

Standardized Syllabus for the College of Engineering

ENU4612 – Nuclear Radiation Detection and Instrumentation

1. Catalog Description

3 credits; Three one-hour lectures discussing 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.

2. Pre-requisites and Co-requisites

ENU 4605 with a minimum grade of C and EEL 3003.

3. Course Objectives

- Graduates will have successful careers in Nuclear Engineering and related disciplines.
- Graduates will pursue advanced degrees or continuing education.

4. Contribution of course to meeting the professional component

- Provide students with the ability to apply advanced mathematics, computational skills, science and engineering science, including atomic and nuclear physics, to identify, formulate, analyze, and solve nuclear and radiological engineering problems.
- Provide students with knowledge of the fundamentals of radiation transport, interactions, and detection and with the principles required for the analysis, design, and safe operation of radiation producing devices and using equipment and systems.
- Provide students with the ability to design and conduct experiments and analyze and interpret data using current experimental, data acquisition and data analysis techniques.
- Provide students with the skills needed to communicate effectively, work collaboratively, and understand their professional and ethical responsibilities and the impact of engineering solutions in a societal and economic context so they can pursue successful, productive careers in nuclear and radiological engineering.

5. Relationship of course to program outcomes:

- Outcome a: An ability to apply knowledge of mathematics, science and engineering.
- Outcome b: An ability to design and conduct experiments as well as to analyze and interpret data
- Outcome c: An ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability
- Outcome d: An ability to function effectively on multi-disciplinary skills teams
- Outcome e: An ability to identify, formulate and solve engineering problems.

- Outcome g: An ability to communicate effectively
- Outcome k: An ability to use the techniques, skills and modern engineering tools necessary for engineering practice
- Outcome l: An ability to apply advanced mathematics, science and engineering sciences, including atomic and nuclear physics, to nuclear and radiological systems and processes
- Outcome m: An ability to measure and interpret measurements of nuclear and radiological processes
- Outcome n: an ability to work professionally in on or more of the areas of: nuclear power systems, nuclear instrumentation and measurement, radiation protection and shielding and radiation sources and applications

6. Instructor

Pingchien Neo
 231 Nuclear Sciences Building
 (352) 3921401 x 315
pneo@mse.ufl.edu
 Office Hours: MWF 2-3 pm

7. Teaching Assistant

None

8. Meeting Times

MWF 10:40 am – 11:30 am (UF Period 4)

9. Class Schedule

3 one-hour sessions each week.

10. Meeting Location

CSE E122

11. Material and Supply Fees

\$20.85

12. Textbooks and Software Required

Radiation Detection and Measurement, Glenn F. Knoll, 2010 (4th edition), John Wiley & Sons, Inc., ISBN: 0470131489

13. Recommended Reading:

Measurement and Detection of Radiation, Nicholas Tsoulfanidis, 1995, (2nd Ed.), Taylor and Francis, ISBN: 1560323175

14. Course Outline (provide topics covered by week or by class period)

- Radiation Sources and Interactions (3 classes) – Knoll Chapter 1 & 2
- Counting Statistics and Error Analysis (4 classes) – Knoll Chapter 3
- General Properties of Radiation Detectors (3 classes) – Knoll Chapter 4

- Gas Detectors – Ionization Chambers, Proportional Counters, Geiger-Mueller Counters (6 classes) – Knoll Chapter 5 – 7
- Scintillation Detectors, PMT and Photodiodes (7 classes) – Knoll Chapter 8 – 10
- Semiconductor Detectors and Germanium Detectors (7 classes) – Knoll Chapter 11 – 12
- Neutron Detectors (5 classes) – Knoll Chapter 14 – 15

15. Attendance and Expectations

Attendance is not considered in the grade. However, some materials in the course will not be covered in the textbook or in the notes provided online – only in class. Students are responsible for all material covered in class. If a student arrives late or leaves early, he/she is expected to do so with minimum level of disruption to the class in progress. There is NO tolerance for mobile phones or other electronic disruptions. Such disruptions will lead to the student being told to leave the room for the duration of the class period, including during examination periods.

16. Grading

- Homework – 25%
- Exam 1 – 25%
- Exam 2 – 25%
- Final exam – 25%

17. Grading Scale

A: 92–100
 A-: 89 – 91.99
 B+: 86 – 88.99
 B: 83 – 85.99
 B-: 79 – 82.99
 C+: 76 – 78.99
 C: 73 – 75.99
 C-: 70–72.99
 D: Below 70

“A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

18. Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at:

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

19. 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 Honor Code

(<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class. Note that failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures. See <http://www.dso.ufl.edu/sccr/procedures/honorcode.php>

20. Accommodation for Students with Disabilities – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

21. UF Counseling Services –Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, <http://www.counseling.ufl.edu/cwc/Default.aspx>, counseling services and mental health services.
- Career Resource Center, Reitz Union, 392-1601, career and job search services.
- University Police Department 392-1111

22. Software Use

All faculty, staff and student 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.

23. Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.