

NRE 3026 Syllabus

[Experimental Nuclear Reactor Physics, Section A, 3 Credits]

[Class Day(s) TBD, Time TBD, Location Room XXX XXX building]

Instructor Information

Instructor

Professor Anna Erickson

Email

Anna.Erickson@me.gatech.edu

Office Hours & Location

Tu 12:30 to 1:30 PM (prior notification by E-mail is recommended), or by appointment
Boggs building 3-XX

Teaching Assistant(s)

TBD

Email

TBD

Office Hours & Location

TBD

General Information

Description

This course provides understanding of the fundamentals of experimental nuclear reactor physics and laboratory techniques. Applications include nuclear power, radiation detection, and nuclear medicine. Students will be introduced to techniques to measure the approach to criticality, flux mapping as well as buckling, subcritical assembly, and diffusion length measurement. Neutron spectral measurements, Foil activation methods, shielding and dose measurements will also be studied. Laboratory sessions will be accompanied by lectures that inform students on the theory behind the measurement techniques.

Pre- &/or Co-Requisites

NRE 3208 Nuclear Reactor Physics I, NRE 3112 Radiation Detection

Course Goals and Learning Outcomes

Upon successful completion of this course, students should be able to:

1. understand the relationship between basic reactor physics concepts and actual reactor characteristics
2. integrate their previous measurement experience and reactor physics knowledge to measure reactor physics parameters.
3. demonstrate their ability to analyze experimental data.

Course Requirements & Grading

Assignment	Date	Weight (Percentage, points, etc)
Lab 1 Report	Week 3	10% of total grade
Experimental design proposal	Week 4	5% of total grade
Laboratory 2a worksheet	Week 5	5% of total grade
Laboratory 2a and 2b report	Week 6	20% of total grade

Assignment	Date	Weight (Percentage, points, etc)
Laboratory 3 worksheet	Week 8	5% of total grade
Midterm Examination	Week 9	15% of total grade
Laboratory 4 summary report	Week 10	10% of total grade
Laboratory 5 report	Week 14	5% of total grade
Group Presentation:	Week 14	5% of total grade
Experimental Design Laboratory Worksheet	Weeks 12 and 15	20% of total grade

Description of Graded Components

Midterm Examination(15%)

There will be one in-class exam. Exams will focus on material covered in class, laboratory relevant problems, and previous quiz problems. Exams will include both quantitative and qualitative components. All exams will be closed book and closed notes. Calculators will be allowed during exams. Academic dishonesty on exams will be taken very seriously.

Laboratory Worksheets and Reports (55%)

Depending on the laboratory, data may be collected in various size groups, but all worksheets/reports will be completed **individually**. All reports are to be well-written and suitable for publication. Please make sure to reference all information correctly; this includes information from each other. A summary of each type of assignment is below:

Worksheets: For worksheets you will need to turn in all calculations and short answers posed in the laboratory write-up regarding the laboratory.

Summary Reports: A summary report will be a maximum of 3 pages in length (not including appendices) and will be written in the format for ANS transactions. (See T-square for a template)

Full Reports: A full report will be a maximum of 10 pages in length (not including appendices) and will be written in the format for a journal. (See T-square for a template)

Experimental Design Laboratory

An experimental design problem will be assigned during week 4 lecture in which you will be asked to develop/write an experiment and associated procedure. In week 7, your group will give a 10-minute proposal presentation during the lecture/lab times. The procedures will be reviewed, and each lab section will discuss and develop final plans for the laboratory during week 12 during the lecture. The experiment based on the final plan will be conducted during week 14. Your final deliverables will be worksheet that you'll produce after the ED laboratory is performed and final presentation of the experiment and the results in week 15 during the lecture/lab times.

Grading Scale

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.

Course Materials

Course Text

- Laboratory handouts posted on T-square,
- “Radiation Detection and Measurement” by G. Knoll, ISBN 978-0470131480

Additional Materials/Resources

Many of the experiments in the course make use of the radiation sources and emitting devices as well as neutron activated foils. 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.

Course Website and Other Classroom Management Tools

Canvas will be used as the course website to communicate with the students.

Course Expectations & Guidelines

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit <http://www.catalog.gatech.edu/policies/honor-code/> or <http://www.catalog.gatech.edu/rules/18/>.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or <http://disabilityservices.gatech.edu/>, and <http://disabilityservices.gatech.edu/content/welcome-accommodate> as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Attendance and/or Participation

Attendance will not be mandatory, however, in-class activity including quizzes and a presentation will be a portion of the grade as described in the description of graded components.

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.

Student Use of Mobile Devices in the Classroom

Use of portable technology during class time is not permitted unless prior arrangement has been made with the course instructor. Please leave your laptop in your bag, turn off your cell phone, and resist the urge to text your mom.

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

<u>Week</u>	<u>Lecture</u>	<u>Laboratory</u>	<u>Assignment:</u>
1 (1/8/17)	Overview and RAM Training Review Writing Lab Reports	RSEL overview	None
2 (1/15)	No Class (Holiday)		
3 (1/22/17)	Lecture #1	Lab #1: Activation and Decay	Lab #1: Summary Report (due 2/6)
4 (1/29/17)	Experimental design (given by C. Burns)	Group meeting	ED proposal (due 2/20)
5 (2/5/17)	Lecture #2a	Lab #2a: Diffusion Length in Graphite	Lab 2a: Worksheet (due 2/13)
6 (2/12/17)	Lecture #2b	Lab #2b: Material Buckling Measurement	Lab 2a and 2b: Full Report (due 3/13)
7 (2/19/17)	Experimental design and proposal discussion	Group meeting	Full ED report is assigned
8 (2/26/17)	Lecture #3	Lab#3: Approach to Criticality	Lab #3: Worksheet (due 3/6)
9 (3/5/17)	MIDTERM EXAM		
10 (3/12/17)	Lecture #4	Lab#4: Pulsed Neutron Source	Lab #4 Summary Report (due 3/27)
11 (3/19/17)	No Lecture (Spring Break)		
12 (3/26/17)	Review of the full report, ED discussion	Group meeting	Full ED report is due
13 (4/2/17)	Lecture #5a	Lab #5a: Experimental Design Laboratory practice session	Modifications to the procedures (as necessary)
14 (4/9/17)	Lecture #5b	Lab #5b: Experimental Design Laboratory	Lab #5: Worksheet/Full Report

15 (4/16/17)	Course wrap up	Group presentations	ED worksheet is due
16 (4/23/17)	Exit Survey	No lab	No assignment