Department of Physics and Engineering
EGR3013/L ; PHY3013/L - Nuclear Physics and Lab 2+1 units

Fall 2020 | August 17-December 4

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Office hours: By appointment as needed.

PLNU Mission

To Teach ~ To Shape ~ To Send

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Department Mission

The Physics and Engineering Department at PLNU provides strong programs of study in the fields of Physics and Engineering. Our students are well prepared for graduate studies and careers in scientific and engineering fields. We emphasize a collaborative learning environment which allows students to thrive academically, build personal confidence, and develop interpersonal skills. We provide a Christian environment for students to learn values and judgment, and pursue integration of modern scientific knowledge and Christian faith.

COURSE DESCRIPTION

A survey of nuclear physics including nuclear models, laws of radioactive decay, radiation detection, and applications of nuclear science in engineering and medicine. Lecture and laboratory.

COURSE LEARNING OUTCOMES

1. Students will be aware of and practice ALARA
2. Students will be able to collect and analyze data of basic experiments in nuclear physics
3. Students will be able to sketch and explain features of common plots and graphical representations used in nuclear physics

4. Students will be able to understand the basic theory of alpha, beta, and gamma radiation and how each type of radiation interacts with matter
5. Students will be able to describe the essential features of the operation of a nuclear reactor and the interaction between the various important parameters
6. Students will be able to explain the physical meaning of mathematical formulations
7. Students will be able to justify and explain their thinking and approach to a problem or physical situation in written or oral form.
8. Students will be able to sketch the physical parameters of a system and their relations to each other where appropriately.
9. Students will be able to use appropriate databases and computational tools to solve problems in nuclear physics.

REQUIRED TEXTS AND RECOMMENDED STUDY RESOURCES

1. Lilley, John. *Nuclear physics: principles and applications*. John Wiley & Sons, 2013.
2. We will be using several online resources and downloadable software packages through the semester including python, latex (and I like texmaker)
3. online resources including the chart of nuclides, or nudat, the national nuclear data center has many links, as does NIST including: estar, pstar, and astar

COURSE CREDIT HOUR INFORMATION

In the interest of providing sufficient time to accomplish the stated Course Learning Outcomes, this class meets the PLNU credit hour policy for a 3 unit class delivered over sixteen weeks. Specific details about how the class meets the credit hour requirement can be provided upon request. (Based on 37.5 hours of student engagement per credit hour.)

Category	Time Expectation in Hours
Reading Assignments	26
Homework Assignments	34
Other Assignments & Learning Activities	11
Quizzes and Exams	5
Lab	38
Total Hours	114

ASSESSMENT AND GRADING

Graded Components

- **(25%) Lab** provides you the opportunity for a hands-on experience of topics from class meetings, developing lab technique, understanding of basic equipment from the nuclear lab, and data analysis. Labs will be performed in small groups, but each individual is responsible for submitting their own documents unless otherwise specified. Depending on covid regulations at the time of the meetings, there may be more emphasis placed on data analysis.
- **(25%) Homework** is exceedingly important for developing an understanding of the course material, not to mention building skills in complex physical and mathematical problem solving. Remember that it is not just a "correct solution" that is the goal, it is the process to the solution that will develop your skill as a physicist or engineer. I encourage you to work together on the homework sets, but you must participate in the process of obtaining the solution to each problem. The guideline is that you should have no trouble explaining or repeating work that you turn in.
- **(5%) Pre-meeting questions**: Each week you will watch/read and submit answers to material before that week's zoom meeting. Points are earned from the questions you answer as well as attendance and participation in zoom meetings.
- **(25%) Examinations** and the **(20%) Final Examination**. Examinations and the Final Examination will include problems and questions over material assigned in the text, readings and handouts, as well as material presented in class. No examination shall be missed without prior consent or a well-documented emergency beyond your control. A score of zero will be assigned for an examination that is missed without prior consent or a well-documented emergency beyond your control.

Late work will not be accepted without prior consent or a well-documented emergency. Up to a maximum of one homework assignment will be accepted up to 3 days late provided that consent is received from the professor before it is due. Homework assignments that are submitted late without prior consent will be recorded with a score of zero. If more than half of the homework assignments are submitted on time, then the lowest homework score will be dropped from the calculations of the homework grade.

Grading Scale

Grades are based on the number of points accumulated throughout the course with approximate minimal percentages required to obtain a given grade are:

Standard Grade Scale Based on Percentages

	A	B	C	D	F
+		87.5- 90	77.5-80	67.5-70	
	92.5 -100	82.5-87.5	72.5-77.5	62.5 -67.5	0-60
_	90-92.5	80-82.5	70-72.5	60-62.5	

STATE AUTHORIZATION – only if the class is online

State authorization is a formal determination by a state that Point Loma Nazarene University is approved to conduct activities regulated by that state. In certain states outside California, Point Loma Nazarene University is not authorized to enroll online (distance education) students. If a student moves to another state after admission to the program and/or enrollment in an online course, continuation within the program and/or course will depend on whether Point Loma Nazarene University is authorized to offer distance education courses in that state. It is the student's responsibility to notify the institution of any change in his or her physical location. Refer to the map on State Authorization to view which states allow online (distance education) outside of California.

INCOMPLETES AND LATE ASSIGNMENTS

All assignments are to be submitted/turned in by the beginning of the class session when they are due—including assignments posted in Canvas. Incompletes will only be assigned in extremely unusual circumstances.

PLNU COPYRIGHT POLICY

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

PLNU ACADEMIC HONESTY POLICY

Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See Academic Policies for definitions of kinds of academic dishonesty and for further policy information.

PLNU ACADEMIC ACCOMMODATIONS POLICY

While all students are expected to meet the minimum standards for completion of this course as established by the instructor, students with disabilities may require academic adjustments, modifications or auxiliary aids/services. At Point Loma Nazarene University (PLNU), these students are requested to register with the Disability Resource Center (DRC), located in the Bond Academic Center. (DRC@pointloma.edu or 619-849-2486). The DRC's policies and procedures for assisting such students in the development of an appropriate academic adjustment plan (AP) allows PLNU to comply with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Section 504 (a) prohibits discrimination against students with special needs and guarantees all qualified students equal access to and benefits of PLNU programs and activities. After the student files the required documentation, the DRC, in conjunction with the student, will develop an AP to meet that student's specific learning needs. The DRC will thereafter email the student's AP to all faculty who teach courses in which the student is enrolled each semester. The AP must be implemented in all such courses.

If students do not wish to avail themselves of some or all of the elements of their AP in a particular course, it is the responsibility of those students to notify their professor in that course. PLNU highly recommends that DRC students speak with their professors during the first two weeks of each semester about the applicability of their AP in that particular course and/or if they do not desire to take advantage of some or all of the elements of their AP in that course.

PLNU ATTENDANCE AND PARTICIPATION POLICY

Attendance is expected at each class session. In the event of an absence you are responsible for the material covered in class and the assignments given that day.

Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See Academic Policies for further information about class attendance.

SPIRITUAL CARE

Please be aware PLNU strives to be a place where you grow as whole persons. To this end, we provide resources for our students to encounter God and grow in their Christian faith. If students have questions, a desire to meet with the chaplain or have prayer requests you can contact the Office of Spiritual Development

Course Summary:

Date	Details	
Mon Aug 17, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 1: Course Orientation	to do: 11:59am	
Page Week 1: Overview	to do: 12:30pm	
Page Home Page | Quick Links to Resources	to do: 11:59pm	
Page Meet Your Instructor	to do: 11:59pm	
Page Syllabus	to do: 11:59pm	
Tue Aug 18, 2020	Assignment VQ 1	due by 11:59pm
Wed Aug 19, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Aug 20, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Aug 21, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am

Sun Aug 23, 2020	Assignment VQ 2	due by 11:59pm
Mon Aug 24, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 2: Overview	to do: 11:59pm	
Assignment Hmk 1	due by 11:59pm	
Wed Aug 26, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Aug 27, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Aug 28, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab 1	due by 11:59pm	
Sun Aug 30, 2020	Assignment VQ 3	due by 11:59pm
Mon Aug 31, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 3: Overview	to do: 11:59pm	
Assignment Hmk 2	due by 11:59pm	
Wed Sep 2, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Sep 3, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Sep 4, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab 2	due by 11:59pm	
Sun Sep 6, 2020	Assignment VQ 4	due by 11:59pm
Mon Sep 7, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 4: Overview	to do: 11:59pm	
Assignment Hmk 3	due by 11:59pm	

Wed Sep 9, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Sep 10, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Sep 11, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab 3	due by 11:59pm	
Sun Sep 13, 2020	Assignment VQ 5	due by 11:59pm
Mon Sep 14, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 5: Overview	to do: 11:59pm	
Assignment Hmk 4	due by 11:59pm	
Wed Sep 16, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Sep 17, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Sep 18, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab 4	due by 11:59pm	
Sun Sep 20, 2020	Assignment VQ 6	due by 11:59pm
Mon Sep 21, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 6: Overview	to do: 11:59pm	
Assignment Hmk 5	due by 11:59pm	
Wed Sep 23, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Sep 24, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Assignment Exam 1	due by 11:59pm	
Fri Sep 25, 2020	Calendar Event EGR3013-1 FA20 - Nuclear	8:30am to

	Physics	9:30am
Sun Sep 27, 2020	Assignment VQ 7	due by 11:59pm
Mon Sep 28, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 7: Overview	to do: 11:59pm	
Assignment Hmk 6	due by 11:59pm	
Wed Sep 30, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Oct 1, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Oct 2, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab week 6	due by 11:59pm	
Sun Oct 4, 2020	Assignment VQ 8	due by 11:59pm
Mon Oct 5, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 8: Overview	to do: 11:59pm	
Assignment Hmk 7	due by 11:59pm	
Wed Oct 7, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Oct 8, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Oct 9, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab week 7	due by 11:59pm	
Sun Oct 11, 2020	Assignment VQ 9	due by 11:59pm
Mon Oct 12, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 9: Overview	to do: 11:59pm	

Assignment Hmk 8	due by 11:59pm	
Wed Oct 14, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Oct 15, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Oct 16, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab week 8	due by 11:59pm	
Sun Oct 18, 2020	Assignment VQ 10	due by 11:59pm
Mon Oct 19, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 10: Overview	to do: 11:59pm	
Assignment Hmk 9	due by 11:59pm	
Wed Oct 21, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Oct 22, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Oct 23, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab week 9	due by 11:59pm	
Mon Oct 26, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 11: Overview	to do: 11:59pm	
Assignment Hmk 10	due by 11:59pm	
Tue Oct 27, 2020	Assignment VQ 11	due by 11:59pm
Wed Oct 28, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Oct 29, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am

Assignment Exam 2	due by 11:59pm	
Fri Oct 30, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab week 10	due by 11:59pm	
Sun Nov 1, 2020	Assignment VQ 12	due by 11:59pm
Mon Nov 2, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 12: Overview	to do: 11:59pm	
Assignment Hmk 11	due by 11:59pm	
Wed Nov 4, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Nov 5, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Nov 6, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Sun Nov 8, 2020	Assignment VQ 13	due by 11:59pm
Mon Nov 9, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 13: Overview	to do: 11:59pm	
Assignment Hmk 12	due by 11:59pm	
Wed Nov 11, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Nov 12, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Nov 13, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab week 12	due by 11:59pm	
Sun Nov 15, 2020	Assignment VQ 14	due by 11:59pm
Mon Nov 16, 2020	Calendar Event EGR3013-1 FA20 - Nuclear	8:30am to

	Physics	9:30am
Page Week 14: Overview	to do: 11:59pm	
Assignment Hmk 13	due by 11:59pm	
Wed Nov 18, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Thu Nov 19, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Fri Nov 20, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Assignment Lab week 13	due by 11:59pm	
Mon Nov 23, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8:30am to 9:30am
Page Week 15: Overview - Finals and Thanksgiving	to do: 11:59pm	
Assignment Hmk 14	due by 11:59pm	
Assignment Lab week 14	due by 11:59pm	
Thu Nov 26, 2020	Calendar Event EGR3013-1 FA20 - Nuclear Physics	8am to 9am
Mon Nov 30, 2020	Page Week 16: Overview - Wrap Up Week	to do: 11:59pm
Wed Dec 2, 2020	Assignment Final Exam	due by 7:30am