Course Unit Descriptor

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| **Study Programme:** Physics | | | |
| **Course Unit Title:** Fundamental and applied neutron research | | | |
| **Course Unit Code:** FD18MSJ | | | |
| **Name of Lecturer(s):** Assistant Professor Nikola Jovančević | | | |
| **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:** Nuclear Physics | | | |
| **Course Aims:**<br>Introducing students with the most up-to-date fundamental and applied research that requires the use of experimental techniques with neutrons. | | | |
| **Learning Outcomes:**<br>Understanding the principles of research with neutrons. Ability to follow the latest results in this research field. | | | |
| **Syllabus:**<br>*Theoretical instruction:*<br>Neutron properties. Neutron interactions with matter. Neutron transport through matter. Neutron nuclear reactions. Sources of neutron. Detection and spectroscopy of neutrons. Neutron activation analysis. Prompt neutron activation analysis. Neutron scattering measurement techniques. Methods of neutron shield. Determination of the parameters of the nuclear structures with neutron activation techniques. Techniques for measuring effective cross sections for neutron nuclear reactions. Determination of neutron flux by methods of deconvolution. Nuclear fission and neutrons. International database. Neutron application in medicine. Neutron application in environmental studies. Detection of neutrons in low-background gamma spectroscopy measurements.<br>*Practical instruction:*<br>Monte Carlo simulations of neutron detector systems. Working with neutron detectors. Working with computer programs for deconvolution of spectra. Processing of experimental data obtained by activation measurements. | | | |
| **Required Reading:**<br>1. Glenn E. Knoll, Radiation Detection and Measurement, John Wiley & Sons, Inc., New York, 2000.<br>2. Vladivoj Vlajkovic, 14 MeV Neutrons – Physics and Applications, CRC Press Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742.<br>3. Gábor L. Molnár , Handbook of Prompt Gamma Activation Analysis with Neutron Beams, ISBN: 978-1-4757-0997-1 (Print) 978-0-387-23359-8. | | | |
| **Weekly Contact Hours:** | **Lectures:** 6 | **Practical work:** 4 | |
| **Teaching Methods:**<br>Lectures, seminars and practical work. | | | |
| **Knowledge Assessment (maximum of 100 points):** | | | |
| **Pre-exam obligations** | points | **Final exam** | points |

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| Active class participation | - | written exam | - |
| Practical work | 30 | oral exam | 70 |
| Preliminary exam(s) | - | ……. | |
| Seminar(s) | - | | |
| The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc. | | | |