Las Positas College
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Course Outline for RADS 40A

RADIATION SAFETY

Effective: Fall 2018

I. CATALOG DESCRIPTION:
RADS 40A — RADIATION SAFETY — 2.00 units

A course designed to provide basic radiation safety instruction. Includes identification of the sources of radiation and radioactive materials, the nature of ionization radiation, biological effects, and risk assessment.

2.00 Units Lecture

Strongly Recommended
MATH 110 - Elementary Algebra
with a minimum grade of C
or

MATH 110B - Elementary Algebra B
with a minimum grade of C

Grading Methods:
Letter or P/NP

Discipline:
- Industrial Safety

	MIN
Lecture Hours:	36.00
Expected Outside of Class Hours:	72.00
Total Hours:	108.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering this course, it is strongly recommended that the student should be able to:

A. MATH110
1. Perform arithmetic operations on real numbers and polynomial expressions;
2. Simplify and evaluate algebraic expressions;
3. Solve linear equations in one variable;
4. Apply concepts of slopes and rates of change;
5. Apply the rules for integer exponents;
6. Write numbers and perform computations using scientific notation;

B. MATH110B

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Identify the basic principles of atomic energy, radioactivity, and decay
B. Assess hazards associated with the use of ionizing radiation
C. Determine biological effects and risks from radiation exposure
D. Estimate dose and risks to individuals and populations
E. Define monitoring for the workplace
F. Identify sources of radiation, including artificial and natural sources

V. CONTENT:
A. Radiation Safety
1. In depth review
a. Sources of radiation and radioactive materials
b. Nature of ionization radiation
2. Radiation fundamentals
a. Atomic structure and definitions

b. Types of radiation and origin
c. Radioactive decay
3. Radiation interactions
a. Nuclear interactions
b. Effects of shielding
4. Radiation units and dose
5. Biological effects
6. Risks and dose assessments
a. Radiation dose
b. Population/collective dose
c. Probability of health effects
d. Balance with benefits
7. Industrial sources and natural sources
a. Fission, fusion, accelerators
b. Medical and industrial sources
c. Cosmic, terrestrial, natural sources of radiation

VI. METHODS OF INSTRUCTION:
A. **Guest Lecturers** - guest speakers from industry
B. **Field Trips** -
C. **Written exercises and case studies** -
D. **Lecture** -
E. **Demonstration** -
F. **Discussion** - Group discussions
G. **Audio-visual Activity** - Video and overhead presentation
H. **Student Presentations** -

VII. TYPICAL ASSIGNMENTS:
A. Problem solving
1. Using a decay equation, solve the following problem:
a. If a sample has 1000 atoms of Tritium (H-3) on 9/17/2017, how many H-3 atoms will there be on 9/17/2021? The half-life of H-3 is 12.3 years.
2. What is the primary type of interaction of a 0.2 MeV photon in Lead?
a. How about a 2 MeV photon?
b. How about 9 MeV photons?
3. If 250,000 people are exposed to 5 rem of radiation;
a. How many person-rem would that be?
b. If there are 8 excess cancer fatalities for every 10,000 person-rem, how many cancers above the natural occurrence would you expect?
c. Assuming a 20% natural cancer mortality, how many natural cancer deaths?

VIII. EVALUATION:
A. **Methods**

1. Exams/Tests
2. Quizzes
3. Papers
4. Field Trips
5. Class Participation
6. Home Work

B. **Frequency**

1. Three exams
2. Weekly quizzes
3. One 2-4 page paper
4. One field trip
5. Daily class participation
6. Weekly homework

IX. TYPICAL TEXTS:
1. Johnson, Thomas. *Introduction to Health Physics.* 5th ed., McGraw-Hill Education/Medical, 2017.
2. Domenech, Haydee. *Radiation Safety: Management and Programs.* 1st ed., Springer International Publishing, 2016.

X. OTHER MATERIALS REQUIRED OF STUDENTS: