



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Rentgenske spektroskopske metode
Course title:	X-ray spectroscopic methods

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
FIZIKA		1. ali 2.	1., 2. ali 3.
PHYSICS		1. or 2.	1., 2. or 3.

Vrsta predmeta / Course type

Izbirni za modula Biofizika 3 in Fizika 1, 2, 3

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje	Samost. delo Individ. work	ECTS
10	5	-	-		435	15

Nosilec predmeta / Lecturer:

Jana Padežnik Gomilšek

Jeziki /

Languages:

Predavanja / slovenski/Slovenian

Lectures:

Vaje / Tutorial:

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

poznavanje osnov atomske fizike

Prerequisites:

preknowledge of atomic physics

Vsebina:

1. Pregled rentgenskih spektroskopskih metod:
- izviri rentgenske svetlobe
- rentgenske difrakcijske spektroskopije
- rentgenske absorpcijske spektroskopije
- rentgenska fluorescenčna spektroskopija

Content (Syllabus outline):

2. Survey of x-ray spectroscopic methods:
- x-ray sources
- x-ray diffraction spectroscopies
- x-ray absorption spectroscopies
- x-ray fluorescent spectroscopy

- spektroskopija elektronov

2. Metodi EXAFS in XANES:

- teoretične osnove
- priprava vzorcev
- izvedba meritev
- obdelava meritev
- interpretacija rezultatov
- tipični primeri

- electron spectroscopy

2. EXAFS and XANES:

- theory
- sample preparation
- measurements
- data processing
- interpretation of results
- typical examples

Temeljni literatura in viri / Readings:

- 1) B.K. Agarwal, X-ray Spectroscopy: An Introduction (Springer Series in Optical Sciences), Springer-Verlag Berlin and Heidelberg GmbH & Co. KG (1991).
- 2) D. C. Koningsberger, R. Prins, X-ray absorption spectroscopy (principles, applications, techniques of EXAFS, SEXAFS and XANES). John Wiley and Sons, New York (1988).
- 3) B. K. Theo, EXAFS: Basic Principles and Data Analysis (Springer, Berlin, 1986)
- 4) G. B. Bunker: Introduction to XAFS: A Practical Guide to X-ray Absorption Fine Structure Spectroscopy, (Cambridge University Press, 2010).
- 5) J. Als-Nielsen, D. McMorrow: Elements of Modern X-ray Analysis (John Wiley & Sons, 2001).

Cilji in kompetence:

Študentje si zgradijo pregled nad rentgenskimi spektroskopskimi metodami v atomski fiziki, razumejo njihove fizikalne principe in možnosti uporabe.

Objectives and competences:

Students obtain an overview of x-ray spectroscopic methods in atomic physics, they understand physical principles and range of application of the methods.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študentje poznajo prednosti in omejitve posameznih spektroskopskih metod in znajo izbrati primerno metodo ali kombinacijo metod za dani problem, pripraviti vzorce, poiskati možnosti merjenja in obdelave ter interpretirati rezultate.

Za metodi EXAFS in XANES znajo tudi sami obdelati izmerjene spektre.

Intended learning outcomes:

Knowledge and understanding:

Students understand advantages and limitations of particular spectroscopic methods and are able to select the appropriate one or their combination for an actual problem. They are able to prepare samples, find possibilities where and how to measure and process the data, they can interpret the results.

Students are able to process EXAFS and XANES data by themselves.

<p>Prenesljive/ključne spretnosti in drugi atributi:</p> <p>Kritičen odnos do zahtev in rezultatov posameznih merilnih metod, pripravljenost na samostojno delo, spretnost načrtovanja in izvedbe eksperimentov.</p>	<p>Transferable/Key Skills and other attributes:</p> <p>Critical attitude to demands and results of particular methods, preparedness for individual work, skills at planning and conducting of the experiment.</p>
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Metode poučevanja in učenja:

Predavanja
Seminarsko delo

Learning and teaching methods:

Lectures
Seminar work

Delež (v %) /

Načini ocenjevanja:

Weight (in %) /

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
Seminarska naloga	50 %	Seminar work
Ustni izpit	50 %	Oral exam

Reference nosilca / Lecturer's references:

1. HAUKO, Robert, PADEŽNIK GOMILŠEK, Jana, ARČON, Iztok, KODRE, Alojz. Absolute determination of the X-ray absorption coefficient of strontium in the K edge region. *Radiation physics and chemistry*, ISSN 0969-806X. [Print ed.], Oct. 2014, vol. 103, str. 203-208. <http://www.sciencedirect.com/science/article/pii/S0969806X14002424#>, doi: [10.1016/j.radphyschem.2014.05.059](https://doi.org/10.1016/j.radphyschem.2014.05.059). [COBISS.SI-ID [17976854](https://www.cobiss.si/id/17976854)]
2. KODRE, Alojz, PADEŽNIK GOMILŠEK, Jana, HAUKO, Robert, ŠALA, Martin, ARČON, Iztok. Absolute determination of the X-ray absorption coefficient of barium in the L region using a liquid absorption cell. *X-ray spectrometry*, ISSN 0049-8246, 2013, vol. 42, iss. 2, str. 63-67. <http://onlinelibrary.wiley.com/doi/10.1002/xrs.2434/pdf>, doi: [10.1002/xrs.2434](https://doi.org/10.1002/xrs.2434). [COBISS.SI-ID [2611451](https://www.cobiss.si/id/2611451)]
3. PADEŽNIK GOMILŠEK, Jana, KODRE, Alojz, ARČON, Iztok, DE PANFILIS, Simone, MAKOVEC, Darko. Atomic absorption background of Ba in EXAFS analysis of BaFe₂O₉ nanoparticles. *Journal of synchrotron radiation*, ISSN 0909-0495, 2011, vol. 18, issue 4, str. 557-563, doi: [10.1107/S0909049511010181](https://doi.org/10.1107/S0909049511010181). [COBISS.SI-ID [2335844](https://www.cobiss.si/id/2335844)]
4. PADEŽNIK GOMILŠEK, Jana, KODRE, Alojz, ARČON, Iztok, BRATINA, Gvido. X-ray absorption of cadmium in the L-edge region. *Physical review. A, Atomic, molecular, and optical physics*, ISSN 1050-2947, 2011, vol. 84, issue 5, str. 052508-1-052508-7, doi: [10.1103/PhysRevA.84.052508](https://doi.org/10.1103/PhysRevA.84.052508). [COBISS.SI-ID [2375012](https://www.cobiss.si/id/2375012)]
5. KODRE, Alojz, PADEŽNIK GOMILŠEK, Jana, ARČON, Iztok, AQUILANTI, Giuliana. X-ray atomic absorption of cesium and xenon in L-edge region. *Physical review. A, Atomic, molecular, and optical physics*, ISSN 1050-2947, 2010, vol. 82, issue 2, str. 022513-1-022513-7. [COBISS.SI-

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