Syllabus (two pages):
PHYS 523, Advanced Atomic Physics, Fall 2012
Class: MW, 1:00 pm – 2:15 pm, Science Building, room TBA

Instructor:

Dr. Carlos A. Bertulani
Office: Science Bldg. 140
Phone: 886-5882
Office hours: TR 12:00 - 1:15 pm
e-mail: carlos.bertulani@tamuc.edu
http://faculty.tamu-commerce.edu/cbertulani/

Textbook:

Topics in Atomic Physics
Charles E. Burkhardt and Jacob J. Leventhal (Authors)
Paperback: 302 pages
Publisher: Springer; (October 5, 2010)
ISBN-10: 1441920684
ISBN-13: 978-1441920683

Course Content:

Three course credits. A calculus and quantum mechanics based physics course on atomic physics and its applications to physics and to science in general.
The student will learn atomic physics with a calculus and quantum mechanics based method.

Goals and Learning Outcomes for this Course

Goal 1: Students will understand the discipline-specific knowledge in atomic physics, covering the subjects:

- Quantum Theory of Angular Momentum
- The Hydrogen Atom
- Degenerate States
- Hydrogen Atom in External Fields
- The Helium Atom
- The Quantum Defect Theory
- Multi-electron Atoms in External Fields
- Interaction of Atoms with Radiation
- Selected Topics in Applied Atomic Physics

Objective 1: Students will know the concepts of atomic physics and demonstrate a proficiency in the fundamental concepts in this area of physics.

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

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 physics. They will use critical thinking skills to formulate and solve quantitative problems in atomic 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, homework presented in classroom.

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

- The total grade will consist of Exams (70% total), and quality of the homework reports (30%).

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

Muonic helium has 1 electron, 1 muon. Comment on the energy levels of muonic helium, discussing in detail the cases $(1s)_e(2s)_\mu\ ^3S_1$ and $(1s)_e(2s)_\mu\ ^1S_0$, where the subscript indicates which particle is in which state. Compare and contrast with normal helium. N.B. we are interested not only in the gross energies, but also in any splitting of states and the role of spin. Does the state $(1s)_e(1s)_\mu\ ^3S_1$ exist? (where, of course, the 1s state of the electron will be a different wavefunction from the 1s state of the muon, etc.)

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

- This survey will be developed in the Fall of 2012, 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.

Attendance and Tardiness: Students are expected to be on time and present for all class meetings. Excused absences can be arranged prior to the class period being missed for appropriate activities as determined by the instructor. If an emergency results in an absence, the student should contact the instructor as soon as possible informing the instructor of the emergency and inquiring about ways to make up the missed class. The instructor will make judgments on how to handle the situation. Possible reasons for an excused absence are listed in the " Student's Guidebook" under class attendance policy. Attendance and tardy records will be maintained and both may result in deductions from your overall grade.

Classroom Behavior: Disorderly conduct which interferes with the normal classroom atmosphere will not be tolerated. The classroom instructor is the judge of such behavior and may instruct a disorderly student to leave the room with an unexcused absence or in more serious situations a student may be removed from the class with a failing grade.

Cheating and other Breaches of Academic Conduct: Academic cheating, plagiarism, and other forms of academic misconduct may result in removal of the student from class with a failing grade or may in extreme cases result in suspension or expulsion from the University as described in the "Code of Student Conduct" section of the " Student's Guidebook".

ADA Eligible Students: ADA eligible students should make arrangements with the instructor in the first week of the semester about special arrangements needed for classroom or testing facilities and procedures to accommodate the disability.