Embry-Riddle Aeronautical University
Prescott Campus

Course **PS405.01 Atomic & Nuclear Physics (Fall 2016) 3 credit hours**

Instructor **Dr. Darrel Smith**
Office Hours See my website: **http://physicsx.pr.erau.edu/**

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Course Description

Study of the two-particle system with fermions and bosons, electron configuration in atoms, the free electron gas in solids, quantum statistical mechanics, blackbody spectrum, time independent perturbation theory, time dependent perturbation theory, scattering, nuclear shell model, empirical mass formula, fission, and fusion.
Three lectures per week. **Prerequisite:** PS350 (Quantum Mechanics).

Goals

This course is designed primarily for students in the Space Physics program. It is a continuation of quantum mechanics with applications to atomic and nuclear physics. This course is designed to provide the student with an appropriate background for more advanced work in physics that require a rigorous background in atomic and nuclear physics.

Textbooks

Introduction to Quantum Mechanics, **2nd edition,** by David Griffiths, © 2003, Publisher: Pearson / Prentice Hall ISBN 0-13-111892-7

An Introduction to the Physics of Nuclei and Particles, by Richard A. Dunlap Publisher: Thomson Brooks/Cole wwww.brookscole.com

Reference

Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, 2nd edition, by Eisberg & Resnick © 1985, Publisher: John Wiley & Sons
(This books is not required for the course)

Required Materials

Your two textbooks and a scientific calculator. Mathematica, or a similar program for mathematical calculations.

Attendance

"Regular attendance and punctuality, in accordance with the published class schedule, are expected at all times in all courses." . . . . ***Don't miss class !!***

Course Outline

The following chapters are from our quantum mechanics textbook

Chapter 5 Identical Particles
Chapter 6 Time-Independent Perturbation Theory
1st Exam (15%)

Chapter 9 Time-Dependent Perturbation Theory
Chapter 11 Scattering
2nd Exam (15%)

The following chapters are from our nuclear physics textbook

Chapter 1 Basic Concepts
Chapter 2 Particles and Interactions

Chapter 3 Nuclear Composition and Size
Chapter 4 Binding Energy and the Liquid Drop Model
Chapter 5 The Shell Model
3rd Exam (15%)

Chapter 7 General Properties of Decay Processes
Chapter 12 Nuclear Fission
Chapter 13 Nuclear Fusion

December 8, 2016 Last Day of Classes

Homework (30%)

Homework is an essential part of this course. The homework problems found in the textbooks are designed to develop and improve (1) your critical thinking skills, and (2) your ability to apply physics principles when solving atomic and nuclear physics problems. Given the mathematical rigor of this course, many of the homework problems are not practical for in-class exams. So, knowing how to work the homework problems is vital to your understanding of this material.

Homework Grading – Each homework assignment is worth 10 points. Five points will be awarded to homework papers where a reasonable effort has been made to solve the problems. One or more problems will be graded for an additional five points for a total of 10 points. Students are encouraged to expand their practical knowledge of physics and improve their problem-solving skills by working more than just the assigned problems. **Homework is due on the date posted on the homework assignment** One point is taken off every day homework is late.

Final Exam (25%) Comprehensive 12:30 – 2:30 PM Tuesday Dec. 13, 2016

Grading	**Weight**	
Homework	30%	A = 90 - 100%
Exams	3 exams = 45%	B = 80 - 90%
Final	25%	C = 70 - 80%
		D = 60 - 70%

The best way to prepare for the exams is to understand how to solve the homework problems. You are responsible for understanding the solutions to homework problems as well as the material presented in class.

Access To Learning

ERAU is committed to the success of all students. It is University policy to provide reasonable accommodations to students with disabilities who qualify for services. If you would like to discuss and/or request accommodations, please contact Disability Support Services in Hazy Library Room 109, extension 6750, or 928/777-6750.

Civil Rights Equity and Title IX:

ERAU seeks to provide an environment that is free of bias, discrimination, and harassment. If you have been the victim of harassment, discrimination or sexual misconduct, we encourage you to report this. If you inform me of an issue of harassment, discrimination, or sexual misconduct I will keep the information as private as I can, but I am required to bring it to the attention of the institution's Title IX Coordinator. If you would like to talk to the Title IX Coordinator (Liz Higgins Frost) directly, she can be reached at Building 49, Dean of Students Office, 928-777-3747, froste@erau.edu. For more information, please refer to the Nondiscrimination/Title IX webpage at http://prescott.erau.edu/about/health/sexual-misconduct-and-title-ix/index.html.