

**SUNY College at Cortland
Physics Department**

**Physics 570 – Nuclear Physics
Spring 2006**

Catalog Description:

A study of elementary nuclear theory. Topics include the properties of nuclei, radioactivity and transmutation. Prerequisite: PHYS 410, Corequisite PHYS 450. (3 cr hr)

Required Text:

Nuclear and Particle Physics, W. S. C. Williams, Oxford Science Publications, 1991
Introductory Nuclear Physics, K. S. Krane, John Wiley & Sons, 1988

Course Schedule:

Lecture: TR 4:25 – 5:40 p.m., Bowers Hall 154

Professor Information:

Dr. Anju Sharma

Office: Bowers Hall 162

Email: SharmaA@Cortland.edu

Phone: (607) 753-2309

Office Hours: MWF 9:00 – 10:00 a.m., T 3:00 – 4:15 p.m. (and by appointment)

Attendance Policy:

Attendance is not taken in class, but you are responsible for ALL information given in class including assignments, handouts, modifications in the syllabus etc.

Learning Objectives:

1. To develop an understanding and appreciation of the principles of nuclear physics, and to explore their applications.
2. To apply the nuclear physics concepts and principles learnt in class to solve problems.
3. To develop skills for analytical thinking that will be useful for problem-solving in other fields.

Evaluation:

There will be two in-class exams during the semester. Final grade will be based on the total points accumulated from the following components

Exam I	25%
Exam II	25%
Final Exam	35%
Homework	15%
Maximum Points	100%

A final curve will be established at the end of the course for the assignment of the individual letter grades.

Exam Schedule:

Exam I: Feb 28

Exam II: Apr 11

Final Exam May 16

Students' Responsibilities:

- I. Read the appropriate material before coming to class.
- II. Make sure to interrupt if you do not follow the subject matter being presented.
- III. Active and intelligent participation in class is expected by asking questions and/or offering your opinions on the subject.
- IV. Be able to solve the problems derived from lectures covered in class. The tests and final examination will be drawn from these or similar problems.

Extended Course Goals keyed to the New York State Education Department Adolescent Education (NYSED) Content Examination in Physics Rubric

Students will:

0001. Understand the relationships and common themes that connect mathematics, science and technology
0003. Understand the process of scientific inquiry and the role of observation and experimentation in explaining natural phenomena
0004. Understand the process of gathering, organizing, reporting and interpreting scientific data.
0005. Understand principles and procedures of measurement used in physics
0006. Understand the use of mathematics and mathematical modeling in physics.
0007. Understand equipment, materials and chemicals used in physics investigations; and apply procedures for their proper and safe use.

Extended Course goals keyed to the SUNY College at Cortland Conceptual Framework

Students will gain an understanding of:

Knowledge base

Technology

Extended Course goals keyed to the National Science Teachers Association

Students will gain an understanding of:

Unifying concepts and processes in science

Science as inquiry

Science in personal and social perspectives

Physical Science

Students with a Disability:

If you are a student with a disability and wish to request accommodations, please contact the Office of Student Disability Services located in B-40 VanHoesen or call (607) 753-2066 for an appointment. Information regarding your disability will be treated in a confidential manner. Because many accommodations require early planning, requests for accommodations should be made as early as possible.

Withdrawal Policies:

The deadline for withdrawing from this course with a W is Apr 15, 2006. It is the student's responsibility to withdraw from the course. Failure to do so will result in a performance grade, which may be an F.

PHYS 570: NUCLEAR PHYSICS
Tentative Course Schedule

Jan 24, 26

Introduction
Rutherford scattering
Nuclear constituents
Nuclear Scale

Jan 31, Feb 2, 7, 9

Size and Shape of Nuclei
Nuclear force
Nuclear charge distribution
Nuclear matter distribution
Shape of nuclei

Feb 14, 16, 21, 23

Masses of Nuclei
Masses and Abundance of nuclei
Nuclear Binding Energy
Liquid Drop Model
Implications of semi-empirical mass formula

Feb 28

Exam I

Mar 2, 7, 9, 21

Nuclear Decay
Radioactive decay law
 α - decay
 β - decay
 γ - decay

Mar 14, 16

Spring Break

Mar 23, 28, 30, Apr 4, 6

Applications of Nuclear Physics
Fission
Fusion
Radioactive Dating
Nuclear Medicine
Analytical Applications

Apr 11

Exam II

Apr 13, 18, 20, 25, 27

Nuclear Models
Magic Numbers
Shell Model
Collective Model

May 2, 4

Introduction to Particle Physics

May 9

Review

May 16 (4:25-6:25 pm)

FINAL EXAM