

Purdue University
School of Nuclear Engineering
NUCL 420: Radiation Interaction with Materials and Applications
Fall 2021, MWF: 9:30am-10:20am, GRIS 133

Course Description: 3 credit hours. The course covers the fundamentals of ion and neutron interaction with materials and applications. The course introduces students to the types of radiation and radiation sources, physical mechanisms of ion and neutron interaction with solids, radiation damage, ion beam mixing, applications in nuclear fission and fusion reactors and materials modification and synthesis by ion beams.

Course Objectives:

1. Learn the types and sources of ion and neutron radiation
2. Learn the physical mechanisms of ion and neutron interaction with materials
3. Relate the concepts of radiation damage to neutron interaction with solids in both fission and fusion reactors
4. Become familiar with the technological applications of ion interactions with materials

Prerequisite: NUCL 320

Instructor: Ms. Pola Lydia Lagari WANG 4000E-3
Email: plagari@purdue.edu
Office Hours: By appointment

Textbooks: Required textbook: *Ion-Solid Interactions: Fundamentals and Applications*, M. Nastasi, J. W. Mayer and J. K. Hirvonen.
Additional readings: *Fundamentals of Radiation Materials Science- Metals and Alloys*, 2nd Edition by Gary Was
Ion implantation and synthesis of materials, by M. Nastasi and J. W. Mayer

Homework:

- Homework is assigned to enhance learning and to help students practice towards the exams. HW corresponds to 20% of your final grade.
- HW needs to be neatly organized, showing logical and detailed working steps, you must present work on all given problems.
- Homework will be collected on Brightspace and will be due one week after the assigned date.
- Late HW will be penalized with a 20% grade reduction, and HW won't be accepted if it's more than 3 days past the due date.

Exams:

- Midterm exam will be 25% of your final grade and will be given on Monday, November 1st, 2021, during class time.
- Final exam will be 25% of your final grade and will be given during final exam week in December.
- No make-up exam will be allowed.

Project:

- A project will be assigned to you to promote collaboration among the students. At the end of the semester, you will be asked to write a report, present your work and evaluate your teammates.
- The project will be 20% of your final grade.

5⁺ News: · Students are expected to give 2 five-minute presentations on a nuclear topic of their preference, to help them extend their knowledge and remain updated on the latest global nuclear news.
· 5-minute presentations will be 5% of your final grade.

Attendance: · Attendance will correspond to 5% of your final grade.

Course grade:	[98-100]	A+
	[95-98)	A
	[90-95)	A-
	[85-90)	B+
	[83-85)	B
	[80-83)	B-
	[75-80)	C+
	[70-75)	C
	[65-70)	D
	[0-65)	F

Extenuating circumstances: Exceptions may be considered for exams and homework assignments under some limited extenuating circumstances, such as: official Purdue approved activities; military obligations; religious observances; government duties; personal reasons beyond his/her control etc. In such cases, students are required to provide the instructor with proof of evidence prior to the expected absences. For the official university policy, refer to:

http://www.purdue.edu/studentregulations/regulations_procedures/classes.html

Academic Integrity: Academic misconduct of any kind will not be tolerated in any course offered by the School of Nuclear Engineering. Information on Purdue's policies with regard to academic misconduct can be found at https://www.purdue.edu/purdue/about/integrity_statement.php You should familiarize yourself with these policies, particularly if you are new to US academic institutions. All apparent violations of these policies will be referred to the Office of the Dean of Students (ODOS).

Emergency Preparedness: In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Students may consult the class Blackboard site or e-mail or phone the instructor to obtain information about changes in the course.

Non-discrimination Policy: Purdue University's non-discrimination policy will be upheld in this classroom. Purdue University is committed to maintaining a community which recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her own potential. More information can be found at http://www.purdue.edu/purdue/ea_eou_statement.html

Accessibility: Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are welcome to let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone at 765-494-1247.

Attendance:

In accordance with University policy, students are expected to attend all the classes. If a student has a valid reason for missing class such as a University-sponsored activity, religious observances, illness, or family

emergency, you need to inform the instructor in writing regarding your absence in advance. Students who fail to attend class without a valid excuse should not expect the instructor to supply class notes or provide special help.

In the current context of the COVID-19 pandemic, students must follow the guidelines in the Protect Purdue Pledge. Most specifically, students must refrain from attending class if they are exhibiting any symptoms of COVID-19, are otherwise ill, or are quarantined or isolated. Students should stay home and contact the Protect Purdue Health Center (496-INFO) if they feel ill, have any symptoms associated with COVID-19, or suspect they have been exposed to the virus. In the current context of COVID-19, in person attendance will not be a factor in the final grades, but the student still needs to inform the instructor of any conflict that can be anticipated and will affect the submission of an assignment or the ability to take an exam. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflict, when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email, through Brightspace, or by phone. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor's department because of circumstances beyond the student's control, and in cases of bereavement, quarantine, or isolation, the student or the student's representative should contact the Office of the Dean of Students via email or phone at 765-4941747. If you become quarantined or isolated at any point in time during the semester, in addition to support from the Protect Purdue Health Center, you will also have access to an Academic Case Manager who can provide you academic support during this time. Your Academic Case Manager can be reached at acmq@purdue.edu and will provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify me via email or Brightspace. We will make arrangements based on your particular situation. The Office of the Dean of Students (odos@purdue.edu) is also available to support you should this situation occur.

Classroom Guidance Regarding Protect Purdue

The Protect Purdue Plan, which includes the Protect Purdue Pledge, is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, properly wearing a mask in classrooms and campus building, at all times (e.g., mask covers nose and mouth, no eating/drinking in the classroom), disinfecting desk/workspace prior to and after use, maintaining appropriate social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

Students who are not engaging in these behaviors (e.g., wearing a mask) will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class. Students who do not comply with the required health behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office with sanctions ranging from educational requirements to dismissal from the university.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also Purdue University Bill of Student Rights.

Disclaimer: This syllabus is subject to change. You will be notified of any changes as far in advance as possible via an announcement on Brightspace. Monitor your Purdue email daily for updates.