

# Physics 441

## A Topical Introduction to Nuclear and Particle Physics

### Spring 2009

**Class Hours:** Tuesdays and Thursdays, 9:30-10:45 AM

**Room:** 3301 Physics Building

**Instructors:** E. Beise, C. Hall and L. A. Orozco, Dept of Physics

#### Course Description:

This course is an introduction to particle and nuclear physics, with a topical emphasis on the impact of the Weak Interaction and the discovery of Parity Violation. Physics 401 (or 420) and 411 are a prerequisite for the course. Physics 402, or permission by one of the instructors, is a co-requisite.

**Textbook:** There will be no required textbook, but the following books will be used regularly as references.

#### Additional References:

"Subatomic Physics", by E. Henley and A. Garcia (recommended)

"The Physics of Nuclei and Particles", R. Dunlap

"The Experimental Foundations of Particle Physics" by R.N. Cahn and G. Goldhaber

"Introduction to High Energy Physics", D.H. Perkins

"Introductory Nuclear Physics", P.E. Hodgson, E. Gadioloi and E. Gadioli-Erba

"Introductory Nuclear Physics", Kenneth Krane

#### Course Objectives and expected outcomes:

The purpose of this course is to expose students to aspects of modern research in particle and nuclear physics, starting from the historical perspective of the discovery of parity violation and the weak interaction as a course theme – it is not to be a complete survey of either field, but will instead cover selected topics and methods. The format will be lecture-based, with some homework and practice in reading, evaluating and writing scientific papers, and emphasis on design of precision measurements and null tests.

#### Grading Scheme:

Homework:	30%
Writing assignments and oral presentations:	60%
Class participation:	10%

The exact schedule will likely change as the course develops. Below is a listing of the topics that we plan to include, in approximate order.

Week of	Topic	Tentative Lecturer
	General Introduction	

27-Jan		Introduction to Symmetries	Orozco
3-Feb		Introduction to Nuclear Physics	Beise
10-Feb		Introduction to Particle Physics	Hall
	<b>Setting the Stage for Parity Violation</b>		
17-Feb		Nuclei, radioactivity, the neutron	Beise
24-Feb		Muons, pions, and the neutrino	Hall
3-Mar		Beta decay from 1957 to present	Orozco
10-Mar		Scattering: Rutherford to SLAC	Beise
17-Mar		SPRING BREAK -- NO CLASS	
	<b>The Weak Interaction as a Tool</b>		
24-Mar		Origin of the Elements	Beise/Hall
31-Mar		Neutron beta decay	Orozco/Beise
7-Apr		The weak interaction in nuclei	Orozco/Beise
14-Apr		Electron and Neutrino Scattering	Beise
21-Apr		Neutrinos, Oscillations, CP violation	Hall
28-Apr		W,Z decays, the Standard Model	Hall
5-May		ORAL PRESENTATIONS	
13-May	(Tues only)	ORAL PRESENTATIONS	

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