NRE 3112 - Fall 2025

Radiation Detection

Instructor: Dr. Greeshma Agasthya (greeshma@gatech.edu)

NRE3112: An introduction to the principles and characteristics of basic detectors for nuclear radiation and the pulse processing electronics associated with them.

Course objectives: To familiarize students with the important techniques for measuring ionizing radiations that are of primary interest in nuclear fission and fusion energy systems, as well as in medical, environmental, and industrial applications.

Lab schedules: Two to three (depends on number of students enrolled) identical sessions each week: The lab is located in Boggs 3-53.

Text: Glenn F. Knoll, *Radiation Detection and Measurement*, 4th Edition, John Wiley & Sons, Inc., 2010, ISBN 978-0-470-13148-0.
Lab manual will be posted on Canvas before each lab.

Grade Distribution:

Midterm exam	20%
Final exam	20%
Projects	20%
Homeworks	10%
Lab notebook	5%
Lab exam (hands-on performance)	10%
Lab reports	15%

Course Policies and Important Notes:

- **Exams (40% of grade)**
  - Both exams will be in-person.
  - Exams are closed-book.
  - Calculators that cannot be connected to the internet will be allowed.
  - Each student can bring a double sided A4 size cheatsheet.
  - No makeup exams will be given unless approved by the Office of the Dean of Students.
- **Labs Reports (15% of grade)**
  - Students are expected to work independently. **Offering** and **accepting** solutions from others is an act of **plagiarism**, which is a serious offense and **all involved parties will be penalized according to the Academic Honesty Policy**. Discussion amongst

students is encouraged, but when in doubt, direct your questions to the professor, or TA.

- Lab reports are due the week following the lab exercise.
- All labs must be typed and completed by computer.
- Lab reports are to be submitted via Canvas.
- No late assignments will be accepted unless arranged with the instructor ahead of time.
- All lab reports must be turned in order to get a passing grade in the course.
- The outline for the lab report will be posted on Canvas.

- **Lab Exam (10% of grade)**
  - An oral exam will be given at the end of the semester to review laboratory instrumentation.
  - Students will be asked to explain radiation detection equipment, radiation detection, and data acquisition.
  - Students may be asked to complete exercises on the whiteboard.
- **Lab notebook (5% of grade)**
  - Lab notes must be kept in a notebook (composition notebook preferred)
  - The notebook maintenance must include the following:
    1. Table of contents (leave first 4-5 pages blank to fill the table)
    2. Time sequence of entries made in ink. No blank pages or gaps to be left in the notebook. Ever. You may leave placeholders to fill with graph printouts if necessary, but the space must be clearly labeled.
    3. Errors clearly labeled and explained. Under no circumstances lab notebook pages may be removed.
  - Organization counts!
- **Homework (10% of grade)**
  - Four homeworks will be provided through the semester.
  - Only one to two problems will be graded per homework, and this will be indicated in the homework uploaded on canvas.
  - Due dates are also given on the homework uploaded on canvas.
  - Students can work with each other but have to submit independent work.
- **Projects (20% of grade)**
  - There will be two to three projects which will be discussed as the class progresses.
  - The projects will be an introduction to GEANT4, and MCNP.
- **Grades**

  Your final grade will be assigned as a letter grade according to the following scale:

  A 90-100%
  B 80-89%
  C 70-79%
  D 60-69%
  F 0-59%

  No curves should be anticipated for this course.
- **Attendance and Absences**

- Class and lab attendance is expected. You may not miss lab sessions unless arranged with the instructor ahead of time.
- Students are responsible for all missed work, regardless of the reason for absence. It is also the absentee's responsibility to get all missing notes or materials.

- **RAM training**
  - Many of the experiments in the course make use of the radiation sources. All students are expected to complete the radioactive material worker training and abide by the rules from the GT Office of Radiological Safety, the course instructor, and the Graduate Teaching Assistants. Instructions about the online training program will be given during the first class on Monday 18th August. No eating (including chewing gum), drinking or applying cosmetics during the laboratory. Long pants and closed-toe shoes must be worn during the laboratory sessions. Entry will not be given to the lab if the required training isn't completed.

Academic Honesty Policy Summary:

Introduction

Scholastic Dishonesty is any act designed to give an unfair academic advantage to a student, or the attempt to commit such an act. This includes copying from another students exam; possessing or using unauthorized materials during an exam; using, buying, stealing, transporting or soliciting a test or the answer key; collaborating with another student during a test; copying someone elses homework or assignment; and permitting someone to take a test for you. The falsification of academic records is also an act of scholastic dishonesty. Students who participate in scholastic dishonesty will be reported and dealt with in accordance with Institute regulations. For information on the students responsibility in meeting the specific Georgia Tech Honor Code, see Section 3 of the Honor Code at the following website:
http://osi.gatech.edu/content/honor-code/

Authorship

The student must clearly establish authorship of a work. Referenced work must be clearly documented, cited, and attributed, regardless of media or distribution. Even in the case of work licensed as public domain or Copyleft, (See: http://creativecommons.org/) the student must provide attribution of that work in order to uphold the standards of intent and authorship.

Collaboration & Group Work

Students are expected to turn in their own work for assignments and quizzes, however, discussion among students on understanding of the subjects and topics is encouraged. At all times students are expected to follow the Academic Honor Code (http://www.catalog.gatech.edu/policies/honor-code/)

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

Late assignments will not be accepted and missed exams will not be rescheduled without an Institute approved absence (e.g. field trips and athletic events). Students with medical or family emergencies should contact the Dean of Students. See http://catalog.gatech.edu/rules/4/ for an articulation of the Institute rules.

Student-Faculty Expectations Agreement

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. See http://www.catalog.gatech.edu/rules/22/ for an articulation of some basic expectation that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

AI policy

Students are welcome to use AI tools and large language models (LLMs) as learning aids to better understand course material and concepts. However, the use of these tools to generate solutions, complete homework problems, or write lab reports is not permitted.

All submitted work must reflect the student's own understanding and effort. If a report, assignment, or homework submission is found to contain AI-generated content, the student or all members of the group (if applicable) with names on the report/assignment will receive a grade of zero for that assignment.

Additional Course Policies

The materials used in this class, including, but not limited to, exams, quizzes, homework assignments, and lectures are copyright protected works. Any unauthorized copying of the class materials is a violation of federal law and may result in disciplinary actions being taken against the student. This includes, among other things, uploading class materials to websites for the purpose of sharing those materials with other current or future students.

Campus Resources for Students

Academic Advisors (advising.gatech.edu/) in each school help students navigate degree requirements and take advantage of campus resources to ensure their success.

The **Center for Academic Success** (success.gatech.edu/) offers a variety of academic support services to help students succeed academically at Georgia Tech (e.g. tutoring, peer-led study groups, study skills, etc.).

The **Communication Center** (communicationcenter.gatech.edu/) provides support for students with respect to developing competency and excellence in written, oral, visual, electronic, and nonverbal communication.

The **Library** (library.gatech.edu/) provides students with many services besides borrowing privileges including access to technology and technical assistance, online access to many journals and databases, and subject and personalized research assistance.

The **Office of Disability Services** (disabilityservices.gatech.edu/) ensures that students with disabilities have equal access to all programs and activities offered at Georgia Tech. They provide documentation and officially sanctioned requests for accommodation for students

OMED: Educational Services (omed.gatech.edu/) is the unit charged by Georgia Tech with the retention, development, and performance of the complete student learner who is traditionally underrepresented: African American, Hispanic, and Native American. OMED's programming and academic support services are aimed at equipping all students with strategies to navigate the Georgia

Tech environment.

The **Division of Student Life** (studentlife.gatech.edu/) – often referred to as the Office of the Dean of Students – offers resources and support for all students in our community.

Counseling Center	counseling.gatech.edu/	404-894-2575
Dean of Students	studentlife.gatech.edu/	404-385-8772
GT Police	police.gatech.edu/	404-894-2500
Stamps Health Services	health.gatech.edu/	404-894-1420

Course Schedule

See associated course schedule

Class Recordings

This is an on-campus class. As a result, students are expected to show up to class. Some, but not all classes, will be recorded. If there is a class you need recorded due to an anticipated absence, please let the instructor know in advance.

https://link.springer.com/chapter/10.1007/978-3-642-00829-0_6