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Course Outline for RADS 40A

RADIATION SAFETY

Effective: Fall

I. CATALOG DESCRIPTION:

RADS 40A — RADIATION SAFETY — 2.00 units

A modularized 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, risk assessment, protection strategies, environmental impacts, and waste handling.

2.00 Units Lecture

Strongly Recommended

MATH 110 - Elementary Algebra

MATH 71 - Applied Math for Technicians
or

-

Grading Methods:

Discipline:

	MIN
Lecture Hours:	36.00
Total Hours:	36.00

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
- B. MATH71

IV. MEASURABLE OBJECTIVES:

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

- A. describe and identify the basic principles of atomic energy and radioactivity, including:
 - 1. hazards associated with the use of ionizing radiation;
 - 2. biological effects from radiation exposure;
 - 3. measurement techniques for radioactive material and ionizing radiation;
 - 4. methods for control of ionizing radiation;
 - 5. methods for monitoring the workplace and environment;
 - 6. personnel monitoring techniques
- B. identify sources of radiation and relative risk to people.

V. CONTENT:

- A. Radiation Safety 40A:
 - 1. Perspective overview
 - 2. Radiation fundamentals
 - a. atomic structure and definitions
 - b. types of radiation and origin
 - c. radioactive decay
 - 3. Radiation interactions
 - a. using reference material
 - b. interactions
 - 4. Radiation units and dose
 - a. units of measure
 - b. dose
 - 5. Biological effects
 - 6. Risks and the environment
 - a. radiation risks

- b. balance with benefits
- c. environmental radioactivity
- 7. Industrial sources and personnel monitoring
 - a. fission, fusion, accelerators
 - b. medical and industrial sources
 - c. personnel (internal and external)
 - d. workplace (air, radiation fields, etc.)

VI. METHODS OF INSTRUCTION:

- A. **Lecture** -
- B. **Demonstration** -
- C. **Discussion** - Group discussions
- D. Role playing, peer interaction and group reports
- E. Practical exercises, e.g., using equipment and personal protection equipment
- F. **Audio-visual Activity** - Video and overhead presentation
- G. **Guest Lecturers** - Guest presenters from industry and/or field trips
- H. Students, working in groups, solve problems by collecting and interpreting data
- I. **Written exercises and case studies** - Term paper 4-6 pages; required for Radiation Safety 40A

VII. TYPICAL ASSIGNMENTS:

- A. Reading: Read Gollnick, Part of Chapter 4 (pages 100-111); handout; Smithsonian: RISK I B. Problem solving, writing and critical thinking: 1. Gollnick: (page 111); solve problems #19 and 21 and solve the following: Describe some of the limits/difficulties associated with radiation risk estimates. 2. For emergency response actions that involve exposures to very high doses of radiation, why are "older" people chosen versus teenagers or "twenty-somethings"?

VIII. EVALUATION:

A. **Methods**

- 1. Exams/Tests
- 2. Class Participation
- 3. Home Work
- 4. Other:
 - a. Methods and Frequency:
 - 1. Weekly assignments
 - 2. Class participation
 - 3. Examinations
 - b. Typical examination questions:
 - 1. Radiation Safety 40A:
 - a. Circle correct description:
 - 1. Gammas interact (continuously or erratically) with material along their travel path.
 - 2. Charged particles interact (continuously or erratically) with material along their travel path.
 - b. How well a material stops charged particles is dependent upon (circle correct answer):
 - 1. charge of the particle
 - 2. energy of the particle
 - 3. atomic # (Z) of the material
 - 4. all of the above
 - 5. none of the above

B. **Frequency**

IX. TYPICAL TEXTS:

- 1. Gollnick, Daniel *Basic Radiation Protection Technology*. latest ed., Pacific Radiation Press, 0.
- 2. - *Nuclides and Isotopes: Chart of Nuclides*. Latest ed., GE Nuclear Energy, 0.

X. OTHER MATERIALS REQUIRED OF STUDENTS: