

Syllabus

“Radioactivity and its implications for environment and society”

Fall Semester 2016

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Prerequisites:

High school physics
High school algebra

Class Content:

The course “Radioactivity and its implications for environment and society” will provide a broad overview about one of the most divisive scientific topics in our society. Both the scientific and societal aspects of radioactivity will be considered. The course provides an understanding of the physical principles for cause and effects of radioactive decay and radiation. It will also provide a basis for the student to evaluate the cost benefit in the growing use of radioactivity as a tool in industry and technology.

Course Outline:

To cover the broad range of material the course will be offered in four topical sections that address the science and scientific effects of radioactivity, as well as the environmental consequences and the societal impact of its growing number of applications:

1. The phenomenon of radioactivity
2. The origin of radioactivity
3. The environmental impact of radioactivity
4. Societal impact of radioactivity

Within these four topical sections a number of different aspects of the phenomenon of radioactivity will be presented and discussed

1. The phenomenon of radioactivity
 - 1.1. The discovery of radioactivity
 - 1.2. The nature and detection of radioactivity
 - 1.3. The physics of radioactive decay
 - 1.4. Natural and induced radioactivity
 - 1.5. Dosimetry and exposure limits
 - 1.6. The biological impact of radioactivity
2. The origin of radioactivity

- 2.1. The origin of the elements
 - 2.2. The radioactive universe
 - 2.3. The radioactive earth
 - 2.4. Geological implications and consequences
 - 2.5. The human radioactivity cycle
 - 2.6. The origin and evolution of life
3. The environmental impact of radioactivity
 - 3.1. Atmospheric Radioactivity
 - 3.2. Radioactivity in agriculture
 - 3.3. Radioactivity in building materials
 - 3.4. Radioactivity and natural resources
 - 3.5. Radioactivity and renewable energy
 - 3.6. Radioactivity and nuclear energy
4. Societal impact of radioactivity
 - 4.1. Radioactivity in the industrial production process
 - 4.2. Radioactivity in the art market
 - 4.3. Radioactivity and medical applications
 - 4.4. Radioactivity and homeland security
 - 4.5. Radioactivity in war
 - 4.6. Radioactivity and fear

The class will be offered twice a week so that each of these topics can be discussed in one 90 minute class session. The grade will be determined by participation in discussion, by quizzes on the class material, by homework results and by the results of the mid-term and final exam (essay). Prerequisites are high-school physics and high-school algebra. To allow room and time for discussion the number of participants is limited to 24 students.

There is no textbook available at this level. Lecture notes will be prepared and will be posted for each class topic. A list of supplementary reading material will be provided

Class Grades:

Weekly quizzes 10%; Homework 20%; Midterm Exam 30%; final exam or essay 20%; participation 20%

Honor Code:

“This class follows the binding Code of Honor at Notre Dame. The graded work you do in this class must be your own. In the case where you collaborate with other students make sure to fairly attribute their contribution to your project.”