

DOCTORAL STUDIES COURSE UNIT DESCRIPTION

Name of subject	Scientific Field	Center	Department
Subatomic Physics (8 ECTS credits)	Physics N 002	Center for Physical Sciences and Technology	Nuclear Research
Student's workload	Hours	Student's workload	Hours
Lectures	20	Consultations	6
Individual study	170	Seminars	4

Course annotation

Objects and significance of subatomic physics. Research methods in subatomic physics. Significance of conservation laws. Quantum mechanics and special relativity in subatomic physics.

Atomic nuclei. Nuclear masses and binding energy. Nuclear energy levels. Radioactivity. Origin of radioactivity. Nuclear spectroscopy. Nuclear models. Nuclear Reactors.

Fission of heavy nuclei by neutrons and chain reaction. Nuclear reactors.

Light nuclei fusion reactions and fusion energy. Controlled fusion implementation problems.

Elementary particles. Leptons and hadrons. Standard model. Quarks and strong interactions.

Intermediate bosons. Subatomic physics and astrophysics.

Particle accelerators. Detection of subatomic particles. Applied nuclear physics.

List of literature

1. K.S. Krane. Introductory Nuclear Physics , John Wiley & Sons, 1988
2. G.F. Knoll. Radiation Detection and Measurement , Wiley; 2010
3. P.Reuss. Neutron physics , EDP Sciences, 2008
4. L.Valentin, Physique Subatomique: Noyaux et Particules, t.1, t.2, Hermann, Paris, 1982 (French), "Mir", Moscow, 1986 (Russian).

Consulting teachers	Scientific degree	Pedagogical name	Main scientific works published in a scientific field in last 5 year period
Artūras Plukis	Dr.	Assoc. Prof.	<p>1. Koroliiov, A., Reklaitis, J., Varsockaja, K., Germanas D., Plukis A., Remeikis V., X-ray pulse emission of alkali metal halide salts irradiated by femtosecond laser pulses. Appl. Phys. B 126, 144 (2020). https://doi.org/10.1007/s00340-020-07494-5</p> <p>2. V. Remeikis, R. Plukienė, A. Plukis, V. Barkauskas, A. Gudelis, R. Druteikienė, R. Gvozditė, L. Juodis, G. Duškesas, E. Lagzdina, D. Germanas, D. Ridikas, S. Krutovcov, Characterisation of RBMK-1500 graphite: A method to identify the neutron activation and surface contamination terms, Nuclear Engineering and Design, Volume 361, 2020, 110501, ISSN 0029-5493, https://doi.org/10.1016/j.nucengdes.2019.110501.</p> <p>3. Reklaitis, J., Barkauskas, V., Plukis, A. et al. Emission and dose characterization of the</p>

			<p>1 kHz repetition rate high-Z metal $K\alpha$ source driven by 20 mJ femtosecond pulses. Appl. Phys. B 125, 41 (2019). https://doi.org/10.1007/s00340-019-7155-6</p> <p>4. L. Juodis, E. Maceika, A. Plukis, F. Dacquait, J.B. Genin, G. Benier, Assessment of radioactive contamination in primary circuit of WWER-440 type reactors by computer code OSCAR for the decommissioning case, Progress in Nuclear Energy, Volume 110, 2019, Pages 191-198, ISSN 0149-1970, https://doi.org/10.1016/j.pnucene.2018.09.019</p> <p>5. J. Garankin, A. Plukis, R. Plukienė, E. Lagzdina and V. Remeikis, "Identification of Particles of Ionizing Radiation by the Analysis of Fluorescence Pulse Form of the Thin Pen Film Scintillator," in IEEE Transactions on Nuclear Science, vol. 65, no. 2, pp. 739-743, Feb. 2018, https://doi.org/10.1109/TNS.2017.2785683.</p> <p>6. D. Lingis, E. Lagzdina, A. Plukis, R. Plukienė, V. Remeikis, Evaluation of the primary displacement damage in the neutron irradiated RBMK-1500 graphite, Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms, Volume 436, 2018, Pages 9-17, ISSN 0168-583X, https://doi.org/10.1016/j.nimb.2018.08.038</p>
<p>Certified during Doctoral Committee session 02/02/2022, protocol No. (7.17 E) 15600-KT-32</p>			
<p>Committee Chairman prof. S. Juršėnas</p>			