

**Embry-Riddle Aeronautical University
Prescott Campus**

Course **PS412.01 Particle Physics & Cosmology I (Fall 2017) 3 credit hours**

Instructor **Dr. Darrel Smith**

Office Hours See my website: <http://physicsx.pr.erau.edu/>

Office Academic Complex 1 Room 253
Phone 777-6663

Course Description

Study of modern particle physics and the foundations of general relativity including special relativity and Minkowski space-time, particle collisions and conservation laws, the Standard Model of Particle physics, and introduction to classical and quantum scattering theory.

Two lectures per week. **Prerequisite:** PS350 (Quantum Mechanics) and MA442 (Mathematical Methods for Engineering and Physics II).

Goals

This course is required for the Particle Physics and Cosmology area of concentration in the Space Physics program. It is the first part of a two-semester upper level undergraduate course. The goal of the course is to provide a thorough background in special relativity and an understanding of the foundations of the Standard Model used in describing the forces and interactions occurring particle physics. The first semester ends with a discussion of recent discoveries and the impact they have in high energy interactions occurring in astrophysical phenomena.

Textbooks

Modern Particle Physics, 2nd edition, by Mark Thomson, © 2013,
Publisher: Cambridge University Press ISBN 978-1-107-03426-6

Something about the textbook: I chose this textbook because it is written by someone who knows and understands experimental particle physics. The author introduces a strong theoretical (i.e., mathematical) frame to support the topics while presenting it in a manner where the focus is on the physics. This book assumes that the student has a basic understanding of Quantum Mechanics and Special Relativity, and this is consistent with the prerequisites for this course.

Required Materials

Your textbook 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 textbook (Modern Particle Physics, 2nd edition)

Chapter 1 Introduction -- Standard Model, Particle accelerators, and detection of particles

Chapter 2 Underlying concepts -- Special relativity, units in particle physics, non-relativistic quantum mechanics

1st Exam (15%)

PS412-Particle Physics & Cosmology I

Chapter 3 Decay Rates and Cross Sections

Chapter 4 The Dirac Equation

2nd Exam (15%)

Chapter 5 Interaction by particle exchange -- Feynman diagrams, introduction to QED

3rd Exam (15%)

December 7, 2017 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 10:15 AM – 12:15 PM Saturday Dec. 9, 2017

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

PS412-Particle Physics & Cosmology I

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>.