) be able to comprehend basic quantum mechanical applications at the research level, e.g., in research articles;
- (3) be able to read any other related quantum mechanics material as they need it.

### **Learning Assessment**

Certain problems on the homeworks, independent projects, and class presentations will explicitly require facility with the course objectives and be used as learning assessments tools.

## **Text**

I will follow my notes compiled from several books such as:

- (1) Lectures on Quantum Mechanics by Gordon Baym
- (2) Modern Quantum Mechanics, J.J. Sakurai
- (3) Advanced Quantum Mechanics by Franz Schwabl, R. Hilton, and A. Lahee

## **Homework**

Problem sets are assigned for each subject. Discussions of the problems among students are strongly encouraged, but each student should write out and turn his/her own solutions. Identical copies of the same homework will not be accepted and students will receive F as final grades.

## **Exams**

- Homeworks (75%)
- Project (25%): Minimum of 4 pages of research type paper + class presentation. For the project you are free to choose a subject relevant to your field of research or interest, however, you need my approval regarding the subject.

## **Grades**

100-A-88, 87.9-B-76, 75.9-C-64, 63.9-D-50, 49.9-F-0

## **Attendance**

Required, except for excused emergencies. Each recorded absence counts as -1% and will be deducted from the course total. Students are expected to assist in maintaining a classroom environment that is conducive to learning. In order to assure that all students have the opportunity to gain from time spent in class, unless otherwise approved by the instructor, students are prohibited from engaging in any other form of distraction. Inappropriate behavior in the classroom shall result, minimally, in a request to leave class.

## **Disability**

Any person who, because of a disabling condition may require some special arrangements in order to meet course requirements should contact the instructor as soon as possible, so that necessary accommodation can be made. Proper documentation must be presented from the Dean of Students' Office.