Course Unit Descriptor

Study Programme: Physics

Course Unit Title: Radioactivity in the Environment

Course Unit Code: FD18RZS

Name of Lecturer(s): Sofija Forkapić, PhD, Research Associate

Type and Level of Studies: PhD Degree

Course Status (compulsory/elective): Elective

Semester (winter/summer): Summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 15

Prerequisites: Fundamentals of Nuclear Physics, Nuclear Physics

Course Aims:

Training students for research in the field of radioecology, to inform them with the latest achievements in the field of radiation protection and learn about modern methods for experimental investigations of radioactivity in the environment.

Learning Outcomes:

- General Skills:

Application of nuclear physics knowledge in the field of radioecology, application of legal regulations in the field of radiation protection, the use of scientific literature for research.

- Specific Competencies:

Knowledge of modern methods of testing the low activity from natural sources of ionizing radiation, the ability of conducting the radioactivity monitoring of the environment and analyzing the obtained results, the use of software packages ERICA and CROM6 for dose modeling of the environment.

Syllabus:

The origin of the elements. The origin of radioactive nuclei. Transformations in the radioactive decay chains. Radioactive equilibrium. The natural radioactive elements. Cosmogenic radioisotopes. Anthropogenic radioisotopes. Radioactive dating. Radioisotopes in the living environment. Regional and local variations. Migration of radionuclides in nature. Radioisotopes in the lithosphere, hydrosphere, atmosphere. Chemical and biological effects of radiation. Radioisotopes in ecosystems. Contamination. Spatial and temporal development. Transmission of radioisotopes through the food chains. NORM and TENORM problems. Radon and radiation risk from radon and radon short-lived daughters inhalation. Radon equilibrium. Radon potential.

Measurement of radioactivity in the samples from the environment. Low-level counting and spectrometric techniques. The origin and reduction of background. Nuclear detectors for measurement of radioactivity in the environment. In-situ measurements. Radioactivity monitoring of the environment. Sampling and preparation of environmental samples. Acquisition, analysis and presentation of results. Practical exercises of dose estimation in software packages ERICA and CROM6.

Required Reading:

1. V. Valkovic: Radioactivity in the Environment, Elsevier, Amsterdam, 2000.

2. Man-Made and Natural Radioactivity in Environmental Pollution and Radiochronology, Edited by Richard Tykva and Dieter Berg, ISBN 1-4020-1860-6, Kluwer Academic Publishers, 2004.

3. Handbok of Radioactivity Analysis, second Edition, Edited by Michael F.L'Annunziata ISBN 0-12-436603-1, 2003, Academic Press.

4. United Nations Scientific Committee on the Effects of Atomic Radiation, Ionizing Radiation: Sources and Effects, UNSCEAR 2008 REPORT, VOLUME II, United Nations, New York (2008).

5. IAEA Safety Reports Series 19 - Generic Models for Use in Assessing the Impact of Discharges of Radioactive Substances to the Environment, International Atomic Energy Agency, Vienna, 2001

6. Regional Training Course on Public and Environmental Exposure Models and Related Radiation Monitoring, IAEA Technical Cooperation Project RER/9/117, Tirana 29 October – 2 November 2012, предавања ERICA и CROM6

Weekly Contact Hours:	**Lectures:** 4	**Practical work:** 6

Teaching Methods:

Lectures, seminars and practical work.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation	-	written exam	-
Practical work	-	oral exam	70
Preliminary exam(s)	-	…….	
Seminar(s)	30		

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.