COURSE SYLLABUS
RW 113-01

1. General Course Information
   a. Course Title: Introduction to Radiological Control and Waste Handling
   b. Course Number: RW 113-01
   c. Semester/year: Fall/2003
   d. Credit Hours: 3 Hours
   e. Instructor: Olav Amundsen
   f. Office Phone: 505 392 5335 ext 265
   g. Office Hours: posted on Office Door, HH228
   h. Prerequisite: None

2. Course Description
   In this course students will be introduced to Radiological Control and Waste Handling. This course covers the fundamentals that are required by many employers in the Nuclear Industry for employment. It includes basic mathematics, physics, biology, chemistry and sources of radiation.

3. Course Rationale/Transferability
   This course is an undergraduate level course designed to introduce the student to radiological control technology. This course has no guarantee of transferability to other New Mexico Schools or out-of-state institutions. Students are advised to check with the receiving institutions if they intend to transfer to another institution.

4. Required/Suggested Course Materials

   Other material listed with each module under section 7- Specific Course Objectives/Competencies within this document.

5. Grading Policy
   Each student is evaluated by homework assignment/pop quizzes, written examinations, reports and projects. Final grades will be determined by averaging three graded areas based on the following scale. A grade of 80 % or better is necessary for certification.
Written Examinations: 70% of overall grade
Homework / Pop Quizzes: 20% of overall grade
Final Exam: 10% of overall grade

Upon completion of the afore mentioned averaging grades will be administered as follows:

A= 90-100
B= 80-89
C= 70-79
D= 60-69
F= 59-0

6. **General Course Objectives/Competencies**

This course is an undergraduate level course designed to introduce the student to the field of Radiological Control and Waste Handling. It covers the initial training requirements for DOE regulated sites. The course is focused on preparing the students for further development through additional training to become Radiological Control Technicians. The course is divided into six very basic modules; (1) basic mathematics and algebra, (2) unit analysis & conversion, (3) basic physical sciences, (4) basic nuclear physics and (5) sources of radiation. At the end of the course (6) basic computer skills necessary for the industry is also covered, focusing on the ability to understand and convey the information you gather as a technician, thus sharing information in a more effective way.

7. **Specific Course Objectives/Competencies**

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<thead>
<tr>
<th>Course Title:</th>
<th>Introduction to Radiological Control and Waste Handling</th>
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<tbody>
<tr>
<td>Module Title:</td>
<td>Basic Mathematics and Algebra</td>
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<tr>
<td>Module Number:</td>
<td>1.01</td>
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<tr>
<td>Objectives:</td>
<td>1.01.01 Add, subtract, multiply, and divide fractions.</td>
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<td>1.01.02 Add, subtract, multiply, and divide decimals.</td>
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<td>1.01.03 Convert fractions to decimals and decimals to fractions.</td>
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<td>1.01.04 Convert percent to decimal and decimal to percent.</td>
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<td>1.01.05 Add, subtract, multiply, and divide signed numbers.</td>
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<td>1.01.06 Add, subtract, multiply, and divide numbers with exponents.</td>
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<td>1.01.07 Find the square roots of numbers.</td>
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<td>1.01.08 Convert between numbers expressed in standard form and in scientific notation.</td>
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<td>1.01.09 Add, subtract, multiply, and divide numbers expressed in scientific notation.</td>
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<td>1.01.10 Solve equations using the &quot;Order of Mathematical Operations.&quot;</td>
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<td>1.01.11 Perform algebraic functions.</td>
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<td>1.01.12 Solve equations using common and/or natural logarithms.</td>
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References:

Instructional Aids:

1. Overheads, Videos, Self paced Internet Modules
2. Overhead projector/screen
3. Chalkboard/whiteboard
4. Lessons learned

Course Title: Introduction to Radiological Control and Waste Handling
Module Title: Unit Analysis & Conversion
Module Number: 1.02

Objectives:

1.02.01 Identify the commonly used unit systems of measurement and the base units for mass, length, and time in each system.

1.02.02 Identify the values and abbreviations for SI prefixes.

1.02.03 Given a measurement and the appropriate conversion factor(s) or conversion factor table, convert the measurement to the specified units.

1.02.04 Using the formula provided, convert a given temperature measurement to specified units.

References:


Instructional Aids:
1. Overheads
2. Overhead projector/screen
3. Chalkboard/whiteboard
4. Lessons Learned

Course Title: Introduction to Radiological Control and Waste Handling
Module Title: Physical Sciences
Module Number: 1.03

Objectives:

1.03.01 Define the following terms as they relate to physics:
   a. Work
   b. Force
   c. Energy

1.03.02 Describe four forms of energy.

1.03.03 State the Law of Conservation of Energy.

1.03.04 Distinguish between a solid, a liquid, and a gas in terms of shape and volume.

1.03.05 Identify the basic structure of the atom, including the characteristics of subatomic particles.

1.03.06 Define the following terms:
   a. Atomic number
   b. Mass number
   c. Atomic mass
   d. Atomic weight

1.03.07 Identify what each symbol represents in the $\text{AX}$ notation.

1.03.08 State the mode of arrangement of the elements in the Periodic Table.

1.03.09 Identify periods and groups in the Periodic Table in terms of their layout.

1.03.10 Define the terms as they relate to atomic structure:
   a. Valence shell
   b. Valence electron

References:

Instructional Aids:

1. Overheads
2. Overhead projector/screen
3. Chalkboard/whiteboard
4. Chart of the Nuclides
5. Periodic Table of the Elements
6. Lessons Learned

Course Title: Introduction to Radiological Control and Waste Handling
Module Title: Nuclear Physics
Module Number: 1.04

Objectives:

1.04.01 Define the following terms:
   a. Nucleon
   b. Nuclide
   c. Isotope

1.04.02 List the basic principles of the mass-energy equivalence concept.

1.04.03 Identify the definitions of the following terms:
   a. Mass defect
   b. Binding energy
   c. Binding energy per nucleon

1.04.04 Definitions of the following terms:
   a. Fission
   b. Criticality
   c. Fusion

References:

1. "Nuclear Chemistry"; Harvey, B. G.
3. "Introduction to Atomic and Nuclear Physics"; Oldenburg, O. and Holladay, W. G.
Instructional Aids:

1. Overheads
2. Overhead projector and screen
3. Chalkboard/whiteboard
4. Lessons Learned

Course Title: Introduction to Radiological Control and Waste Handling
Module Title: Sources of Radiation
Module Number: 1.05

Objectives:

1.05.01 Describe and understand the following four sources of natural background radiation including the origin, radionuclides, variables, and contribution to exposure.
   a. Terrestrial
   b. Cosmic
   c. Internal Emitters
   d. Radon

1.05.02 Identify the following four sources of artificially produced radiation and the magnitude of dose received from each.
   a. Nuclear Fallout
   b. Medical Exposures
   c. Consumer Products
   d. Nuclear Facilities

References:

3. NCRP Report No. 45 "Natural Background Radiation in the United States".
4. NCRP Report No. 56 "Radiation Exposure from Consumer Product Miscellaneous Sources".
5. NCRP Report No. 93 "Ionizing Radiation Exposure of the Population of the United States".

Instructional Aids:
1. Overheads
2. Overhead projector/screen
3. Chalkboard/whiteboard
4. Lessons Learned

Course Title:   Introduction to Radiological Control and Waste Handling
Module Title:   Basic Computer Skills
Module Number:  1.06

Objectives:

1.06.01 Describe the components of a personal Computer including the:
   a. Memory Chip
   b. Processor
   c. Hard Drive
   d. Setup of a computer

1.06.02 Identify the following four major software components used in an office environment:
   a. Word Processing
   b. Spreadsheets
   c. Databases
   d. email

References:


Instructional Aids:

1. Overheads
2. Overhead projector/screen
3. Chalkboard/whiteboard
4. Lessons Learned

8. General/Miscellaneous

See attached General Information Sheet / Institutional Page

9. Critical Incident and Evacuation Plan with Evacuation Route Map

See attached New Mexico Junior College Emergency/Critical Incident Information sheet and campus map.

10. Course Outline
a. **Class Dates**
Monday, Tuesday Wednesday 13th of January through February 14th with optional additional sections upon need. Course consists of a total of 45 lecture hours with start at 18:00 to 21:00. Times are subject to change due to unexpected needs.

b. **Instructional Aids:**
1. Overheads, Internet, Videos
2. Overhead projector/screen
3. Chalkboard/whiteboard
4. Computer Lab

c. **Examinations**
In addition to the final exam, a minimum of one exam for each module will be administered during the semester. The test date and specific course material covered by the exam will be announced during class by the instructor at the start of each module. Examinations must be taken at the scheduled time. If a student is aware that she/he will not be able to take the exam at the scheduled time, then prior to the exam date he/she must reschedule a special examination with the professor. Any other absences from examination will be retaken only if the professor decides it was a valid excuse, otherwise, a grade of “0” will be recorded.

d. **Late Papers, Homework or Projects**
Five points per day will be deducted from the grade for late work. Possible field trips associated with class projects will be announced and scheduled as early as practical.

e. **Tardiness**
Students are expected to be seated at the time each lecture is scheduled to begin.

f. **Withdrawal**
You may officially withdraw from this class on or before the end of the class with a grade of “W”. Last date of withdrawal will be posted by instructor at the beginning of the class.

g. **Audits**
No student may “audit” the class after having signed up for credit. In other words, you may not change from credit status to audit status once the course has commenced.

h. **Attendance**
Students are not required to attend lectures for the first five modules.