COURSE DESCRIPTION CARD - SYLLABUS

Course name
Physical basis of radiological protection [S2EJ1>FPOR]

Course

Field of study
Nuclear Power Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
30

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

1. Knowledge: Knowledge of physics and chemistry at the level of the primary school leaving exam and the chemistry lecture cycle general and physical chemistry as well as knowledge of issues related to the basics of nuclear physics. Knowledge of the structure of the atom, the atomic nucleus, the basics of mathematical statistics. 2. Skills: Solving algebraic equations and systems of equations, formulating chemical problems, physicochemical and environmental in the language of mathematics, solving simple equations differential and logarithmic. The student has the ability to independently perform laboratory experiments in the field physical chemistry and physics. Is able to formulate conclusions logically resulting from the obtained results experimental. 3. Social competences: The student is aware of the limitations of his or her own knowledge and understands the need to further deepen it. He understands that preparing for laboratory classes is his homework. He is aware that it is a subject and not an object of education.

Course objective

Familiarizing students with the basics of issues related to ionizing radiation, radiometry, elements of radiological protection and atomic law. Familiarization with basic dosimetric devices and their operation. Presentation of problems related to risk assessment of working with radioactive substances. Developing students' ability to characterize and describe radiological hazards. To familiarize students with the directions of development of methods for measuring various types of radiation ionizing. Preparing students to implement projects related to radiological protection. Developing the ability to develop and present threats related to the use of sources ionizing radiation and dose calculation.

Course-related learning outcomes

none

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
1-part written final exam, duration 90 minutes, exam includes checking
skills (2 tasks), knowledge test (3 questions); additionally, continuous assessment for each
classes (activities);
Auditorium exercises:
1-3 colloquia during classes per semester
final test (up to 1.5 hours) during the last class
rewarding activity
Laboratory exercises:
Final grade from the laboratory based on many knowledge tests and a colloquium on tasks.

Programme content

The module program covers the following topics:
Basics of ionizing radiation production and its detection. Radiological quantities and units used in a given field. Physical properties and control parameters of radiological devices used in a given field. The impact of ionizing radiation on humans. Dose
effective and equivalent and radiation risk. General assumptions of radiological protection. Field-specific aspects of radiological protection. Doses obtained as a result of using the appropriate ones
for a given field. Principles of optimization. Quality assurance program. National and European legislation, international recommendations.
Basic occupational health and safety regulations and the basics of work in a radioisotope laboratory. Statistical analysis of radiometric measurement results. Measurement methods: meter characteristics Geiger-Muller; determination of the half-life of long-lived radioisotopes on the example of potassium K 40; determination of scintillation counter characteristics; determining the semi-absorbent layer for
various materials, for gamma radiation; spectrometric measurements - spectra measurements.
calculations of the activity of radioactive sources, gamma radiation doses from point sources (shields), working time with gamma radiation sources, calculation of the thickness of gamma radiation shields, calculation of the thickness of beta radiation shields, work with
radiometers - calibration of several (selected) radiometers, practical use of radiometers.

Course topics

The lecture program covers the following topics:
Basics of ionizing radiation production and its detection. Radiological quantities and units used in a given field. Physical properties and control parameters of radiological devices used in a given field. The impact of ionizing radiation on humans. Dose
effective and equivalent and radiation risk. General assumptions of radiological protection. Field-specific aspects of radiological protection. Doses obtained as a result of application appropriate for a given field. Principles of optimization. Quality assurance program. National and European legislation, international recommendations
The laboratory program covers the following topics:
Basic occupational health and safety regulations and the basics of work in a radioisotope laboratory. Statistical analysis of radiometric measurement results. Measurement methods: meter characteristics

Geiger-Muller; determination of the half-life of long-lived radioisotopes using the example of potassium K 40; determination of scintillation counter characteristics; determining the semi-absorbent layer for various materials, for gamma radiation; spectrometric measurements - spectra measurements.
The exercise program covers the following topics:
Calculating tasks regarding: activity of radioactive sources, gamma radiation doses from point sources (shields), working time with gamma radiation sources, thickness calculation
shields against gamma radiation, calculating the thickness of shields against beta radiation, working with radiometers - calibration of several (selected) radiometers, practical use of radiometers.

Teaching methods

Lecture conducted remotely using synchronous access methods.
Teaching methods: informative lecture, lecture with multimedia presentation, problem-based lecture; laboratories, exercise method, computational method, problem method, case study, measurement, observation,
experiment, calculation exercises.
Work in measurement teams.

Bibliography

Basic literature:
1. W.Gorączko, Ochrona radiologiczna, Politechnika Poznańska, Poznań, 2011
2. W.Gorączko, Elementy chemii jądrowej, Politechnika Poznańska, Poznań 2012
3. W.Gorączko, Radiochemia i ochrona radiologiczna, Politechnika Poznańska, Poznań, 2003
4. W..Szymański, Chemia jądrowa, PWN, Warszawa, 1999
5. J.Sobkowiak, Chemia jądrowa, PWN, Warszawa, 1990
6. S.Magas, Technika izotopowa, Politechnika Poznańska, Poznań, 1994
7. B.Dziunikowski, Zastosowanie izotopów promieniotwórczych, AGH, Kraków, 1995

Additional literature:
1. Prawo atomowe, Ustawa z dnia 29 listopada 2000 r.,(Dz.U. Nr. 3, poz. 18) z 2001 r. z uwzględnieniem tekstu jednolitego z 14 lutego 2007 r. (Dz. U. Nr 42, poz. 276) z późniejszymi zmianami.
2. A.Hrynkiewicz, Człowiek i promieniowanie jonizujące, PWN, Warszawa, 2001
3. W.Szymański, Elementy nauki o promieniowaniu jądrowym dla kierunków ochrony środowiska, UMK, Toruń, 1999
4. A.Niesmiejanow, Radiochemia, PWN, Warszawa, 1995
5. A.Vertes, I.Kiss, Nuclear chemistry, Akademia Kiado, Budapest, 1987
6. J.Kroh, Chemia radiacyjna, PWN, Warszawa, 1995 7. Principles of radiochemistry, H.Kay, Butterworths, London, 1985

Breakdown of average student's workload

	Hours	ECTS
Total workload		
Classes requiring direct contact with the teacher		
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)		