

# PHYSICS 341

## ELEMENTARY NUCLEAR PHYSICS

**Prof. Yuri Efremenko**

**Nielsen M103**

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### **General Information**

Class Hours: 1:00 – 1:50 Monday/ Wednesday/ Friday at P415

Office Hours: after class and by appointment.

Text: “Introductory Nuclear Physics” Kenneth Krane, Wiley, ISBN 047180553X

*Supplementary texts* (optional):

“Quantum physics of atoms, molecules, solids, nuclei and particles” Robert Eisberg and Robert Resnick, Wiley, ISBN 0-471-87373-X.

“Quantum Mechanics” Paul C.W. Davies and David S. Betts, Chapman and Hall, ISBN 0-412-57900-6.

### **General Course Description**

The course will start with an extension of the quantum mechanics learned in 232 and will progress to cover basic nuclear structure, nuclear decay and reactions.

### **Prerequisites**

Knowledge of basic calculus and physics up to the level of Physics 232 or 250 is required for success in this course.

### **Course Objectives**

The course is aimed toward junior level nuclear engineers and physics majors; however other engineering and science majors with the correct preparation are very welcome. The objectives are:

- 1) To cover the basics of nuclear structure, i.e. how neutrons and protons collect together to form a nucleus.
- 2) To give students a basic understanding of nuclear reactions and the energetics involved.
- 3) To introduce some of the current regions of research in nuclear physics.

4) To give students the opportunity of working on a small project as part of a team.

### **Lecture Notes and Communication**

Lecture notes will be posted online. My main modes of communication are:

- 1) Through the lectures, and the times before and after classes.
- 2) In my office during office hours or by appointment (you can try to drop in without an appointment, but I'm sometimes at ORNL or elsewhere). Best way to make appointment is to send me e-mail with request.

My preferred method of communicating about material in the course, and homework problems in particular, is in person and over email.

### **Reading Assignments**

Reading the relevant chapter or sections for each week's lectures is a compulsory and vital part of the course. The course is structured in such a way that reading prior to the lecture is essential. Much of the class time will be devoted to discussing the material.

## **ACADEMIC HONESTY**

All work submitted by a student is expected to represent their own work. Students are expected to submit their own homework. Students are expected to perform all work in conformance with the University policies regarding Academic Honesty.

### **Classroom Environment**

I firmly believe that the classroom atmosphere should be comfortable and open, allowing students and teachers to **discuss the material**. This requires a great deal of **respect** and listening to one another as well as reducing side conversations to a minimum. I request that laptops not be used in the classroom, as they can easily become a distraction e.g. email, facebook etc, believe me, I know! This does mean that I expect you to take any notes on paper with a pen.

### **Grading Policy**

If, for any reason, there is a concern about a grade given on an exam or exam question, an appeal will be entertained if it is raised **no later than one week** after the date on which the graded exams are made available for return to the class. After this “appeal period” of one week, exam grades will be considered final and will not be altered.

***MISSING THE FINAL EXAM IS VERY SERIOUS AND MAY WELL RESULT IN FAILURE OF THE COURSE***

## **Grading Scale**

Final Grades are determined from the weighted average, where the weights are:

- 25% - Homework (10% quizzes, 15% homework sets)
- 15% - Group Project
- 30% - Three in class tests
- 30% - Final Exam

## **Homework Assignments**

There will be ten quizzes that you can access through Canvas and will require numerical, true/false, or multiple answer (click **ALL** the correct answers). Additionally there will be three homework sets that will have longer answers and need to be handed in on paper before the in class test. For the homework sets there will be a penalty of 5% per day that the homework is handed in late up to a maximum of 50%. That is, if you hand in your homework two days late you can obtain up to a maximum of 90%. If you hand your homework in ten or more days late you can obtain up to a maximum of 50% for that homework set.

## **Exams**

There will be three in class tests during the semester and the final. The final will be comprehensive. Date of the final exam is December 12.

## **Preliminary dates for homework and in class tests are:**

HW1 and Test 1 – September 20  
HW2 and Test 2 – October 20  
HW3 and Test 3 – November 15

Final Dec 8 1:00 p.m.

## Group Project

Students will work in teams of about 7-9 to research a topic of current interest in nuclear physics. Each group will present their findings to the class and will write a short report. Each student in the group will receive the same grade for the project and will need to sign off that **ALL** the students in the group contributed. A list of topics will be posted with primary source references.

The final grade will be assigned from the weighted average based on the following *provisional* grading scale.

A	90 and above
A-	87 and above
B+	83 and above
B	80 and above
B-	77 and above
C+	73 and above
C	70 and above
C-	67 and above
D+	63 and above
D	60 and above
D-	57 and above
F	Below 57

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Please contact the Office of Disability Services at 865-974-6087 in Hoskins Library to coordinate reasonable accommodations for students with documented disabilities.

## COVID-19 adjustments.

Situation is still fluid. However, face masks are required during lectures. Information regarding the modality will be posted later. I'm still waiting guidance from the College.