

RADI 5024 Course Syllabus

- Course Title:** 5024 Radiation Detection and Measurement
- Instructor:** Isaac Rutel, Ph.D., DABR; irutel@ouhsc.edu,
Office: 271-5175
- Credit Hours:** 4 semester credit hours
(3 lecture hours weekly;
4-7 labs as arranged – equivalent to 1 lab hour weekly)
- Office Location:** OUMC Adult Tower (PT) LL, Rutel Office
Office Hours: Tues: 2-3PM
- Description:** The physical characteristics of principal types of detection and measurement systems used for charged particle and photon beams. Experimental laboratories involve use of the systems for standardization, calibration and energy analysis. Laboratory included.
- Frequency of Offering:** Biennially (spring semester even years)
- Times:** 10:00AM-11:30AM TR
Room: Basic Sciences Education Building (BSEB) 169
- Prerequisites:** None.
- Course Objectives:** Students are expected to learn standard principles involved with radiation measurement and detection including production of radiation, statistics, pulse shaping strategies and the technical description of many radiation detection devices. The radiation detection devices included but are not limited to, ionization chambers, proportional counters, Geiger-Mueller counters, scintillation detectors (and ancillary equipment) and semiconductor detectors.

Conduct of the Course

Students are evaluated on their performance in the homework, laboratory assignments, three closed book examinations, and a project/presentation. Due to the discussion nature of the course, participation in the class discussions is also included in the evaluation. The course falls under instruction mode 3-Web enhanced [<50%].

- Text:** *Radiation Detection and Measurement*
Glenn F. Knoll, Fourth Edition, 2010; John Wiley and Sons, Inc.
ISBN# 978-0-471-07338-3

Lectures: Prerecorded lectures on the material can be found on the OUHSC Desire2Learn web interface, found at <http://learn.ouhsc.edu>.

References: *Introductory Nuclear Physics*, Kenneth S. Krane, John Wiley and Sons, Inc., ISBN#: 0-471-80553-X;
Physics and Engineering of Radiation Detection, S. Ahmed, Elsevier, ISBN#:0-12-045581-1
Signal Processing and Linear Systems, B.P. Lathi, Berkeley Cambridge Press, ISBN#: 0-941413-35-7
Measurement and Detection of Radiation, N. Tsoulfandis and S. Landsberger, CRC Press, ISBN#:978-1-4200-9185-4
Others presented as used.

Homework: Homework will be due 1 week after the class discussion of the each chapter is completed. Homework is completed online and students have multiple attempts to electronically turn in assignments. No homework submissions will be accepted after 5:00PM on the due date. Homework can be accessed on the OUHSC Desire2Learn web interface, found at <http://learn.ouhsc.edu>.

Chapter:	Due Date:
1	2/2
2	2/9
3	2/23
4	3/1
5	3/10
6	3/22
7	3/29
8	4/7
9	4/19
10	4/26
16&17	5/3
11	5/12

Testing: Exams will be closed book but allow for an equation sheet (1 - 4"x7" card – both sides may be used). Cards will be turned in with exams. There are 3 exams requiring cumulative knowledge from the course and will be offered 1 week after completion of chapters 4, 8 and 11. Make up tests will be administered for excused absences only and should be arranged with the instructor.

COURSE OUTLINE

1. Radiation Sources	1/21
2. Radiation Sources	1/26
3. Radiation Interactions	1/28
4. Radiation Interactions	2/2
5. Radiation Interactions	2/4
6. Counting Statistics and Error Prediction	2/9
7. Counting Statistics and Error Prediction	2/11
8. Counting Statistics and Error Prediction	2/16
9. General Properties of Radiation Detectors	2/18
10. General Properties of Radiation Detectors	2/23
11. Ionization Chambers	2/25
12. First Exam	3/1
13. Ionization Chambers	3/3
14. Proportional Counters	3/8
15. Proportional Counters	3/10
16. Geiger-Mueller Counters	3/22
17. Scintillation Detection Principles	3/24
18. Scintillation Detection Principles	3/29
19. Scintillation Detection Principles	3/31
20. Photomultiplier Tubes and Photodiodes	4/5
21. Second Exam	4/7
22. Photomultiplier Tubes and Photodiodes	4/12
23. Radiation Spectroscopy with Scintillators	4/14
24. Radiation Spectroscopy with Scintillators	4/19
25. Pulse Processing and Shaping	4/21
26. Pulse Processing and Shaping	4/26
27. Semiconductor Detectors	4/28
28. Semiconductor Detectors	5/3
29. Semiconductor Detectors	5/5
30. Third Exam	5/12

More subjects may be added, time permitting. Students will be responsible for content but no additional summaries or homework will be assigned.

Evaluation:

10%	First Exam	Ch 1-4	25%	Graded Homework
10%	Second Exam	Ch 5-8	25%	Participation/Attendance
10%	Third Exam	Ch 9-11, 16	10%	Project/Presentation
10%	Lab Reports			

Participation and Attendance: While attendance is not mandatory it will greatly affect your participation grade. The course is set-up in a “flipped classroom” style, so all participants are expected to be prepared to discuss the topics during the scheduled contact hours. The participation grade will be based upon the students’ willingness to answer questions from both the instructor and the other students during the discussion. While the students don’t have to be correct in their responses, responses will be required. Preparation may include viewing of online lectures, reading the text, reading other sources, discussion with other participants, etc.

Project/Presentation: Students will be required to give an 8-10min presentation on a detector or detector system (novel or unusual) utilizing the knowledge they have gained from the course. Descriptions of the physics, limits of the detector and parameters generally associated with the system should be included. The purpose is to apply what you have learned to a detector not discussed in class. Expect questions from the other participants and be ready to offer intelligent responses.

Laboratory: Labs will be conducted in a radiographic room (to be determined) and the Nuclear Pharmacy Lab room (across from the Nuclear Pharmacy) in the College of Pharmacy. Labs are expected to be held on Tuesday or Thursday afternoons and will begin later in the semester (to coordinate with the material). Lab reports will be furnished by each student and should comply with the guidance provided in the “Lab report Guidance” document.

Required Policy Statements

- **This syllabus is intended as a guide for this course. Dates, assignments, and evaluation are subject to revision by the instructor. Any such revisions will be announced in advance.**
- **Copyright.** This syllabus and all related course material are protected under US Copyright Law and may not be further disseminated in any form or format without the prior explicit written consent of the faculty member. Failure to comply with this provision may subject the student to disciplinary action and/or state or federal action.
- **Student Professional Behavior in an Academic Program.** Ethical and professional behaviors are considered a core competency in an academic program and, thus are key factors in good academic standing. Upon acceptance of an offer of admission, the student commits to comply with all professional conduct regulations established by the University, respective college, and program. The complete University policy is at www.ouhsc.edu/provost/documents/FacultyHandbookOUHSC.pdf
- **Academic Misconduct Code.** The code describes academic misconduct as acts intended to improperly affect the evaluation of a student's academic performance or achievement and includes but is not limited to acts such as cheating, plagiarism, fabrication, fraud, destruction, bribery or intimidation, assisting others in any act proscribed by this Code, or attempting to engage in such acts. The policy and procedures related to academic misconduct are detailed in the Academic Misconduct Code found in Appendix C of the Faculty Handbook at www.ouhsc.edu/provost/documents/FacultyHandbookOUHSC.pdf.
- **Academic Appeals.** This policy outlines the procedure to request a hearing for appeals related to evaluation in a course, thesis or dissertation defense, general or comprehensive exam. It also outlines the appeal process for a suspension or dismissal or under the Student Professional Behavior in an Academic Program Policy, and the appeal of decisions resulting in dismissal, expulsion, or suspension from a program. The sole basis for an academic appeal is an alleged prejudiced or capricious evaluation or decision. Policy and procedure details are in Appendix C of the Faculty Handbook at www.ouhsc.edu/provost/documents/FacultyHandbookOUHSC.pdf.
- **Accommodation on the Basis of Disability.** The University of Oklahoma is committed to the goal of achieving equal educational opportunity and full participation for students with disabilities. Accommodations on the basis of disability are available by contacting the Disability Resource Center (DRC) by email at drc@ou.edu. or by calling (405) 325-3852 or Voice or (405) 325-4173/TDD. Information on policies and registration with the Disability Resource Center may be found on the DRC website at: www.ou.edu/drc. Students requesting accommodations related to work in a course must contact the DRC as soon as possible; accommodations are not made retroactively.
- **Sexual Misconduct.** For concerns regarding gender-based discrimination, sexual harassment, sexual misconduct, stalking, or intimate partner violence, the University offers a variety of resources, including Advocates-On-Call 24/7, counseling services, mutual "No Contact orders," scheduling adjustments, and disciplinary sanctions against the perpetrator. Please contact the Sexual Misconduct Office at (405) 325-2215 (8AM-5PM) or the Sexual Assault Response Team at (405) 605-0013 (24/7).
- **Adjustment for Pregnancy/Childbirth Related Issues.** Students needing modifications or adjustments to course requirements because of documented pregnancy-related or childbirth-related issues should contact the college's Assistant/Associate Dean for Student Affairs (or academic advisor) as soon as possible to discuss. Generally, modifications will be made where medically necessary and similar in scope to accommodations based on temporary disability. See www.ou.edu/content/eoo/pregnancyfaqs.html for commonly asked questions.
- **Course Drop/University Withdrawal.** The student is responsible to submit required University paperwork before the deadlines shown in the Academic Calendar online at <http://ouhsc.edu/admissions>. Missed homework and examination grades will be entered as a grade of zero if a student fails to formally drop the course or withdraw from the University.