

Advanced Quantum Mechanics I, Physics 615, Winter 2011

UNIVERSITY OF CALGARY
DEPARTMENT OF PHYSICS and ASTRONOMY
COURSE OUTLINE

1. Physics 615, Advanced Quantum Mechanics I

Lecture Sections:

L01: MWF, 11:00-11:50, SS 117 **Christoph Simon**, Office SB 313, Tel. No. 220 7007, csimo@ucalgary.ca,
Office Hours: W 12:45-2:15

Department of Physics and Astronomy, Science B 605, Tel. No. 220 5385, office@phas.ucalgary.ca

2. **PREREQUISITES:** It is expected that the student's background will include Physics 543 or equivalent.
3. **GRADING:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments	40%
Project	30% (The project will be due on March 30, 2011.)
Final Examination	30% (To be scheduled by the Registrar)

Percentage grades will be given for all elements of term work and examinations. A weighted course percentage will be calculated for each student after the final exam is written. A table of conversion from final course percentage to final course letter grade will be made available later in the term.

4. **Missed Components of Term Work.** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in section 3.6: <http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html>. It is the student's responsibility to familiarize himself/herself with these regulations. See also <http://www.ucalgary.ca/pubs/calendar/current/e-3.html>.
5. **TEXTBOOK:** J.J. Sakurai and Jim Napolitano, Modern Quantum Mechanics (2nd edition, Addison-Wesley, 2011)
6. **EXAMINATION POLICY:** The final exam will be closed book, no aids allowed. Students are encouraged to read the Calendar, Section G, on Examinations: <http://www.ucalgary.ca/pubs/calendar/current/g.html>.

Department Approval _____ Date _____

Associate Dean's Approval for
out of regular class-time activity: _____ Date: _____

11. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **ACADEMIC MISCONDUCT** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under K. Student Misconduct (<http://www.ucalgary.ca/pubs/calendar/current/k.html>) to inform yourself of definitions, processes and penalties
- (b) **ASSEMBLY POINTS in case of emergency during class time.** Be sure to **FAMILIARIZE YOURSELF** with the information at <http://www.ucalgary.ca/emergencyplan/assemblypoints>.
- (c) **ACADEMIC ACCOMMODATION POLICY.** Students with documentable disabilities are referred to the following links:
Calendar entry on students with disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html>
Disability Resource Centre: <http://www.ucalgary.ca/drc/>
- (d) **SAFEWALK:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **FREEDOM OF INFORMATION AND PRIVACY:** This course will be conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, **students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page.** For more information see also <http://www.ucalgary.ca/secretariat/privacy>.

- (f) **STUDENT UNION INFORMATION:** VP Academic **Phone:** 220-3911 **Email:** [suyaca@ucalgary.ca](mailto:suypaca@ucalgary.ca).
SU Faculty Rep. **Phone:** 220-3913 **Email:** sciencerep@su.ucalgary.ca Website <http://www.su.ucalgary.ca/home/contact.html>.
Student Ombudsman: <http://www.su.ucalgary.ca/services/student-services/student-rights.html>
- (i) **INTERNET and ELECTRONIC COMMUNICATION DEVICE Information.** You can assume that in all classes that you attend, **your cell phone should be turned off.** Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

DETAILED COURSE SYLLABUS

Fundamental concepts: Stern-Gerlach experiment, quantum interference, indistinguishability principle, complementarity, bras and kets, measurements and observables, uncertainty relation, position and momentum basis.

Quantum dynamics: Schroedinger and Heisenberg picture.

Harmonic oscillator and coherent states.

Potentials and gauge transformations, charged particles.

Angular momentum.

Entanglement, density operators, two-particle interference, EPR argument, Bell's inequality.

Symmetries: Parity, Time reversal.

Approximation methods: time-independent and time-dependent perturbation theory, application to the interaction with the radiation field.

Scattering theory and bound states.

Interpretations of quantum physics.