Physics 397

Introduction to Nuclear and Particle Physics

Spring, 2005

Prerequisites:	None
Instructor:	Charles Benesh
Phone:	x5265
e-mail:	cbenesh@wesleyancollege.edu
Web:	http://www.wesleyancollege.edu/∼cbenesh
Office Hours:	to be announced
Grading:	44% - 4 Exams 45% - Weekly Homework and Quizzes 11% - Project
Texts:	*Introductory Nuclear Physics* , by Kenneth S. Krane *Modern Physics for Scientists and Engineers*, 2nd Edition, by Taylor, Zafiratos and Dubson.(Optional)

- **Exams:** Periodic exams will be given in class, per the attached schedule. The exams will consist of questions similar/related to the homework problems.

  There will be four exams given, the last during the scheduled final exam period.

- **Lecture Attendance:** Regular attendance in class is both expected and recommended. Generally, quizzes are only given when attendance falls below 70%. Therefore, the day you don't show up is more likely to have a quiz.....

- **Quizzes:** I reserve the right to give unannounced in class quizzes which will count towards the homework portion of your grade. No makeup quizzes will be given.

- **Homework:**Homework will be due on Fridays, at 5 pm.

- **Late Homework:** Due to time constraints, I cannot grade more than one late assignment or lab report per student per week, including Finals week.(Note that Makeup Labs are not considered late until one week after the lab is made up.) In particular, this means that only one late assignment will be graded during the last week of classes and Finals Week.

- **Student Project:**Each student is required to complete a project on a topic that is related to the topic of this course. Projects will have a significant practical component involving the successful completion of an experiment or simulation, and a presentation of results at the end of the semester. The topic and scope of each project is to be determined in consultation with the instructor.

  A successful Project will consist of a short(1-2 page) proposal outlining the nature and scope of the project, due three weeks into the semester(10 points, due three weeks into the semester), a progress report(15 points, due at mid-term), a twenty minute final oral presentation of your results(20 points), and a final written report(55 points).

Class Schedule - Physics 397

Aug	14	Early History; Constituents of nuclei **READ:** Chapter 1
Aug	19	Cross Sections
	21	Rutherford Scattering - Classical Version **READ:** Review Class Notes
Aug	26	Review of Quantum Mechanics I - Wave functions, Probability, and The
	28	Review of Quantum Mechanics II - Three Dimensional Problems **READ:** Chapter 2
Sep	2	Review of Quantum Mechanics III - Spin and Multi-Particle Systems
	4	Review of Quantum mechanics IV = Fermi's Golden rule
	5	**Project Proposal due** **READ:** Chapter 2
Sep	9	The Size and Shape of Nuclei
	11	Exam I **READ:** Chapter 3
Sep	16¿	Liquid Drop Model
	18	Semi-Empirical Mass Formula **READ:** Chapter 3
Sep	23	The Deuteron
	25	Quantum Mechanical Scattering **READ:**Chapter 4
Sep	30	Properties of the Nuclear Force
Oct	2	The Shell Model
	3	**Project Progress Report Due** **READ:**Chapter 4 and 5
Oct	7	NO CLASS
	9	Exam II **Read:** Chapter 5

Oct	14	More on the Shell Model
	16	Collective Excitations
		Read: Chapter 5
Oct	21	Radioactive Decay
	23	TBA
		READ: Chapter 6
Oct	28	Quantum Theory of Decays
	30	Decay Chains
		READ: Chapter 6
Nov	4	Energy Loss by Charged Particles in Matter
	6	Radiation detectors
		READ: Chapter 7
Nov	11	Counting Statistics
	13	Exam III
		READ: Chapter 7
Nov	18	Alpha Particle Decays
	20	Theory of Alpha Decay
		READ: Chapter 8
Nov	25	Exam III
	27	NO CLASS
		READ: Chapter 9
Dec	2	Beta Decay
	4	Project Presentations