

# Nuclear Radiation Detection and Instrumentation

ENU 4612L

**Class Periods:** Tuesday, 8:30-11:30 AM (additional lab sections will be opened)

**Location:** 115 Rhines Hall

**Academic Term:** Fall 2021

## **Instructor:**

Dr. James E Baciak

[jebaciak@mse.ufl.edu](mailto:jebaciak@mse.ufl.edu)

352-273-2131

Office Hours: Tuesday, Period 8 (3:00 – 3:50 PM)

Wednesday, Period 6 (12:50 – 1:40 PM)

Friday, Period 8 (3:00 – 3:50 PM)

In addition to the above office hours, I will be setting up some office hours on Zoom, 2 hours per week to accommodate asking me questions online. I will announce these on the Canvas site as well as updating the course syllabus. Note: Office hours may change once the laboratory schedule is set.

Office Location: 109 Nuclear Annex

## **Teaching Assistant/Peer Mentor/Supervised Teaching Student:**

Kyle Latty ([klatty@ufl.edu](mailto:klatty@ufl.edu)) will be the supervised teaching student associated with 4612L.

## **Course Description**

Laboratory experiments related to the physics and electronics of radiation detection and instrumentation systems for application to nuclear energy, radiological sciences, radiation protection, medical physics and imaging, and industrial safety and control systems.

## **Course Pre-Requisites / Co-Requisites**

EEL 3003 Elements of Electrical Engineering (note: this is changing)

ENU 4605 Interaction of Radiation with Matter

ENU 4612 Radiation Detection and Instrumentation (Co-Requisite)

## **Course Objectives**

Provide students with a working knowledge of radiation detectors, detector systems, and their associated electronics; Development of communication skills including technical writing and oral presentations; Prepare students for independent research and/or design projects.

## **Materials and Supply Fees**

\$46.92

## **Relation to Program Outcomes (ABET):**

Outcome	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Low
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare,	Low

as well as global, cultural, social, environmental, and economic factors	
3. An ability to communicate effectively with a range of audiences	High
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Low

\*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

### ***Required Textbooks and Software***

- Radiation Detection and Measurement
- G. F. Knoll
- 2010, 4<sup>th</sup> Edition
- 0470131489

There will also be notes and various articles I will post on the canvas site, based on questions students may ask during lecture as well as supplementary material I may want you to have.

### **Access to Chart of Nuclides:**

You will need access to a chart of nuclides during the course. Feel free to use any one of the numerous resources available (so long as it is accurate). A simple search on Google will give you access to one.

### ***Course Schedule***

<b>Date</b>	<b>Lab Topic for that Week</b>
September	6 Lab #0: Introduction & Lab Safety
	13 Lab #1: Oscilloscope Usage
	20 Lab #2: Nuclear Instrument Electronics
October	11 Lab #3: Geiger-Mueller Detectors
	18 Lab #4: Gas-Flow Proportional Counters
	25 Lab #5: NaI Scintillation Detectors
November	8 Lab #6: High-Purity Ge Detectors
	15 Lab #7: Neutron Detection

### **Attendance Policy, Class Expectations, and Make-Up Policy**

Students are expected to attend each laboratory session. Students must participate in each laboratory exercise and produce an individual laboratory report on each exercise. Students may make up experiments provided that valid medical reason or previously excused reason. Students must perform **ALL** laboratory experiments in order to receive a passing grade. Experiments which may be missed should be brought to the attention of the Instructor as far in advance of the class period as possible. In the event of an absence, it is the student's responsibility to obtain a make-up date with the instructor.

Late-work excuses can be grouped into the categories of professional, medical, and personal.

**Professional:** Reasonable extensions for job/internship interviews, technical conferences, or other professional/career development reasons should be requested. Requests are typically granted, at my discretion, unless they would grant a student or group of students an unfair advantage over their peers, cause significant disruption to the course or grading schedule, or violate some UF policy.

**Medical:** Extensions will also be granted for (your own) medical reasons – please do not come to class if you are ill. Per UF policy, in the case of medical absences that are frequent or suspiciously-timed (e.g.; you are repeatedly, suddenly ill at deadlines), I may request a signed note from a physician or similar professional practitioner.

**Personal:** In addition, UF policies require accommodation for several non-academic, non-medical reasons. Extensions for these personal issues are strictly limited to those mandated by the letter of UF policies. The list of UF-approved personal reasons changes from time to time. If you have a question regarding your personal issue and if it qualifies under one of the excused absence/late-work policies, contact me in advance.

The 12-day rule will be enforced strictly. Note that the count of days is based on a per-student, not per-approved-activity basis. All requests for excused absence or extension must be submitted in writing, preferably via e-mail. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

### **Evaluation of Grades**

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Lab Attendance / Participation	80	10%
Lab Notebook	10	10%
Pre-Lab Quizzes (7)	20 each	20%
Lab Worksheets (5)	100 each	30%
Laboratory Reports (2)	100 each	30%
		100%

### **Quizzes**

A quiz will be given at the beginning of each lab experiment. It is highly suggested that the students read the lab handout ahead of time to prepare for the lab.

### **Lab Notebook**

I expect students to keep a detailed lab notebook or binder that contains everything from the course. This should have at the minimum all of the data you record or print out that is associated

with the course. Equipment information and sketches of experimental setup should also be included in the notebook, as should any important information that helps you explain your results. This will help you prepare and write your reports. I suggest keeping a binder with all of the course material, sorted in an orderly fashion. It will help you keep track of material handed out in this course!

## Worksheets

Most of your laboratory experiments will have a set of worksheets from which you can work. These will have places to write data, sketch your setup, and questions you need to answer. For the experiments where you need to turn these in, please complete them to the best of your ability. Worksheets are due 1 week after the experiment is performed.

## Reports

You will have 2 short laboratory reports throughout the semester. These reports will be approximately 10-15 pages in length (assuming single spacing), with extensive use of figures, graphs, and tables to provide adequate explanation of the results from the experiment, including linking your observations with theory. Adequate explanation and discussion of all parts of the lab is necessary. I you give some notes for writing short reports. Short reports are due two weeks after the experiment is performed.

There is no final exam for this course.

## Grading Policy

Percent	Grade	Grade Points
94 - 100	A	4.00
90 - 93.9	A-	3.67
87 - 89.9	B+	3.33
83 - 86.9	B	3.00
80. - 82.9	B-	2.67
77 - 79.9	C+	2.33
73 - 76.9	C	2.00
70 - 72.9	C-	1.67
67 - 69.9	D+	1.33
63 - 66.9	D	1.00
60 - 62.9	D-	0.67
0 - 59.9	E	0.00

Since I do not curve the grading scale, all students can receive an A (or an E)! Note: this scale may be adjusted from semester-to-semester by a couple of points depending on topics covered and difficulty of exams.

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

## Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is

*Radiation Detection and Instrumentation Laboratory, ENU 4612L*

*J. E. Baciak, Fall 2021*

important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***In-Class Recording***

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### ***Online Course Recording***

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

### ***Updated COVID-19 language for Fall 2021***

- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email [covid@shcc.ufl.edu](mailto:covid@shcc.ufl.edu)) to be evaluated for testing and to receive further instructions about returning to campus.

- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the [UF Health Screen, Test & Protect website](#) for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Conduct Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, [jpennacc@ufl.edu](mailto:jpennacc@ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***Software Use***

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### ***Campus Resources:***

#### *Health and Wellness*

#### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing

staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

**Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.  
<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.  
<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.