# CONTENT

1. Acquirement of Internal Grant	3		
2. Aplikácie kvantovej teórie poľa v súčasnej fyzike kondenzovaných látok			
3. Author's patents, discoveries, software	6		
4. Citation in monograph	7		
5. Citation in scientific journal published abroad	8		
6. Citation in scientific journal published in the country of residence	9		
7. Citation registered in Science Citation Index	.10		
8. Co-worker of project supported by international grant schemes	11		
9. Co-worker of project supported by national grant schemes	.12		
10. Defence of Doctoral Thesis	.13		
11. Dissertation examination	.14		
12. Domain and Domain Walls	. 15		
13. Elaboration of reviewer report	16		
14. English Language for PhD Students 1	.17		
15. English Language for PhD Students 2	. 18		
16. Experimenálne metódy fyziky nízkych teplôt	.20		
17. Fyzika vysokých tlakov	.22		
18. Home Conference with Foreign Participation	.24		
19. Implementation of new experimental methodology	.25		
20. International Conference	.26		
21. Intruduction to Condensed Matter	.27		
22. Journals Registered by Current Contets Database	28		
23. Journals not registered in the Current Contents Connect database and published abroad	. 29		
24. Journals not registered in the Current Contents Connect database and published in the country	/ of		
residence	. 30		
25. Journals registered in the Current Contents Connect database and published in the country of			
residence	.31		
26 Macroscopic quantum systems	32		
27 Magnetic Materials	34		
28 Magnetotochemistry	35		
29 Makroskonické kvantové systémy II	37		
30 Modern Methods of Solids Structure Investigation	39		
31 National Conference	41		
32 Non-reviewed collections of papers and monographs published abroad or in the country of	71		
residence	42		
33 Pedagogy for university teachers	43		
34 Presentation in Seminar	44		
35. Processing properties and applications of papomaterials	45		
36 Psychology for University Lecturers	Δ7		
37 Quantum Theory of Magnetism	.47 <u>4</u> 0		
38. Rastrovacie sondové mikroskopie	50		
39 Reviewed Proceedings	52		
40. Selected problems of numerical methods in micro-magnetism	53		
40. Serie cou problems of numerical methods in mero-magnetism	.55		
47 Seminar in Solid State Physics	+		
	56		
43 Seminar in Solid State Physics	.56		
43. Seminar in Solid State Physics	.56		
<ul> <li>43. Seminar in Solid State Physics</li></ul>	.56 .58 .60		

46. Seminar in Solid State Physics	63
47. Seminar in Solid State Physics	65
48. Seminar in Solid State Physics	67
49. Sensors and actuators based on selected physical phenomena	69
50. Spring School for PhD Students	70
51. Structural properties of materials	71
52. Study Stay Abroad	72
53. Supervision of Student's Scientific Activity	73
54. Supervisor/consultant of bacelor thesis	74
55. Teaching activities	75
56. Termodynamika supravodičov	76
57. Teória silne korelovaných elektrónových systémov	78
58. Work in Organizing Committee of Conference	
59. Writing Dissertation Work	80

University: P. J. Šafá	University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science			
Course ID: ÚFV/ IG/04	Course ID: ÚFV/ Course name: Acquirement of Internal Grant G/04		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 10		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:			
Notes:	Notes:		
Course assessment Total number of assessed students: 130			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafárik University in Košice		
Faculty: Faculty of S	cience	
<b>Course ID:</b> ÚFV/ AKTP/12	Course name: Aplikácie kvantovej teórie poľa v súčasnej fyzike kondenzovaných látok	
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present Number of ECTS credits: 5 Recommended semester/trimester of the course:		
Conditions for course completion: exam		
<b>Learning outcomes:</b> To acquaint the stude condensed matter ph	ents with modern methods of quantum field theory and their application in the vsics.	

#### Brief outline of the course:

Hypothesis of scaling (critical scaling) in thermodynamics; Ising model and thermodynamics of ferromagnetism; Scaling of Green functions; Landau theory; Fluctuation theory and critical behaviour; Foundations of quantum field theory; Physical quantum fields and their equations – Dirac equations, Klein-Gordon equaiton; Quantization of fields; Evolution operator; S-matrix; Green functions and generation functional; T- and N-products; Wick theorems; Feynman diagrammatic technique; Functional form of Green functions, generating functional and statistical sum; Phase transitions; Universal behaviour of statistical sum in the vicinity of phase transition point; Landau fluctuation theory for description of phase transitions; Anomalous scaling; Renormalization of Landau theory; Epsilon-expansion and calculation of renormalization constants; Renormalization group and differential equations for Green functions; Asymptotic scaling solutions in the region of large scales, determination of their stability; Calculation of anomalous and critical exponents.

#### **Recommended literature:**

 N.N. Bogolyubov, D.V. Shirkov: Quantum fields, Nauka, Moskva, 2005 (in russian)
 A.N. Vasilev: Renormalization group in Critical Behavior Theory and Stochastic Dynamics Chapman & Hall/CRS, Boca Raton London New York Washington D.C., 2004.

#### **Course language:**

slovak, english

Notes:

Course assessment Total number of assessed students: 1		
N P		
0.0	100.0	
Provides: prof. RNDr. Michal Hnatič, DrSc.		
Date of last modification: 03.05.2015		
Approved:		

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
<b>Course ID:</b> ÚFV/ PVS/04	Course ID: ÚFV/ Course name: Author's patents, discoveries, software		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 2		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:			
Notes:			
Course assessment Total number of assessed students: 38			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafá	University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science			
Course ID: ÚFV/ CM/04	Course ID: ÚFV/ Course name: Citation in monograph		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 20		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:			
Notes:			
Course assessment Total number of assessed students: 1			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
Course ID: ÚFV/ CZC/04	Course ID: ÚFV/ Course name: Citation in scientific journal published abroad		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 10		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:			
Notes:			
Course assessment Total number of assessed students: 67			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafá	University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science			
Course ID: ÚFV/ CDC/04	7/ <b>Course name:</b> Citation in scientific journal published in the country of residence		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 5		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	ature:		
Course language:	Course language:		
Notes:			
Course assessment Total number of assessed students: 4			
abs n			
	100.0 0.0		
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science		
Course ID: ÚFV/ SCI/04	<b>rse ID:</b> ÚFV/ <b>Course name:</b> Citation registered in Science Citation Index 04	
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present		
Number of ECTS cr	edits: 20	
Recommended seme	ster/trimester of the cours	e:
Course level: III.		
Prerequisities:		
Conditions for cours	e completion:	
Learning outcomes:		
Brief outline of the c	ourse:	
Recommended litera	iture:	
Course language:		
Notes:		
Course assessment Total number of assessed students: 227		
abs n		
100.0 0.0		
Provides:		
Date of last modification:		
Approved:		

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
Course ID: ÚFV/ SMPR/04	ÉÚFV/ <b>Course name:</b> Co-worker of project supported by international grant schemes		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cro	edits: 15		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:			
Notes:			
Course assessment Total number of assessed students: 98			
abs n			
	100.0 0.0		
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafá	University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science			
<b>Course ID:</b> ÚFV/ SDPR/04	<b>Course ID:</b> ÚFV/ <b>Course name:</b> Co-worker of project supported by national grant schemes DPR/04		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 2		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
<b>Recommended litera</b>	iture:		
Course language:	Course language:		
Notes:	Notes:		
Course assessment Total number of assessed students: 527			
abs n			
	100.0 0.0		
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafá	rik University in Košice		
Faculty: Faculty of S	Faculty: Faculty of Science		
Course ID: ÚFV/ ODZP/14	ID: ÚFV/Course name: Defence of Doctoral Thesis14		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 30		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:			
Notes:	Notes:		
Course assessment Total number of assessed students: 94			
N P			
0.0 100.0			
Provides:			
Date of last modification: 03.05.2015			
Approved:			

University: P. J. Šafá	University: P. J. Šafárik University in Košice			
Faculty: Faculty of S	Faculty: Faculty of Science			
<b>Course ID:</b> ÚFV/ DZS/14	urse ID: ÚFV/ Course name: Dissertation examination S/14			
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present				
Number of ECTS cro	edits: 20			
Recommended seme	ster/trimester of the course	2:		
Course level: III.				
Prerequisities:				
<b>Conditions for cours</b> Obtaining required nu	e completion: umber of credits as given by	the study plan.		
<b>Learning outcomes:</b> Evaluation of compet	ences of the student accordi	ng to his/her scientific profile.		
<b>Brief outline of the course:</b> Presentation of the results in the thesis for disertation exam, responding to referee's comments, answering questions of exam committee. Two questions are selected subsequently from one compulsory and one optional subject, respectively. The subjects are selected by guarantee of the program according to the study plan and scientific profile of the student. The third question addresses the current state of work on dissertation thesis				
Recommended literature:				
Course language: english				
Notes:				
Course assessment Total number of assessed students: 117				
	N P			
	0.0	100.0		
Provides:				
Date of last modification: 03.05.2015				
Approved:	Approved:			

University:	University: P. J. Šafárik University in Košice						
Faculty: Fa	Faculty: Faculty of Science						
<b>Course ID:</b> DDS/15	ÚFV/	V/ Course name: Domain and Domain Walls					
Course typ Course tyj Recomme Per week: Course me	Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present						
Number of	ECTS cred	lits: 3					
Recommen	ded semest	er/trimester	of the course	e:			
Course leve	el: II., III.						
Prerequisit	ies:						
Conditions Oral exami	for course nation	completion:					
Learning o The objecti their structu	<b>Learning outcomes:</b> The objective is to acquaint the students with the basis of the domain and domain wall formation, their structure, static and dynamic properties in magnetic materials.						
<b>Brief outlin</b> Domain str Anisotropic motion indu	<b>Brief outline of the course:</b> Domain structure. Experimental study of domain structure. Calculation of domain structure. Anisotropies. Domain wall types. Domain wall potential. Domain wall dynamics. Domain wall motion induced by electrical current.						
Recommended literature: 1. B.D. Cullity, C.D. Graham, "Introduction to magnetic materials", John Wiley & Sons, New Jersy (2009) 2. S. Chikazumi, Physics of Ferromagnetism, Oxford University Press, USA (2009) 3. S. Tumanski, Handbook of Magnetic Measurements, CRC Press (2011) 4. N. A. Spaldin, Magnetic Materials: Fundamentals and Device Applications, Cambridge University Press (2003)							
Course language: slovak, english							
Notes:	Notes:						
Course assessment Total number of assessed students: 7							
А	В	C	D	Е	FX	Ν	Р
71.43	0.0	28.57	0.0	0.0	0.0	0.0	0.0
Provides: prof. RNDr. Rastislav Varga, DrSc.							
Date of last modification: 23.07.2021							
Approved:							

University: P. J. Šafá	rik University in Košice		
Faculty: Faculty of S	cience		
Course ID: ÚFV/ VPBP/04	ÚFV/ <b>Course name:</b> Elaboration of reviewer report		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 2		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:	Course language:		
Notes:	Notes:		
Course assessment Total number of assessed students: 20			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			

University: P. J.	Šafárik Univers	ity in Košice			
Faculty: Faculty	of Science				
Course ID: CJP/ AJD1/07	Course name: English Language for PhD Students 1				
Course type, sco Course type: Pr Recommended Per week: 2 Per Course method	pe and the met ractice course-load (h r study period: : present	thod: ours): 28			
Number of ECT	S credits: 2				
Recommended s	emester/trimes	ster of the cours	<b>e:</b> 1.		
Course level: III.					
Prerequisities:					
<b>Conditions for c</b> Written assignment distance mode of	ourse completi ents - profession instruction usin	<b>on:</b> nal CV, short acao ng MS teams	demic biography	y (200-350 words	).
Learning outcomes:					
Brief outline of t	Brief outline of the course:				
Recommended literature:					
Course language	2:				
Notes:	,				
Course assessme Total number of	Course assessment Total number of assessed students: 654				
N	Ne	Р	Pr	abs	neabs
0.0	0.0	51.38	0.0	48.62	0.0
Provides: PhDr. Helena Petruňová, CSc., Mgr. Zuzana Kolaříková, PhD.					
Date of last modification: 11.02.2021					
Approved:	Approved:				

University: P. J. Šafá	rik University in Košice		
Faculty: Faculty of S	cience		
Course ID: CJP/ AJD2/07	Course name: English Language for PhD Students 2		
Course type, scope a Course type: Practic Recommended cour Per week: 2 Per stu Course method: pre	nd the method: ce rse-load (hours): dy period: 28 esent		
Number of ECTS cr	edits: 3		
Recommended seme	ster/trimester of the course: 2.		
Course level: III.			
Prerequisities:			
<b>Conditions for cours</b> Distance mode of ins Test, oral exam in acc cjp/doktorandi-upjs/)	e completion: truction. Online consultations. ordance with the exam requirements (https://www.upjs.sk/filozoficka-fakulta/		
Learning outcomes: Development of stu (selected aspects of pragmatic competence and specific purposes	idents' language skills, improvement of students' linguistic competencies English pronunciation, vocabulary and syntax), development of students's e (selected aspects of functional grammar) with focus on English for academic s. B2/C1 level of lanugage competence (according to CEFR.)		
<b>Brief outline of the course:</b> Specific aspecs of academic and professional English with focus on vocabulary development (noun and verb collocations, phrasal verbs, prepositional phrases, word-formation, formal/informal language, etc.), selected aspects of English grammar (prepositions, grammar tenses, passive voice, etc.), selected functional grammar (expressing opinion, cause/effect, arguments, examples, etc.). Academic communication. Cross-language interference.			
Recommended litera Kolaříková, Z., Petru UPJŠ Košice, 2015 McCarthy, M., O'Del Štepánek, L., J. De H 2011 Blašková, K.: Handbo Dušková, L. a kol.: H Bratislava, 1982 Armer, T.: Cambridge Porter, D.: Check you Oxford Collocations Ims.upjs.sk	<ul> <li>hture:</li> <li>ňová, H., Timková, R.: Angličtina v akademickom prostredí (cvičebnica).</li> <li>II, F.: Academic Vocabulary in Use. CUP, 2008</li> <li>aff a kol.: Academic English-Akademická angličtina. Grada Publishing, a.s.,</li> <li>ook of English for Postgraduate Students. Vyd. SPRINT Bratislava, 2007</li> <li>lovorová angličtina pre vedeckých a odborných pracovníkov. Veda.</li> <li>e English for Scientists. CUP, 2011</li> <li>ar vocabulary for Academic English. Macmillan Publishers Limited, 2008</li> <li>Dictionary for students of English. OUP, 2002</li> </ul>		
Course language:			

B2/C1 level according to CEFR					
Notes:	Notes:				
Course assessment Total number of assessed students: 649					
N	Ne	Ne P Pr abs neabs			
0.31	0.0	93.07	1.23	5.39	0.0
Provides: PhDr. Helena Petruňová, CSc., Mgr. Zuzana Kolaříková, PhD.					
Date of last modification: 10.02.2021					
Approved:					

University: P. J. Šaf	árik University in Košice
Faculty: Faculty of	Science
<b>Course ID:</b> ÚFV/ EMFNT/12	Course name: Experimenálne metódy fyziky nízkych teplôt
Course type, scope Course type: Lectu Recommended cou Per week: 2 Per st Course method: pr	and the method: are arse-load (hours): udy period: 28 resent
Number of ECTS c	redits: 3
Recommended sem	ester/trimester of the course:
Course level: III.	
Prerequisities:	
<b>Conditions for cour</b> Succesful passing te	rse completion: est and final exam.
Learning outcomes Introduction to fund and technical realizatechniques. Introduct temperature physicator ordinary life.	: amental principles and methods of cooling to low and ultra low temperatures ation of low temperature facilities. Fundamentals of the vacuum physics and ction to low and ultra low temperature measurements and specifics of the low all measurements. Applications of low temperature physics and techniques in
<b>Brief outline of the</b> Physical principles of	<b>course:</b> of cooling below ambient temperature. Liquefaction of gases and manipulation

with cryogenic liquids. Fundamentals of vacuum techniques and leak detection of vacuum systems. Physical principles and methods of cooling to low and ultra low temperatures. Measurements of low and ultra low temperatures, temperature scale definition. Physical properties of condensed matters at low temperatures. Construction of low temperature refrigerators and apparatures. Low temperature electronics and measurements of physical quantities at low and ultra low temperatures. Applications of low and ultra low temperature physics and techniques.

#### **Recommended literature:**

F. Pobell: Matter and Methods at Low Temperatures, Springer Verlag Berlin 1995.

Ch. Enss and S. Hunklinger: Low Temperature Physics, Springer Verlag Berlin 2005.

L. Skrbek a kolektív: Fyzika nízkych teplot, matfyz press, Praha 2011

G.K. White and P.J. Meeson: Experimental Techniques in Low Temperature Physics, Clarendon Press, Oxford 2002.

Š. Jánoš: Fyzika nízkych teplôt, Alfa, Bratislava 1982.

J. Jelínek a Z. Málek: Kryogénní technika, SNTL Paraha 1982.

#### Course language:

Slovak, English

Notes:

Course assessment Total number of assessed students: 11				
N P				
0.0 100.0				
Provides: RNDr. Peter Skyba, DrSc.				
Date of last modification: 03.05.2015				
Approved:				

University: P. J. Šafá	University: P. J. Šafárik University in Košice			
Faculty: Faculty of S	cience			
<b>Course ID:</b> ÚFV/ FVT/12	Course name: Fyzika vysokých tlakov			
Course type, scope a Course type: Lectur Recommended cour Per week: 2 Per stu Course method: pre	nd the method: re rse-load (hours): dy period: 28 esent			
Number of ECTS cr	edits: 5			
Recommended seme	ster/trimester of the course:			
Course level: III.				
Prerequisities:				
<b>Conditions for cours</b> Succesful passing fin	e completion: al exam			
Learning outcomes: Introduction to the Students will learn a superconducting, mag	high pressure physics and technique including experimental practice. about importance of thermodynamic parameter – pressure in the study of gnetic, strongly correlated or structure properties of materials.			
Brief outline of the c Pressure as paramet physical properties i piston cylinder and E phase transitions. Th at high pressures an Moesbauer, NMR an pressure induced qu anti-/ferromagnet-sup on electronic structu properties of molecul	<b>Brief outline of the course:</b> Pressure as parameter in solid state physics and general mechanism of pressure effect on physical properties in condense matter. Experimental techniques for high pressure generation: piston cylinder and Bridgman cells, diamond anvil and Al2O3 cells. Pressure induced structural phase transitions. The measurement of magnetic, transport and thermal properties of solid state at high pressures and very low temperatures. Spectroscopy under pressure: Raman, UV VIS, Moesbauer, NMR and neutron diffraction. Typical examples of high pressure physics study: pressure induced quantum phase transitions in electronic systems (metal-insulator transition, anti-/ferromagnet-superconductor transition, Non-Fermi-liquid behavior). Influence of pressure on electronic structure, strongly correlated systems and superconductivity. Tuning of magnetic properties of molecular magnets by pressure			
Recommended litera 1. M. I. Eremets: Hig 2. J. Loveday: High p 3. S. Sachdev: Quant 4. T. Vojta: Quantum 5. G. R. Stewart: Nor 797-855 (2001) 6. W. Buckel and R. I Weinheim (2004)	h pressure experimental methods, Oxford University Press, Oxford, (2002) pressure physics, CRC Press, Taylor&Francis Group (2012) um Phase Transitions, Cambridge University Press, Cambridge (2000) phase transitions in electronic systems, Ann. Phys. 9, 403-440 (2000) n-Fermi-Liquid behavior in d- and f- electron metals, Rev. Mod. Phys. 73, Kleiner: Superconductivity, Wiley-VCH Verlag GmbH & Co. KGaA,			
<b>Course language:</b> Slovak, English				
Notes:				

Course assessment Total number of assessed students: 11				
Ν	Р			
0.0	100.0			
<b>Provides:</b> doc. RNDr. Slavomír Gabáni, PhD., RNDr. Marián Mihálik, CSc., RNDr. Mária Zentková, CSc.				
Date of last modification: 03.05.2015				
Approved:				

University: P. J. Šafá	rik University in Košice			
Faculty: Faculty of Science				
Course ID: ÚFV/ DKZU/04	<b>ID:</b> ÚFV/ <b>Course name:</b> Home Conference with Foreign Participation			
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present				
Number of ECTS cr	edits: 4			
Recommended seme	ster/trimester of the cours	e:		
Course level: III.				
Prerequisities:				
Conditions for cours	e completion:			
Learning outcomes:	Learning outcomes:			
Brief outline of the c	ourse:			
Recommended litera	iture:			
Course language:	Course language:			
Notes:	Notes:			
Course assessment Total number of assessed students: 303				
abs n				
100.0 0.0				
Provides:				
Date of last modifica	Date of last modification:			
Approved:				

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
Course ID: ÚFV/ NEM/04	Course name: Implementation of new experimental methodology		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 15		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:			
Notes:	Notes:		
Course assessment Total number of assessed students: 79			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
Course ID: ÚFV/ MK/04	ourse ID: ÚFV/ Course name: International Conference K/04		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 6		
Recommended seme	ster/trimester of the cours	2:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:	Course language:		
Notes:	Notes:		
Course assessment Total number of assessed students: 426			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafán	rik University in Košice		
Faculty: Faculty of Science			
<b>Course ID:</b> ÚFV/ VKFKL/04	Course name: Intruduction to Condensed Matter		
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 4 Per study period: 56 Course method: present			
Number of ECTS cro	edits: 9		
Recommended seme	ster/trimester of the cours	<b>e:</b> 1.	
Course level: III.			
Prerequisities:			
<b>Conditions for cours</b> Oral examination	e completion:		
<b>Learning outcomes:</b> Introduction to basic	pronciples of solid state phy	vsics as well as recently studied phenomena	
<b>Brief outline of the c</b> Crystal structure. Cr surfaces and metals. paramagnetism. Ferro	ourse: ystal bonds. Phonons. Fer Superconductivity. Non con o- and antiferromagnetism. S	mi gas of free electrons. Energy bands. Fermi iventional superconductivity. Diamagnetism and Strongly correlated electron systems.	
<b>Recommended literature:</b> Ch. Kittel: Introduction to Solid State Physics, 7th edition, John Wiley and sons, New York 1996. H.Ibach, H.Luth: Solid-State Physics, Springer, Berlin 1996. M Tinkham: Introduction to Superconductivity, 2-nd edition, Mc Graw- Hill, New York 1996			
Course language: slovak, english			
Notes:			
Course assessment Total number of assessed students: 80			
	Ν	Р	
0.0 100.0			
<b>Provides:</b> prof. RNDr. Peter Samuely, DrSc., prof. Ing. Martin Orendáč, DrSc., Mgr. Tomáš Samuely, PhD.			
Date of last modification: 28.03.2020			
Approved:			

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
Course ID: ÚFV/ ZKC/04	Course name: Journals Registered by Current Contets Database		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 20		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:	Course language:		
Notes:			
Course assessment Total number of assessed students: 496			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
<b>Course ID:</b> ÚFV/ ZNC/04	<b>Course name:</b> Journals not registered in the Current Contents Connect database and published abroad		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 5		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	ature:		
Course language:			
Notes:			
Course assessment Total number of assessed students: 54			
	abs n		
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
<b>Course ID:</b> ÚFV/ DNC/04	<b>Course name:</b> Journals not registered in the Current Contents Connect database and published in the country of residence		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 5		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	iture:		
Course language:	Course language:		
Notes:			
Course assessment Total number of assessed students: 23			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:	Approved:		

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
Course ID: ÚFV/ DKC/04	<b>Course name:</b> Journals registered in the Current Contents Connect database and published in the country of residence		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 15		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	ature:		
Course language:	Course language:		
Notes:			
Course assessment Total number of assessed students: 8			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafárik University in Košice				
Faculty: Faculty of S	cience			
Course ID: ÚFV/ MKS I/04	Course name: Macroscopic quantum systems			
Course type, scope a Course type: Lectur Recommended cour Per week: 2 Per stu Course method: pre	Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present			
Number of ECTS cro	edits: 5			
Recommended seme	ster/trimester of the course: 1.			
Course level: III.				
Prerequisities:				
Conditions for cours Test.	e completion:			
Learning outcomes:				
Brief outline of the c 12. Selected chapter 3. Solid helium, prop 4. Quantum cavitation 56. Spin dynamics persistent processing 7. Superfluid helium 8. Nuclear magnetism 9. Spin luquid in spin 1011. Dimerized spi liquid and Bose-Einst 12. Solitons in spin c	ourse: rs about superfluidity in 4He, 3He and in their solutions. erties of quantum crystals. n and evaporation in liquid helium. and magnetic resonance in superfluid 3He. Magnetic superfluidity and domain in 3He-B. Bose-Einstein condensation of magnons in superfluid 3He. as cosmologic laboratory. n. Nanokelvin temperatures. chains and frustrated spin systems. in systems and their energy spectrum. Spin ladder, alternating chain. Luttinger tein condensation of magnetic excitations. hains and dimerized spin systems.			
Recommended litera W. Buckel: Supercon K. H. Bennemann, J. Publication. D. R. Tilley, J. Tilley E. R. Dobbs: Helium	<b>ture:</b> ductivity. VCH, Weinheim, 1991. B. Ketterson: The Physics of liquid and solid Helium. A Wiley Interscience : Superfluidity and Superconductivity. Adam Hilger ltd., Bristol. Three. Oxford Science publications, 2000.			
Course language: Slovak, English				
Notes:				

Course assessment		
N P		
0.0	100.0	
Provides: Dr.h.c. prof. RNDr. Alexander Feher, DrSc., doc. RNDr. Karol Flachbart, DrSc.		
Date of last modification: 30.08.2021		
Approved:		

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
<b>Course ID:</b> ÚFV/ MVV1/07	Course name: Magnetic Materials		
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present			
Number of ECTS c	redits: 5		
Recommended sem	ester/trimester of the course	2.	
Course level: III.			
Prerequisities:			
Conditions for court test and oral examined	rse completion: nation.		
<b>Learning outcomes:</b> To obtain a general view on the magnetic properties an application of soft and hard magnetic materials.			
<b>Brief outline of the course:</b> Magnetic properties of iron, cobalt and nickel and alloys. Magnetic properties of Fe-Si steels (oriented and non-oriented). Structure and magnetic properties af amorphous and nanocrystalline alloys. Magnetic properties of permanent magnets. The principle of magnetic recording and magnetic recording media. Preparation, structure and magnetic properties of thin films and multilayers.			
<ul> <li>Recommended literature:</li> <li>S. Chikazumi: Physics of Magnetism, J.Willey and Sons, Inc. New York, London, Sydney, 1997.</li> <li>D. Jiles: Introduction to magnetism and magnetic materials, Chapman&amp;Hall, London, New York, Tokyo, Melbourne, Madras, 1991</li> <li>R. C. O'Handley: Modern Magnetic Materials, Principles and Applications, J.Willey and Sons, Inc. New York, 1999</li> </ul>			
Course language:			
Notes:			
Course assessment Total number of assessed students: 39			
	N P		
0.0 100.0			
Provides: doc. RNDr. Ján Füzer, PhD., RNDr. Ivan Škorvánek, CSc.			
Date of last modification: 03.05.2015			
Approved:			

University: P. J. Šafárik University in Košice				
Faculty: Faculty of S	cience			
Course ID: ÚFV/ MGCH/04	Course ID: ÚFV/ IGCH/04Course name: Magnetotochemistry			
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present				
Number of ECTS cr	edits: 5			
Recommended seme	ster/trimester of the cours	<b>e:</b> 1., 3.		
Course level: III.				
Prerequisities:				
<b>Conditions for cours</b> examination	e completion:			
<b>Learning outcomes:</b> Introduction to the basic interactions in the electron subsystem of insulators, demonstration of the correlations between the structure and magnetic properties. Students will learn the basic standard methods used in the analysis of thermodynamic data (specific heat, susceptibility, magnetization) and EPR, since the study of magnetic properties yield an important information about the structure of material especially at low temperatures.				
<b>Brief outline of the course:</b> Electronic states in hydrogen atom, electronic configuration, term, multiplet. Paramagnetic and diamagnetic atoms. Atom in magnetic field: specific heat, susceptibility, magnetization and electron paramagnetic resonance (EPR). Atom in the crystal field. Freezing of angular momentum. Spin Hamiltonian. Termodynamics and EPR of paramagnetic atoms in the crystal field. Exchange and dipole interaction.Heisenberg Hamiltonian. Magnetic dimer. Long-range and short- range order. Low-dimensional magnets. Spatial anisotropy of exchange coupling. Exchange anisotropy. Heisenberg Ising and XY model				
<ul> <li>Recommended literature:</li> <li>1.R.L. Carlin, A.J. Duyneveldt: Magnetic properties of transition metal compounds. New York, inc. Springer Verlag, 1977.</li> <li>2. A.B.P.Lever, Inorganic electronic spectroscopy, Elsevier, Amsterdam, 1987.</li> </ul>				
Course language: english				
Notes:				
Course assessment Total number of assessed students: 37				
	N	Р		
	0.0	100.0		

Provides: doc. RNDr. Alžbeta Orendáčová, DrSc., RNDr. Róbert Tarasenko, PhD.

Date of last modification: 15.06.2021

Approved:
University: P. J. Šafár	rik University in Košice				
Faculty: Faculty of So	cience				
Course ID: ÚFV/ MKS II/12	Course name: Makroskopické kvantové systémy II				
Course type, scope an Course type: Lecture Recommended cour Per week: 1 Per stue Course method: pre	nd the method: e rse-load (hours): dy period: 14 sent				
Number of ECTS cre	edits: 3				
Recommended semes	ster/trimester of the course:				
Course level: III.					
Prerequisities:					
Conditions for course Successful passing of	e completion: `the final exam				
Learning outcomes: Acquaint students w mainly superconducti macroscopic quantum quantum interference	ith some special cases of macroscopic quantum systems. These will be ing heavy fermion systems, the Bose – Einstein condensate in dilute gases, tunnelling, the quantum Hall effect and its applications, the superconducting device (SQUID) and its applications.				
Brief outline of the co the lectures 1 7. and given by prof. Dr. M. 1.week: Brief review and its properties). T between superconduct superconductors. Influ 2. week: Influence of Current passing throu parallel superconduct 3. week: Construction small magnetic fields anomalies and in med 4. week: Strongly inter	burse: d 11., 12. are given by Assoc. prof. Dr. K. Flachbart, the lectures 8 10. are Orendáč. of the basics of superconductivity (formation of the Cooper pairs condensate Funnelling of electrons and Cooper pairs (Josephson effect). Relationship ting current and phase difference at a weak / tunnel connection between two uence of the external magnetic field on phase change. 'external magnetic field on the phase change between two superconductors. igh two parallel superconducting tunnel junctions. Interference between two ing currents. Basics of the DC SQUID operation. n of a DC SQUID and creation of various gradiometers for measuring very s. Use of SQUID - magnetometers in research, in the search for magnetic lical diagnostics. eracting Fermi gas and its renormalization to free electron model. Simple 2D				

model of electron correlations. Interaction between conductivity and localized electrons in metals, Kondo phenomenon. Change of electrical and magnetic properties, and change of heat capacity related to the Kondo effect.

5. week: Origin of the Abrikosov - Suhl resonance in the Kondo lattice, origin of heavyfermion systems. Basic properties of heavy-fermion systems (electrical, magnetic, thermal). RKKY interaction in metallic magnetic systems. Interplay between Kondo and RKKY interactions.

6. week: superconductivity in 4f- and 5f- heavy-fermion systems (examples). Other examples of unconventional superconductivity (high temperature superconductors, superfluid 3He). Pairing and order parameter in various unconventional superconductors.

7. week: Applications of superconductivity. Transmission of electricity. Possibilities of using superconductivity in transport (superfast trains). Use of superconductivity in medicine - diagnostic and imaging techniques. Use of superconductivity in research (accelerators, fusion reactors, condensed matter physics). Possibilities of using superconductivity in electronics.

8. week: Bose - Einstein condensation. Properties of bosons and fermions, examples of bosonic and fermionic systems. Principles of BE condensation. Examples of BE condensates (e.g. 4He, 3He). Diluted gases, the de Broglie wavelength. Formation of coherence in diluted gases.

9. week: Laser cooling of diluted gases. 1D and 3D cooling, influence of the Doppler effect. Magnetic capture of cooled gas. Further cooling of the condensate via evaporation. Examples of condensates, achieved results and parameters (temperature, density of condensate). Methods of BE condensate detection and properties of BE condensates

10. week:. Macroscopic quantum tunnelling in single molecule magnets. Influence of hyperfine interactions and magnetic coupling among single molecule magnets on the probability of quantum tunnelling. Experimental possibilities of detection of quantum tunnelling.

11. week: Quantum Hall effect. Hall effect in metals and semiconductors. Quantization of electron energy in magnetic field, Landau levels and their degeneration. Quantization of Hall resistance in 2D electron gases.

12. week: Observation of the fractional quantum Hall effect. Explanation of the fractional quantum Hall effect using the so-called composite fermions. Influence of magnetic field on 3D systems – the de Haas - van Alphen effect.

## **Recommended literature:**

W. Buckel, R. Kleiner: Superconductivity, Wiley-WCH, Weinheim (2004).

L. Skrbek a kol.: Fyzika nízkych teplot, MATFYZPRESS, Praha 2010.

Scientific articles.

K.N.Shrivastava; Introduction to Quantum Hall Effect; Nova Science, Hauppauge, N.Y. 2002 S.Takagi; Macroscopic Quantum Tunneling; Cambridge U. Press, n.Y. 2002

## Course language:

Slovak, English

Course assessment				
Total number of assessed students: 13				
Ν	Р			
0.0 100.0				
Provides: doc. RNDr. Karol Flachbart, DrSc.				
Date of last modification: 30.08.2021				
Approved:				

University: P. J. Šafá	rik University in Košice
Faculty: Faculty of S	cience
<b>Course ID:</b> ÚFV/ MMTL/04	Course name: Modern Methods of Solids Structure Investigation
Course type, scope a Course type: Lectur Recommended cour Per week: 2 Per stu	and the method: re rse-load (hours): ady period: 28

Course method: present

**Number of ECTS credits: 5** 

Recommended semester/trimester of the course: 2.

Course level: III.

Prerequisities: ÚFV/MSA1/03

#### **Conditions for course completion:**

75% written test

25% the ppt presentation from selected topic

#### Learning outcomes:

To obtain knowledges about frontier microskopic techniques and XRD techniques for structural analysis of materials.

#### **Brief outline of the course:**

New trends in Optic microscopy, Electron microscopy, Electron diffraction. Electron microprobe analysis: WDX spectrometer, EDX spectrometer, Auger spectroscopy. Self-emision microscopy. Modern electron diffracion methods (CBD, nanodiffraction), X-ray diffractometry, phase and profile analysis. Synchrotron radion: sources and application of SR in material science research, neutron scattering , Small angle scattering. Modern methods of surface observation: STM, AFM. Synchrotron radiation in material science research.

#### **Recommended literature:**

1.S. Amelincks, D.van Dyck, J. van Landyut, Electron Microscopy – Principles and Fundamentals, VCH, 1997.

2.M.H. Loretto, Electrom beam analysis of materials. Springer, 2002.

3.Fundamentals of Powder Diffraction and Structural Characterization of Materials, Vitalij K. Pecharsky & Peter Y. Zavalij , Kluwer Academic Publishers, 2003.

4.Structure Determination from Powder Diffraction Data, Edited by W.I.F. David, K. Shankland, L.B. McCusker, C. Bärlocher, Oxford University Press, 2006

#### **Course language:**

English

<b>Course assessment</b> Total number of assessed students: 65				
Ν	Р			
0.0	100.0			
<b>Provides:</b> prof. RNDr. Pavol Sovák, CSc., doc. Ing. Karel Saksl, DrSc., RNDr. Jozef Bednarčík, PhD.				
Date of last modification: 03.05.2015				
Approved:				

University: P. J. Šafárik University in Košice					
Faculty: Faculty of S	cience				
Course ID: ÚFV/ DK/04	<b>Course ID:</b> ÚFV/ <b>Course name:</b> National Conference				
Course type, scope a Course type: Recommended cour Per week: Per stud Course method: pre	Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present				
Number of ECTS cr	edits: 2				
Recommended seme	ster/trimester of the cours	e:			
Course level: III.					
Prerequisities:					
Conditions for cours	e completion:				
Learning outcomes:					
Brief outline of the c	ourse:				
Recommended litera	iture:				
Course language:					
Notes:	Notes:				
Course assessment Total number of assessed students: 143					
abs n					
100.0 0.0					
Provides:					
Date of last modification:					
Approved:					

University: P. J. Šafárik University in Košice					
Faculty: Faculty of S	cience				
Course ID: ÚFV/ NZ/04	<b>Course name:</b> Non-review published abroad or in the	<b>Course name:</b> Non-reviewed collections of papers and monographs published abroad or in the country of residence			
Course type, scope a Course type: Recommended cour Per week: Per stud Course method: pre	nd the method: rse-load (hours): ly period: esent				
Number of ECTS cro	edits: 2				
Recommended seme	ster/trimester of the cours	e:			
Course level: III.					
Prerequisities:					
Conditions for cours	e completion:				
Learning outcomes:	Learning outcomes:				
Brief outline of the c	ourse:				
Recommended litera	iture:				
Course language:					
Notes:					
Course assessment Total number of assessed students: 109					
abs n					
100.0 0.0					
Provides:					
Date of last modification:					
Approved:					

University: P. J. Šafárik University in Košice					
Faculty: Faculty of S	cience				
<b>Course ID:</b> KPE/ PgVU/17	Course na	me: Pedagogy for university	teachers		
Course type, scope a Course type: Lectur Recommended cour Per week: Per stud Course method: pre	nd the meth re rse-load (ho y period: 2 esent	hod: ours): 8s			
Number of ECTS cr	edits: 5				
Recommended seme	ster/trimest	ter of the course:			
Course level: III.					
Prerequisities:					
Conditions for cours	e completio	on:			
Learning outcomes:					
Brief outline of the c	ourse:				
Recommended litera	ture:				
Course language:					
Notes:					
Course assessment Total number of assessed students: 33					
abs	abs n neabs				
100.0 0.0 0.0					
Provides: doc. PaedDr. Renáta Orosová, PhD.					
Date of last modification: 08.06.2021					
Approved:					

University: P. J. Šafá	University: P. J. Šafárik University in Košice				
Faculty: Faculty of S	cience				
Course ID: ÚFV/ VYS/04	Course ID: ÚFV/ Course name: Presentation in Seminar				
Course type, scope a Course type: Recommended cour Per week: Per stud Course method: pre	nd the method: rse-load (hours): ly period: esent				
Number of ECTS cr	edits: 2				
Recommended seme	ster/trimester of the cours	e:			
Course level: III.					
Prerequisities:					
Conditions for cours	e completion:				
Learning outcomes:					
Brief outline of the c	ourse:				
Recommended litera	iture:				
Course language:	Course language:				
Notes:	Notes:				
Course assessment Total number of assessed students: 369					
abs n					
100.0 0.0					
Provides:					
Date of last modification:					
Approved:					

Faculty: Faculty of Science         Course ID: ÚFV/         NSM/12       Course name: Processing, properties and applications of nanomaterials         Course type, scope and the method:       Course type: Lecture         Recommended course-load (hours):       Per week: 2 Per study period: 28         Course method: present       Course method: present	University: P. J. Šafárik University in Košice				
Course ID: ÚFV/ NSM/12Course name: Processing, properties and applications of nanomaterialsCourse type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present	Faculty: Faculty of S	cience			
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present	Course ID: ÚFV/ NSM/12Course name: Processing, properties and applications of nanomaterials				
	Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present				

Number of ECTS credits: 5

**Recommended semester/trimester of the course:** 

Course level: III.

Prerequisities:

#### **Conditions for course completion:**

Final written test: 50%

The ppt presentation from selected topic:50%

## Learning outcomes:

To obtain the newest information about processing of nanostructured materials. To use concrete examples of nanostructured materials for documentation of their unique properties and also to indicate their possibilities for applications in real technical practise.

#### Brief outline of the course:

Processing of magnetic nanomaterials using litography methods. Production and properties of thin films and multilayers. Processing of nanocrystalline metals, alloys and composites by electrodeposition. Diffusion in nanocrystalline materials: modelling of interface diffusion, specific aspects, correlation between diffusion and grain boundaries, selected examples of diffusion. Magnetic nanoparticles and their applications, fundamental physics of nanoparticles: bulk feromagnetism, magnetic clusters, molecular magnetism, ideal monodomain particle, surface and interface effects, exchange interactions between nanoparticles. Magnetic properties of some nanosystems: amorphous Fe-M-B alloys, FINEMET, influence of atomic substitutions on properties of FINEMET based alloys, Fe-Zr-Nb-B alloys, Fe-Nb-B-P-Cu alloys produced in atmosphere, influence of grain size on Currie temperature and on volume fraction of amorphous matrix. Mechanical properties of NCM: models and computer simulations of mechanical behaviour, density, pores and microcracks, hardness, yield and ultimate strengths, ductility of NCM. Nanostructured Electronics and Optoelectronic materials: NCM and data storage, nanorobotics, nanoelectronics – superlattice, quantum waves and dots, porous Si and Si clusters.

#### **Recommended literature:**

1. C.C. Koch, Nanostructured Materials – processing, Properties and Applications, WA Publishing, 2007.

Springer Hanbook of Nanotechnology, B. Bhusnan (Ed.), Springer 2007.

- 2. Nanomagnetism and Spintronics, T. Shinjo (Ed.) Elsevier 2009.
- 3. M.A. White, Physical Properties of Materials, CRC Press 2012.
- 4. N. Dahotre and A. Samant, Laser Machining of Advanced Materials, CRC Press 2011.
- 5. R. Oganov, Modern Methods of Crystal structure Prediction, Wiley-VCH, 2011.

<ul><li>6. G.B. Sergeev, Nanochemistry, Elsevier 2008.</li><li>7. M.A.Mayers et al: Nano and Microstructural Design of Advanced Materials, Elsevier 2003.</li></ul>				
Course language: english				
Notes:				
<b>Course assessment</b> Total number of assessed students: 21				
Ν	Р			
0.0	100.0			
Provides: Mgr. Vladimír Komanický, Ph.D.				
Date of last modification: 03.05.2015				
Approved:				

University: P. J. Šafárik University in Košice				
Faculty: Faculty of Science				
Course ID: KPPaPZ/PsVU/17Course name: Psychology for University Lecturers				
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: Per study period: 28s Course method: present				
Number of ECTS credits: 5				
Recommended semester/trimester of the course:				
Course level: III.				
Prerequisities:				
Conditions for course completion:				
Learning outcomes:				
teacher in relation to himself (cognitive, personality, social competencies and competencies in the use of methods), in relation to students and as part of the teacher-student relationship based on selected areas of cognitive psychology, psychology of emotions and motivation, developmental psychology, social psychology, educational psychology and health psychology with application to the university environment.				
Recommended literature: Alexitch, L. R. (2005). Applying social psychology to education. Social Psychology.–Ed.: Schneider F., Gruman J., Coutts L.–Sage Publications, Inc, 205-228. Fry, H., Ketteridge, S., & Marshall, S. (2008). A handbook for teaching and learning in higher education: Enhancing academic practice. Routledge. Mareš, J.: Pedagogická psychologie. Portál, 2013. Kniha psychologie. Universum, 2014 Čáp, J., Mareš, J.: Psychologie pro učitele. Praha: Portál 2007. Vágnerová M.: Školní poradenská psychológie pro pedagogy. Praha: Karolínum 2005				
Course language:				
Notes:				
Course assessment Total number of assessed students: 37				
abs n neabs				
100.0 0.0 0.0				
Provides: PhDr. Anna Janovská, PhD.				
Date of last modification: 28.06.2021				

Approved:

University: P. J. Šafárik University in Košice							
Faculty: Fa	culty of Sc	ience					
<b>Course ID:</b> KTM/14	ÚFV/	Course name:	: Quantum T	heory of Ma	gnetism		
Course typ Course tyj Recomme Per week: Course me	Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 3 Per study period: 42 Course method: present						
Number of	ECTS cree	dits: 5					
Recommen	ded semest	ter/trimester	of the cours	e:			
Course leve	el: II., III.						
Prerequisit	ies:						
Conditions	for course	completion:					
Learning o	utcomes:						
The definition of basic lattice-statistical models in the quantum theory of magnetism. The one-dimensional quantum Heisenberg model, spin waves and the grounds of Bethe-ansatz method. Valence-bond-crystal ground states of the Majumdar-Ghosh and Shastry-Sutherland models. The one-dimensional quantum XY model in a transverse magnetic field, Jordan-Wigner fermionization and quantum critical points. The spin-wave theory, bosonization and Holstein-Primakoff transformation.							
<ul> <li>Recommended literature:</li> <li>1. J. B. Parkinson, D. J. J. Farnell, An Introduction to Quantum Spin Systems, Lecture Notes in Physics 816 (Springer, Berlin Heidelberg, 2010).</li> <li>2. U. Schollwock, J. Richter, D. J. J. Farnell, R. F. Bishop, Quantum Magnetism, Lecture Notes in Physics 645 (Springer, Berlin Heidelberg, 2004).</li> <li>3. N. Majlis, The Quantum Theory of Magnetism (World Scientific, Singapore, 2000).</li> </ul>							
Course language: EN - english							
Notes:	Notes:						
Course assessment Total number of assessed students: 22							
А	В	C	D	Е	FX	N	Р
13.64	36.36	18.18	4.55	9.09	4.55	0.0	13.64
Provides: doc. RNDr. Jozef Strečka, PhD.							
Date of last modification: 03.05.2015							
Approved:							
•							

Faculty: Faculty of Scie         Course ID: ÚFV/         C         PSM/12	ence	
Course ID: ÚFV/ C	ourse name: Rastrovacie sondové mikroskonie	
KSIVI/12		
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present		
Number of ECTS cred	lits: 3	
Recommended semeste	er/trimester of the course:	
Course level: III.		
Prerequisities:		
Conditions for course of oral exam	completion:	
Learning outcomes: Students will learn basi	c principles and state of the art techniques of scanning probe microscopies	
Principles of scanning p spectroscopy of metals preparation of crystal su 1. Introduction – From Optical microscopy, ele 2. Quantum tunneling History, theory, tunnel temperature and magne 3. Scanning tunneling n Piezoelectric effect in S controller electronics, s numerical methods of d 4. Tunneling spectrosco Principles of tunneling structure of metals, se conductance vs. voltag spectroscopy (CITS), nu and various nanostructu 5. Tunneling spectrosco NIS and SIS tunneling field, superconducting 6. Point contact spectro Elastic and non-elastic	<ul> <li>probe microscopies (STM, AFM, MFM etc.), tunneling and point contact s and superconductors, experiments in vacuum and at low temperatures, urfaces, monolayers and thin films.</li> <li>optical microscope to scanning tunneling microscope ectron microscopy, scanning tunneling microscopy</li> <li>ling current and conductivity, tunneling current vs. barrier, effect of etic field nicroscopy (STM)</li> <li>STM, methods of approaching the STM tip to the surface of the sample, scanning modes, principles of the PID feedback loop, topography imaging, lata analysis.</li> <li>opy (TS)</li> <li>g spectroscopy, tunneling through planar and vacuum barrier, electronic emiconductors and superconductors; Current vs. voltage and differential ge characteristics, controller electronics, conductance imaging tunneling umerical methods of data analysis; TS of metals, semiconductors, molecules ares</li> <li>opy of superconductors</li> <li>contacts, superconducting energy gap, effect of temperature and magnetic vortices, vortex pinning and dynamics</li> <li>pector of metals and superconductors; types of point contacts: thin films,</li> </ul>	

7. Experimental methods

Mechanical design; Low temperatures equipment: historical overview, helium liquefaction, cooling methods, refrigerator types, low temperature technologies; vacuum equipment: pumping, pressure gauges, vacuum technologies; sample preparation: surface cleaning, preparation of thin films and nanostructures by evaporation, sputtering etc.

8. Visit of low temperature STM laboratory, experiment preparation and realization

9. Scanning probe microscopies (SPM)

History, principles of Atomic force microscope (AFM), scanning modes, detection of the probe - sample interaction; some other types of SPM: magnetic force microscopy, Kelvin probe microscopy, scanning Hall probe microscopy,

10. STM modifications

Spin polarized STM, electrochemical STM, Fourier transformation STM, Josephson STM etc. 11. Nanomanipulation, Lithography by SPM

Dip pen, local anodic oxidation, nanoscratching, nanoindentation, atomic manipulation etc. 12. Visit of SPM and nanotechnology laboratory, experiment preparation and realization

12. Visit of SPM and nanotechnology laboratory, experiment preparation and realization

#### **Recommended literature:**

Roland Wiesendanger: Scanning Probe Microscopy and Spectroscopy: Methods and Applications, Cambridge University Press 1994

Yu.G. Naidyuk, I.K. Yanson: Point contact spectroscopy, Springer, 2003

E.L. Wolf: Principles of electron tunneling spectroscopy, Oxford university press, 1989

K. Oura, V.G. Lifshits, A.A. Saranin, A.V. Zotov, M. Katayama: Surface Science: An Introduction, Springer, Berlín 2003

P. Samuely (ed.), Kryofyzika a nanoelektronika, ÚEF SAV 2011

## **Course language:**

Slovak or English

#### Notes:

# Course assessment

Total number of assessed students: 8

Ν	Р	
0.0	100.0	
Provides: Mgr. Tomáš Samuely, PhD.		
Date of last modification: 15.06.2021		
Approved:		

University: P. J. Šafá	University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science			
<b>Course ID:</b> ÚFV/ RZ/04	ourse ID: ÚFV/ Course name: Reviewed Proceedings Z/04		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 5		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the c	ourse:		
Recommended litera	Recommended literature:		
Course language:			
Notes:			
Course assessment Total number of assessed students: 235			
abs n			
	100.0 0.0		
Provides:			
Date of last modification:			
Approved:	Approved:		

University:	University: P. J. Šafárik University in Košice						
Faculty: Fa	Faculty: Faculty of Science						
<b>Course ID:</b> VPM/18	ÚFV/ (	<b>Course name:</b> Selected problems of numerical methods in micro- magnetism					
Course typ Course typ Recomme Per week: Course me	Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 1 Per study period: 14 Course method: present						
Number of	ECTS cree	dits: 2					
Recommen	ded semest	ter/trimester	of the cours	<b>e:</b> 2., 4.			
Course leve	el: II., III.						
Prerequisit	ies:						
Conditions	for course	completion:					
Learning o	utcomes:						
Brief outlin	Brief outline of the course:						
Recommen	Recommended literature:						
Course lang	Course language:						
Notes:	Notes:						
Course assessment Total number of assessed students: 0							
А	В	C	D	Е	FX	N	Р
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Provides: RNDr. Kornel Richter, PhD.							
Date of last	Date of last modification: 09.03.2018						
Approved:	Approved:						

University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science		
<b>Course ID:</b> ÚFV/ SFKL1a/04	Course name: Seminar in	Solid State Physics
Course type, scope and the method: Course type: Lecture / Practice Recommended course-load (hours): Per week: 1 / 1 Per study period: 14 / 14 Course method: present		
Number of ECTS cr	edits: 3	
Recommended seme	ster/trimester of the cours	se: 1.
Course level: III.		
Prerequisities:		
<b>Conditions for course completion:</b> Participation on the seminars (valid also for on-line form of presentations). Students are obliged to participate on the seminars. Reasons should be given for any absence, students may absent up to twice per semester without further consequences. For more frequent absence student will prepare presentation focused on a topic which will be consulted with the supervisor of the seminar. Each student has to present at least one his/her contribution, usually before defending his/her diploma thesis.		
<b>Learning outcomes:</b> Students will obtain informations about scientific results of various research groups from Košice and from their cooperating foreign institutions and will be stimulated for scientific discussion. They will also improve their presentation skills.		
<b>Brief outline of the course:</b> The program of seminars from condensed matter physics is prepared every year and is devoted to the recent results achieved in the field of condensed matter physics and material research at the laboratories in Košice and abroad. Scientific workers from laboratories from Košice as well as domestic and foreign guests give the talks. The program also involves presentation of PhD and diploma theses.		
Recommended literature: Selected scientific journals.		
Course language: Slovak, English		
Notes:		
Course assessment Total number of assessed students: 99		
	abs	n
	100.0	0.0

**Provides:** doc. RNDr. Alžbeta Orendáčová, DrSc., Dr.h.c. prof. RNDr. Alexander Feher, DrSc., prof. Ing. Martin Orendáč, DrSc.

Date of last modification: 02.07.2021

Approved:

University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science		
Course ID: ÚFV/ SFKL1b/04	Course name: Seminar in Solid State Physics	
Course type, scope and the method: Course type: Lecture / Practice Recommended course-load (hours): Per week: 1 / 1 Per study period: 14 / 14 Course method: present		
Number of ECTS cre	dits: 3	
Recommended semes	ter/trimester of the cours	e: 2.
Course level: III.		
Prerequisities:		
<ul> <li>Conditions for course completion:</li> <li>1. Participation on the seminars (valid also for on-line form of presentations). Students are obliged to participate on the seminars. Reasons should be given for any absence, students may absent up to twice per semester without further consequences. For more frequent absence student will prepare presentation focused on a topic which will be consulted with the supervisor of the seminar. Each student has to present at least one his/her contribution, usually before defending his/her diploma thesis.</li> <li>2. Activity on the seminar, participation in discussion. Level of presenting student's own presentation.</li> </ul>		
<b>Learning outcomes:</b> Students will obtain informations about scientific results of various research groups from Košice and from their cooperating foreign institutions and will be stimulated for scientific discussion. They will also improve their presentation skills.		
<b>Brief outline of the course:</b> The program of seminars from condensed matter physics is prepared every year and is devoted to the recent results achieved in the field of condensed matter physics and material research at the laboratories in Košice and abroad. Scientific workers from laboratories from Košice as well as domestic and foreign guests give the talks. The program also involves presentation of PhD and diploma theses.		
Recommended literature: Selected scientific journals.		
Course language:		
Notes:		
Course assessment Total number of assessed students: 99		
	abs	n
1	100.0 0.0	

Provides: Dr.h.c. prof. RNDr. Alexander Feher, DrSc., prof. Ing. Martin Orendáč, DrSc.

Date of last modification: 02.07.2021

Approved:

University: P. J. Šafá	irik University in Košice	
Faculty: Faculty of S	Science	
Course ID: ÚFV/ SFKL2a/04	Course name: Seminar in Solid State Physics	
Course type, scope and the method: Course type: Lecture / Practice Recommended course-load (hours): Per week: 1 / 1 Per study period: 14 / 14 Course method: present		
Number of ECTS cr	redits: 3	
Recommended seme	ester/trimester of the course: 3.	
Course level: III.		
Prerequisities:		
Conditions for course 1. Participation on the to participate on the set twice per semester we presentation focused student has to present thesis. 2. Activity on the presentation.	se completion: the seminars (valid also for on-line form of presentations). Students are obliged seminars. Reasons should be given for any absence, students may absent up to without further consequences. For more frequent absence student will prepare on a topic which will be consulted with the supervisor of the seminar. Each at a least one his/her contribution, usually before defending his/her diploma seminar, participation in discussion. Level of presenting student's own	
Learning outcomes: Students will obtain and from their cooper will also improve the	informations about scientific results of various research groups from Košice rating foreign institutions and will be stimulated for scientific discussion. They eir presentation skills.	
Brief outline of the of The program of sem to the recent results the laboratories in K as domestic and fore	course: ninars from condensed matter physics is prepared every year and is devoted achieved in the field of condensed matter physics and material research at cošice and abroad. Scientific workers from laboratories from Košice as well ign guests give the talks. The program also involves presentation of PhD and	

**Recommended literature:** 

Selected scientific journals.

## **Course language:**

Slovak, English

diploma theses.

Course assessment Total number of assessed students: 86		
abs	n	
100.0	0.0	
<b>Provides:</b> doc. RNDr. Alžbeta Orendáčová, DrSc., Dr.h.c. prof. RNDr. Alexander Feher, DrSc., prof. Ing. Martin Orendáč, DrSc.		
Date of last modification: 02.07.2021		
Approved:		

University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science		
Course ID: ÚFV/ SFKL2b/04	Course name: Seminar in	Solid State Physics
Course type, scope and the method: Course type: Lecture / Practice Recommended course-load (hours): Per week: 1 / 1 Per study period: 14 / 14 Course method: present		
Number of ECTS cr	edits: 3	
Recommended seme	ster/trimester of the cours	se: 4.
Course level: III.		
Prerequisities:		
Conditions for course 1. Participation on the to participate on the set twice per semester we presentation focused student has to present thesis. 2. Activity on the presentation.	<b>Se completion:</b> e seminars (valid also for or seminars. Reasons should be rithout further consequences on a topic which will be co at at least one his/her contri seminar, participation in	a-line form of presentations). Students are obliged e given for any absence, students may absent up to s. For more frequent absence student will prepare onsulted with the supervisor of the seminar. Each bution, usually before defending his/her diploma discussion. Level of presenting student's own
<b>Learning outcomes:</b> Students will obtain informations about scientific results of various research groups from Košice and from their cooperating foreign institutions and will be stimulated for scientific discussion. They will also improve their presentation skills.		
Brief outline of the course: Contents is determined by the lectures and varies every year.		
Recommended literature: Selected scientific journals.		
Course language:		
Notes:		
Course assessment Total number of asse	ssed students: 90	
	abs	n
	100.0 0.0	
Provides: prof. Ing. Martin Orendáč, DrSc., Dr.h.c. prof. RNDr. Alexander Feher, DrSc.		
Date of last modification: 02.07.2021		
Approved:		

University: P. J. Šafárik University in Košice		
Faculty: Faculty of S	Science	
Course ID: ÚFV/ SFKL3a/04	Course name: Seminar in Solid State Physics	
Course type, scope and the method: Course type: Lecture / Practice Recommended course-load (hours): Per week: 1 / 1 Per study period: 14 / 14 Course method: present Number of ECTS credits: 3 Recommended semester/trimester of the course: 5.		
Prerequisities.		
Conditions for cour 1. Participation on the to participate on the twice per semester w presentation focused student has to present thesis. 2. Activity on the presentation.	<b>se completion:</b> ne seminars (valid also for on-line form of presentations). Students are obliged seminars. Reasons should be given for any absence, students may absent up to vithout further consequences. For more frequent absence student will prepare l on a topic which will be consulted with the supervisor of the seminar. Each nt at least one his/her contribution, usually before defending his/her diploma seminar, participation in discussion. Level of presenting student's own	
Learning outcomes: Students will obtain and from their coope will also improve the	informations about scientific results of various research groups from Košice rating foreign institutions and will be stimulated for scientific discussion. They eir presentation skills.	
Brief outline of the of the program of sent to the recent results	<b>course:</b> ninars from condensed matter physics is prepared every year and is devoted achieved in the field of condensed matter physics and material research at	

to the recent results achieved in the field of condensed matter physics is propared every year and is devoted to the recent results achieved in the field of condensed matter physics and material research at the laboratories in Košice and abroad. Scientific workers from laboratories from Košice as well as domestic and foreign guests give the talks. The program also involves presentation of PhD and diploma theses.

## **Recommended literature:**

Selected scientific journals.

## Course language:

Slovak, English

Course assessment Total number of assessed students: 75		
abs	n	
100.0	0.0	
<b>Provides:</b> doc. RNDr. Alžbeta Orendáčová, DrSc., Dr.h.c. prof. RNDr. Alexander Feher, DrSc., prof. Ing. Martin Orendáč, DrSc.		
Date of last modification: 02.07.2021		
Approved:		

University: P. J. Šafárik University	in Košice		
Faculty: Faculty of Science			
Course ID: ÚFV/ SFKL3b/04Course nam	e: Seminar in Solid State Physics		
Course type, scope and the metho Course type: Lecture / Practice Recommended course-load (hou Per week: 1 / 1 Per study period Course method: present	Course type, scope and the method: Course type: Lecture / Practice Recommended course-load (hours): Per week: 1 / 1 Per study period: 14 / 14 Course method: present		
Recommended semester/trimeste	r of the course: 6.		
Course level: III.			
Prerequisities:			
<ul> <li>Conditions for course completion</li> <li>1. Participation on the seminars (va to participate on the seminars. Reas twice per semester without further presentation focused on a topic wh student has to present at least one thesis.</li> <li>2. Activity on the seminar, part presentation.</li> </ul>	: ilid also for on-line form of presentations). Students are obliged sons should be given for any absence, students may absent up to consequences. For more frequent absence student will prepare hich will be consulted with the supervisor of the seminar. Each his/her contribution, usually before defending his/her diploma icipation in discussion. Level of presenting student's own		
Learning outcomes: Students will obtain informations about scientific results of various research groups from Košice and from their cooperating foreign institutions and will be stimulated for scientific discussion. They will also improve their presentation skills.			
<b>Brief outline of the course:</b> The program of seminars from condensed matter physics is prepared every year and is devoted to the recent results achieved in the field of condensed matter physics and material research at the laboratories in Košice and abroad. Scientific workers from laboratories from Košice as well as domestic and foreign guests give the talks. The program also involves presentation of PhD and diploma theses.			
Recommended literature: Selected scientific journals.			

# **Course language:** Slovak, English

Course assessment			
Total number of assessed students: 74			
abs n			
100.0 0.0			
Provides: Dr.h.c. prof. RNDr. Alexander Feher, DrSc., prof. Ing. Martin Orendáč, DrSc.			
Date of last modification: 02.07.2021			
Approved:			

University: P. J. Šafárik University in Košice				
Faculty: Faculty of Science				
<b>Course ID:</b> ÚFV/ SFKL4a/04	Course name: Seminar in Solid State Physics			
Course type, scope and the method: Course type: Lecture / Practice Recommended course-load (hours): Per week: 1 / 1 Per study period: 14 / 14 Course method: present				
Recommended seme	Calls: 3 ————————————————————————————————————			
Course level: III				
Prerequisities:				
<ol> <li>Participation on the store per semester w presentation focused student has to present thesis.</li> <li>Activity on the presentation.</li> </ol>	e seminars (valid also for on-line form of presentations). Students are obliged eminars. Reasons should be given for any absence, students may absent up to ithout further consequences. For more frequent absence student will prepare on a topic which will be consulted with the supervisor of the seminar. Each t at least one his/her contribution, usually before defending his/her diploma seminar, participation in discussion. Level of presenting student's own			
Learning outcomes: Students will obtain informations about scientific results of various research groups from Košice and from their cooperating foreign institutions and will be stimulated for scientific discussion. They will also improve their presentation skills.				
<b>Brief outline of the course:</b> The program of seminars from condensed matter physics is prepared every year and is devoted to the recent results achieved in the field of condensed matter physics and material research at the laboratories in Košice and abroad. Scientific workers from laboratories from Košice as well as domestic and foreign guests give the talks. The program also involves presentation of PhD and diploma theses.				
<b>Recommended litera</b> Selected scientific jou	urnals.			

# **Course language:** Slovak, English

Course assessment Total number of assessed students: 65			
abs n			
100.0	0.0		
<b>Provides:</b> doc. RNDr. Alžbeta Orendáčová, DrSc., Dr.h.c. prof. RNDr. Alexander Feher, DrSc., prof. Ing. Martin Orendáč, DrSc.			
Date of last modification: 02.07.2021			
Approved:			

COURSE INFORMATION LETTER				
University: P. J. Šafárik University in Košice				
Faculty: Faculty of Science				
<b>Course ID:</b> ÚFV/ SFKL4b/04	Course name: Seminar in Solid State Physics			
Course type, scope and the method: Course type: Lecture / Practice Recommended course-load (hours): Per week: 1 / 1 Per study period: 14 / 14 Course method: present				
Recommended seme	ster/trimester of the course: 8			
Course level: III.				
Prerequisities:				
<ol> <li>Participation on the seminars (valid also for on-line form of presentations). Students are obliged to participate on the seminars. Reasons should be given for any absence, students may absent up to twice per semester without further consequences. For more frequent absence student will prepare presentation focused on a topic which will be consulted with the supervisor of the seminar. Each student has to present at least one his/her contribution, usually before defending his/her diploma thesis.</li> <li>Activity on the seminar, participation in discussion. Level of presenting student's own presentation.</li> </ol>				
Learning outcomes: Students will obtain i and from their cooper will also improve the	informations about scientific results of various research groups from Košice ating foreign institutions and will be stimulated for scientific discussion. They ir presentation skills.			
<b>Brief outline of the course:</b> The program of seminars from condensed matter physics is prepared every year and is devoted to the recent results achieved in the field of condensed matter physics and material research at the laboratories in Košice and abroad. Scientific workers from laboratories from Košice as well as domestic and foreign guests give the talks. The program also involves presentation of PhD and diploma theses.				
Recommended litera Selected scientific jou	<b>ture:</b> armals.			
Course language:				

Slovak, English

Course assessment Total number of assessed students: 66			
abs n			
100.0 0.0			
Provides: Dr.h.c. prof. RNDr. Alexander Feher, DrSc., prof. Ing. Martin Orendáč, DrSc.			
Date of last modification: 02.07.2021			
Approved:			

University:	P. J. Šafár	ik University in	n Košice				
Faculty: Fa	Faculty: Faculty of Science						
<b>Course ID:</b> SAA/18	ÚFV/	Course name: Sensors and actuators based on selected physical phenomena					
Course type Course type Recommen Per week: Course me	e, scope ar pe: Lecture nded cour 1 Per stuc ethod: pres	nd the method e se-load (hours ly period: 14 sent	: )):				
Number of	ECTS cre	dits: 2					
Recommen	ded semes	ter/trimester	of the cours	<b>e:</b> 2., 4.			
Course leve	el: II., III.						
Prerequisit	ies:						
Conditions	for course	e completion:					
Learning of	utcomes:						
Brief outlin	e of the co	ourse:					
Recommen	Recommended literature:						
Course lang	Course language:						
Notes:							
Course assessment Total number of assessed students: 3							
A	В	C	D	Е	FX	N	Р
33.33	0.0	0.0	0.0	0.0	0.0	0.0	66.67
Provides: prof. RNDr. Rastislav Varga, DrSc., RNDr. Ladislav Galdun, PhD.							
Date of last modification: 09.03.2018							
Approved:	Approved:						

University: P. J. Šafár	rik University in Košice			
Faculty: Faculty of Science				
Course ID: Dek. PF UPJŠ/JSD/14	Course ID: Dek. PF Course name: Spring School for PhD Students JPJŠ/JSD/14			
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: Per study period: 4d Course method: present				
Number of ECTS cro	edits: 2			
Recommended seme	ster/trimester of the cours	e:		
Course level: III.				
Prerequisities:				
Conditions for cours	e completion:			
Learning outcomes:	Learning outcomes:			
Brief outline of the c	Brief outline of the course:			
Recommended litera	iture:			
Course language:				
Notes:				
Course assessment Total number of assessed students: 154				
	abs n			
100.0 0.0			)	
Provides: doc. RNDr. Marián Kireš, PhD.				
Date of last modification: 03.05.2015				
Approved:				

University: P. J. Šafárik University in Košice					
Faculty: Faculty of Science					
Course ID: ÚFV/ SVM/07	Course name: Structural properties of materials				
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present					
Number of ECTS cr	edits: 5				
Recommended seme	ster/trimester of the cours	2:			
Course level: III.					
Prerequisities:					
Conditions for cours successful passing fir	e completion: nal exam				
Learning outcomes: Obtaining knowledge transformation in sele	<b>Learning outcomes:</b> Obtaining knowledge on preparation, structure, influence of defects, phase equilibrium and phase transformation in selected types of unconventional materials.				
<b>Brief outline of the course:</b> Crystal structure of metals, alloys, intermetalics, ceramics and glasses. Crystal defects and their influence on properties of materials. Phase diagrams and phase transformations, solidification, crystal growth. Preparation and properties of progressive single-crystalline, polycrystalline, nano-crystalline and glassy materials.					
Recommended literature: J. M. Ziman, The Physics of Metals, Cambridge University press, Cambridge, 2011. J. Blackman, Handbook of Metal Physics: Metalic Nanoparticles, Elsevier Science, 2009.					
Course language: Slovak, English					
Notes:					
Course assessment Total number of assessed students: 1					
N P					
	0.0 100.0				
Provides: Ing. Pavel Diko, DrSc.					
Date of last modification: 03.05.2015					
Approved:					

University: P. J. Šafárik University in Košice			
Faculty: Faculty of Science			
<b>Course ID:</b> ÚFV/ ZSP/04	: ÚFV/ Course name: Study Stay Abroad		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 2		
Recommended seme	ster/trimester of the cours	2:	
Course level: III.			
Prerequisities:			
Conditions for cours	e completion:		
Learning outcomes:			
Brief outline of the course:			
<b>Recommended litera</b>	iture:		
Course language:	Course language:		
Notes:			
Course assessment Total number of assessed students: 259			
abs n			
100.0 0.0			
Provides:			
Date of last modification:			
Approved:			
University: P. J. Šafá	rik University in Košice		
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Faculty: Faculty of Science			
Course ID: ÚFV/ VPSV/04	Course name: Supervision of Student's Scientific Activity		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 6		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.			
Prerequisities:			
Conditions for cours	Conditions for course completion:		
Learning outcomes:	Learning outcomes:		
Brief outline of the course:			
Recommended literature:			
Course language:			
Notes:			
Course assessment Total number of assessed students: 16			
	abs	n	
	100.0	0.0	
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafá	University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science			
Course ID: ÚFV/ VBP/04	Course name: Supervisor/consultant of bacelor thesis		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 6		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.	Course level: III.		
Prerequisities:			
Conditions for cours	Conditions for course completion:		
Learning outcomes:			
Brief outline of the course:			
Recommended literature:			
Course language:			
Notes:			
Course assessment Total number of assessed students: 40			
	abs	n	
	100.0	0.0	
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafá	University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science			
Course ID: ÚFV/ PPC/04	Course name: Teaching activities		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 1		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.	Course level: III.		
Prerequisities:			
Conditions for course completion:			
Learning outcomes:			
Brief outline of the course:			
Recommended literature:			
Course language:			
Notes:			
Course assessment Total number of assessed students: 252			
	abs	n	
	100.0	0.0	
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafárik University in Košice			
Faculty: Faculty of S	cience		
Course ID: ÚFV/ TS/12	Course name: Termodynamika supravodičov		
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present			
Number of ECTS credits: 3			
Recommended semester/trimester of the course:			
Course level: III.			
Prerequisities:			
Conditions for course completion: Succesful passing final exam			
<b>Learning outcomes:</b> Introduction of basic theoretical and experimental aspects of thermodynamic properties of superconductors with a focus on the modulated calorimetry.			

#### Brief outline of the course:

Thermodynamic properties of superconductors (entropy, heat capacity in normal and superconducting state). Methods of heat capacity measurements (adiabatic, relaxation, pulsed, modulated). Modulated calorimetry – historical overview. Modulated calorimetry – theoretical basis. Modulated calorimetry – experiment (experimental setup, measurement of temperature and temperature oscillations). Heat capacity of superconductors in zero magnetic field – alpha model. Heat capacity of superconductors in zero and non-zero magnetic field – temperature dependence and its relation to the properties of an s-wave superconductor (determination of the upper critical field, thermodynamic critical field, superconducting energy gap, type of coupling). Heat capacity of superconductors in non-zero magnetic field – field dependence and its relation to the the properties of a superconductor. Heat capacity in special cases – two-gap superconductor, d-wave superconductor.

### **Recommended literature:**

M. Tinkham, Introduction to superconductivity, McGraw-Hill, Inc., New York, 1996. Yaakov Kraftmakher, Modulation Calorimetry: Theory And Applications, Springer-Verlag, 2004. Specific heat of solids, Edited by C. Y. Ho, Hemisphere publishing corporation, 1988.

### **Course language:**

Slovak, English

Notes:

Course assessment		
Total number of assessed students: 6		
Ν	Р	
0.0	100.0	
Provides: RNDr. Jozef Kačmarčík, PhD., RNDr. Zuzana Vargaeštoková, PhD.		
Date of last modification: 03.05.2015		
Approved:		

University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science		
<b>Course ID:</b> ÚFV/ TSK/12	Course name: Teória silne	korelovaných elektrónových systémov
Course type, scope and the method: Course type: Lecture Recommended course-load (hours): Per week: 2 Per study period: 28 Course method: present		
Number of ECTS cr	edits: 5	
Recommended seme	ster/trimester of the cours	e:
Course level: III.		
Prerequisities:		
<b>Conditions for cours</b> Succesful passing tes	e completion: t and final exam	
<b>Learning outcomes:</b> To provide students with models, methods and physical applications in the area of strongly correlated electron systems.		
<b>Brief outline of the course:</b> Occupation number representation. Second quantization. Models of strongly correlated electron systems. Hubbard model. Periodic Anderson model. Falicov-Kimball model. t-J model. Analytical and numerical methods in the theory of strongly correlated electron systems. Method of canonical transformations. Green's function method. Perturbation theory. Gutzwiller variation method. Lanczos method. Quantum Monte Carlo method. Collective Phenomena. Valence transitions. Metal-insulator transitions. Formation of charge and spin ordering. Electronic ferroelectricity. Itinerant magnetism. Superconductivity. BCS theory. Ginzburg-Landau theory.		
<b>Recommended literature:</b> [1] P. Farkašovský., H. Čenčariková, Cooperative phenomena in Strongly Correlated Systems, LAP Saarbucken 2011, ISBN: 978-3-8465-0611-0		
Course language: Slovak, English		
Notes:		
Course assessment Total number of assessed students: 6		
	Ν	Р
	0.0	100.0
Provides: RNDr. Pavol Farkašovský, DrSc.		
Date of last modification: 03.05.2015		
Approved:		

University: P. J. Šafá	University: P. J. Šafárik University in Košice		
Faculty: Faculty of Science			
<b>Course ID:</b> ÚFV/ POVK/04	Course name: Work in Organizing Committee of Conference		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 2		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.	Course level: III.		
Prerequisities:			
Conditions for cours	Conditions for course completion:		
Learning outcomes:			
Brief outline of the course:			
Recommended literature:			
Course language:			
Notes:			
Course assessment Total number of assessed students: 95			
	abs	n	
	100.0	0.0	
Provides:			
Date of last modification:			
Approved:			

University: P. J. Šafá	University: P. J. Šafárik University in Košice		
Faculty: Faculty of S	cience		
<b>Course ID:</b> ÚFV/ PDS/18	Course name: Writing Dissertation Work		
Course type, scope and the method: Course type: Recommended course-load (hours): Per week: Per study period: Course method: present			
Number of ECTS cr	edits: 0		
Recommended seme	ster/trimester of the cours	e:	
Course level: III.	Course level: III.		
Prerequisities:			
Conditions for cours	Conditions for course completion:		
Learning outcomes:			
Brief outline of the course:			
Recommended literature:			
Course language:			
Notes:			
Course assessment Total number of assessed students: 22			
	Ν	Р	
	0.0	100.0	
Provides:			
Date of last modification:			
Approved:			