Revised Syllabus 2/5/15; 2/19/2015

*** Revised Syllabus 4.6.2015 ***

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Washington State University
MAJOR CURRICULAR CHANGE FORM - - NEW/RESTORE COURSE

- **Please attach rationale for your request, a complete syllabus**, and explain how this impacts other units in Pullman and other campuses (if applicable).
- **Obtain all required signatures with dates.**
- **Provide original stapled packet of signed form/rationale statement/syllabus** PLUS **10 stapled copies of complete packet to the Registrar's Office**, campus mail code 1035.
- **Submit one electronic copy of complete packet** to wsu.curriculum@wsu.edu.

Requested **Future** Effective Date: Fall 2015 (term/year) Course Typically Offered: ~~New Course~~

DEADLINES: For fall term effective date: **October 1st**; for spring or summer term effective date: **March 1st**. See instructions.

NOTE: Items received after deadlines may be put to the back of the line or forwarded to the following year. Please submit on time.

☒ **New Course** ☐ Temporary Course ☐ **Restore Course**

ENVR_SCI	~~511~~ 520	Radiation Instrumentation
course subject/crosslist	course no.	title

3	(2	.3)	~~ENVR_SCI 406 or permission of instructor~~
Credit hrs	lecture hrs per week	lab or studio hrs per week	prerequisite

Description for catalog: Methods for analysis of radiation and radioactive materials, including use of radiation monitoring equipment and analysis of instrument data. Required preparation: ENVR SCI 406.

Additional Attributes: Check all that apply.

☐ Crosslisting (between WSU departments)* ☐ Conjoint listing (400/500): _____

☐ Variable credit: _____ ☐ Repeat credit (cum. max. hrs): _____

Special Grading: ☐ S, F; ☐ A, S, F (PEACT only); ☐ S, M, F (VET MED only); ☐ H, S, F (PHARMACY, PHARDSCI only)

☐ Cooperative with UI ☐ Other (please list request): _____

The following items require prior submission to other committees/depts. (SEE INSTRUCTIONS.)

☐ Request to meet Writing in the Major [M] requirement **(Must have All-University Writing Committee Approval.)**

☐ Request to meet UCORE in _____ **(Must have UCORE Committee Approval › › See instructions.)**

☐ Special Course Fee_____ **(Must submit request to University Receivables.)**

Contact: James R. Pratt Phone number: (509) 372-7212 Campus mail code: WSU-TC

Email: jrpratt@wsu.edu Instructor, if different: Paul Stansbury & Daniel Strom

9/30/2014	10/10/14	
Chair/date	**Dean/date**	**All-University Writing Com Date**
	10/28/14	
Chair (if crosslisted/interdisciplinary)*	**Dean (if crosslisted/interdisciplinary)***	**UCORE Committee Approval Date**
Catalog Subcommittee Approval Date	**GSC or AAC Approval Date**	**Faculty Senate Approval Date**

***If the proposed change impacts or involves collaboration with other units, use the additional signature lines provided for each impacted unit and college.**

✓

ENVR SCI 520
Radiation Instrumentation.
3 Credits (2 lecture, 1 lab)
Lecture m, W, 1615 to 1705
Lab TBD (1 block of 2 h 50 min)

This course is one of the electives in a new graduate certificate program in radiation protection.

Instructor information. Paul S. Stansbury, Ph.D., CHP 509 545-5055

Office hours. By appointment.

Course information. Methods for analysis of radiation and radioactive materials, including use of radiation monitoring equipment and analysis of instrument data.

Students should regularly check the course web site in Angel at http://lms.wsu.edu for course announcements, assignments, handouts, and other relevant course information.

Required textbooks.

1) Knoll, Glenn F. *Radiation Detection and Measurement.* New York: John Wiley & Sons; 4th ed.; 2010.

2) Baum EM, HD Knox, and TR Miller. 2010. Nuclides and Isotopes. 17th ed. (16^{th} ed. Is not adequate), www.amazon.com Textbook 100-page 9" × 12" bound textbook, $40.00 ea.

Other course material will come from other textbooks, journal articles, and online technical guidance documents. Much course materials will be posted on the course's learning management system site.

Prerequisites. None

Recommended Preparation. ENVR_SCI-406 or permission of instructor.

Course objectives. The objective is to give the student a quantitative, hands-on-knowledge of instruments and instrument systems used to detect radiation or quantify radiological parameters. After completing the course, he student will be able to

- analyze situations in which radiation or radioactive material is interact with radiological instruments, including using critical thinking to solve radiological physics questions that have not been encountered previously
- solve quantitative radiological physics problems encountered when instruments are used in the laboratory or field to quantify radiological parameters
- develop a working-knowledge of the considerable databases of radiological data, which are useful in understanding the results of radiological measurements
- keep laboratory data acquired and its analysis in notebook in the style of a good researcher.

Laboratory. Participation in the laboratory activities is an essential component in this course. Any missed lab exercises must be made up. There will be no penalty for lab exercises submitted before the

end of the course. However, a student failing to submit a lab exercise will result in a grade of incomplete. Each session of the laboratory exercises will have a prescribed set of measurements to be made or information to be assembled. The student will keep a bound, laboratory notebook with the results of his or her measurements therein along with the analysis of the data. A specified time (say 48 or 72 hours) after the completion of a laboratory exercise, the student will submit his or her lab notebook to the instructor for grading and evaluation. The instructor will return each students lab notebook at the start of the next laboratory session. The last laboratory session will be one or more demonstrations, and no notebook grading will be required.

Grading. Grades will be based on examinations with the point values shown below. No particular grading scale is assumed. Class participation is important to your understanding as well as the learning of other students. The approximate final grading scale is shown.

14 lab exercises (15 pts each)	210 pts	Final grades	A: 360-400
Midterm exam	40 pts		B: 320-359
Final exam	150 pts		C: 280
TOTAL	400 pts		D: 240-279
			F: <240

Midterm grades. In this course, midterm grades provide an indication of your progress and will be given using the full range of letter grades (A-F) based on performance on the midterm exam and on the points earned for lab notebook submissions to date. Students receiving a grade of C, D, or F at midterm should meet with the instructor. Midterm grades are advisory and will not appear on your transcript.

Attendance policy. Absences should be avoided. Students should contact an instructor if an absence from class is unavoidable. Students are encouraged to read Section 73 (Absences) of the Washington State University Academic Regulations, which is found in the WSU Tri·Cities Student Handbook. Attendance at laboratory sessions is crucial. If a laboratory session is missed by a student for what the instructor considers a reasonable excuse, the instructor will attempt to provide the truant student a make-up laboratory session.

Accommodations for Disabled Students. Reasonable accommodations are available for students who have a documented disability. If you have a documented disability, even temporary, make an appointment as soon as possible with the Disability Services Coordinator, Cherish Tijerina, 372-7352, ctijerina@tricity.wsu.edu. You will need to provide your instructor with the appropriate classroom accommodation form. The forms should be completed and submitted during the first week of class. Late notification may delay your accommodations. All accommodations for disabilities must be approved through Disability Services. Classroom accommodation forms are available through the Disability Services Office.

Academic Integrity. I encourage you to work with classmates on assignments. However, each student must turn in original work. No copying will be accepted. At a minimum, penalties will include failure (0 points) on a given assignment. Students who violate WSU's Standards of Conduct for Students will receive an F as a final grade in this course, will not have the option to withdraw from the course and will be reported to the Office Student Standards and Accountability. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). It is strongly suggested that you read and understand these definitions. Any academic integrity violation will be reported to the Office of Students Conduct and

carries the possibility of additional university sanctions. Further details are available at http://www.tricity.wsu.edu/studentconduct/academic.html .

Safety. Should there be a need to evacuate the building (e.g., fire alarm or some other critical event), students should meet the instructor at blue pole emergency maker in the parking lot outside of the West building. In order to receive notification regarding campus emergencies (including campus closures), all faculty, staff, and students register their emergency contact information for the Crisis Communication System (CCS) through Zzusis at http://zzusis.wsu.edu. Click "Update Now!" under "Tri-Cities Emergency Info" to register for notification by text message, e-mail, telephone, or any combination of the three. Providing multiple contact methods will help ensure you receive notifications in a timely manner, and your information will NOT be used for any other purpose. Messages regarding campus emergencies will also be distributed through local media. Please also review the Campus Safety Plan, which contains a listing of emergency contacts, and university policies, procedures, statistics, and information relating to campus safety and the health and welfare of the campus community. The Campus Safety Plan can be found at http://www.tricity.wsu.edu/safetyplan/."

Student Learning Outcomes and Evaluation

Student Learning Outcomes At the end of this course, students should be able to:	Course Topics/Dates The following topic(s)/dates(s) will address this outcome:	Evaluation of Outcome: This outcome will be evaluated primarily by:
analyze situations in which radiation or radioactive material is interact with radiological instruments, including using critical thinking to solve radiological physics questions that have not been encountered previously	All laboratory activities focus on this objective.	Written responses in lab reports (assessed for labs 1 thru 14, week 15 will not be graded.) Select questions on mid-term and final exams. Note: lab numbers and week numbers in the table on the following page are interchangeable.
solve quantitative radiological physics problems encountered when instruments are used in the laboratory or field to quantify radiological parameters	Attenuation and efficiency of radiological measurements, Labs 5, 13	Quantitative analysis reports from labs 5, 13
develop a working-knowledge of the considerable databases of radiological data, which are useful in understanding the results of radiological measurements	Review of radiological quantities and units.	Select questions on mid-term and final exams.
keep laboratory data acquired and its analysis in notebook in the style of a good researcher.	All laboratories	Included in assessment of all laboratory assignments.

Course organization. The lecture subjects and the lab activities for the course are given in the table below.

Week	Lecture Subjects	Lab Activities
1	Course Introduction; Review of Interactions of Radiation with Matter; Review of Radiological Quantities and Units	Internet Sources for Radiological Data and Information. Advance Excel™ Computational Techniques
2	Ion Chamber	Ion Chamber Operating Characteristics
3	Attenuation and Efficiency and Other Factors That Affect Radiological Measurements	Demonstrating 1/d^2; Measuring Attenuation
4	Geiger-Mueller Counter	GM Usage including plateau and saturation
5	Statistic of Radiological Counting; Chi-Squared Test	Performing chi-squared and other tests
6	Proportional Counter and Applications of Gas-Filled Detectors	Using a proportional counter
7	Thermoluminescent and Optically-Stimulated Luminescent Dosimeters	Measurements with TLD crystals
8	NaI Spectrometry	Single and multichannel analysis
9	High Resolution Gamma Ray Spectrometry	Using HPGe detector and interpreting typical environmental measurements
10	Gamma Ray Spectrometry Continued	More gamma spectrometry measurements
11	Liquid Scintillation	Preparing samples and using an LSC
12	Alpha and Beta Spectrometry	Using solid state detectors
13	Neutron Detectors	Analysis of neutron detection data acquired by others
14	Microwaves and Lasers, Including the Differences between Ionizing and Non-ionizing Radiation	Microwave interferometer and "measuring the wavelength of light with a ruler"
15	Old Technology and New Technology for Radiation Measurements	Cloud chamber demonstration