

Introduction to Nuclear and Particle Physics

PHYS 540
Spring Semester, 2007

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Days: Monday, Wednesday, Friday

Time: 1:00 p.m. – 1:50 p.m.

Location: CURENS 336

Overview: This is the *Introduction to Nuclear and Particle Physics* course for physics majors at the graduate level. Tentative list of topics to be covered includes *Basic concepts in nuclear and particle physics, Classification of particles and interactions, Nuclear properties and models, Nuclear decays and reactions, Standard model of particles*, and if time permits *Basics of nuclear astrophysics* and/or *heavy ion physics*.

Objectives: The purpose of this course is to introduce the foundations of Nuclear and Particle physics, as well as sketched out the modern topics on the subject.

Textbook: *The Physics of Nuclei and Particles* by **Richard A. Dunlap**.

Supplementary texts: *Particle Physics (A comprehensive Introduction)* by **Abraham Seiden** and *Introductory Nuclear Physics (2nd edition)* by **Samuel S. M. Wong**

Attendance policy: Attendance is expected although not mandatory. Students are responsible for all material presented in class, all homework, and for all changes to the schedule or plans which are announced in class.

My office is **Currens 305**. My office **telephone** number is **309-298-2743**. You are welcome to call me at my office at any time. There is a voice mail if I am not available. My **e-mail** address is **I-Shovkovy@wiu.edu**. I read e-mail daily during weekdays.

Office hours will be on Wednesday and Friday from 4:30 p.m. to 6:00 p.m. In addition, you can make appointments with me.

The final grade for this course will be based on weekly homework assignments, a mid-term examination, and a final examination. My default plan is to use the following table for determining the maximum score for each category:

Homework	40
Mid-term examination	20
Two 15 minute quizzes	10
Final examination	30

TOTAL	100
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together with the following **grade ranges**:

A (85-100 points), **B** (70-84 points), **C** (55-69 points), **D** (40-54 points), **F** (<39 points)

Homework will be assigned about every week or so. The solutions should be handed in the following week before the class. In general, late homework will not be accepted. There will be 15 to 25 problems assigned during the course. Each of them will be graded on a scale from 0 to 10. At the end of the semester, I will rescale the total homework score so that the maximum is 40 points.

Tentative schedule

The exact schedule for lectures and examinations will depend on how long it takes to cover the material. The following is my best guess as of now (January 2007). Please note that the mid-term exam is tentatively scheduled for Wednesday, **March 7**. The mid-term exam will have several problems to be solved in class and several problems to be taken home. Each problem will be graded on a scale from 0 to 10. The answers without solutions will not be accepted. The take-home questions of the mid-term exams will be due on Friday, **March 9** before the class (i.e. 1 p.m.). The mid-term/final examination score will be rescaled so that the maximum is 20/30 points. There will be two 15-minute quizzes, scheduled tentatively for **April 6**, 2007 (Friday) and **April 25**, 2007 (Wednesday). The final examination is scheduled for Wednesday, **May 9**, 1:00 p.m. – 2:50 p.m. Books and notes will not be permitted during quizzes. All exams are open book and open notes. No other reference materials will be permitted during exams. There will be no make-up exams.

Dates		Tentative description of topics to be covered
from	To	
Jan. 17, 2007	Feb. 26, 2007	Basic concepts, Particles and Interactions, Nuclear properties and models, Liquid drop model, Shell model, Nuclear decays and reactions
Mar. 7, 2007		MID-TERM EXAMINATION
	Mar. 9, 2007	Discussion of the mid-term examination problems
Mar. 12 – 16, 2007		Spring break
Mar. 19, 2007	May 4, 2007	Beta and gamma decays, Standard model of particle physics. If time permits also elements of nuclear astrophysics and/or heavy ion physics
May 9, 2007		FINAL EXAMINATION

For student rights and responsibilities see the WIU web page:

<http://www.wiu.edu/provost/student/>

Useful online resources:

1. [The ABC's of Nuclear Science](#)

2. [Glossary of Nuclear Science Terms](#)
3. [American Nuclear Society](#)
4. [Universal Nuclide Chart and Radioactive Decay Applet](#)
5. [Web elements, periodic table of the elements](#)
6. <http://www.nndc.bnl.gov/nudat2/>
7. [Particle Data Group](#)
8. [Particle Adventure](#)
9. [Atomic Mass Table](#)
10. [LBNL Isotopes Project](#)
11. [Isotope Explorer](#)

News on the web:

1. [A Nuclear Magic Trick](#) (12/15/06)
2. [Discovery of the element 118](#) (10/03/06)
3. [Island of Stability](#), NOVA scienceNOW (Oct. 2006)

All handouts and homework solutions can be obtained from [WesternOnline](#).

Last modified April 12, 2007