CONTENT

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: KF/ AFS/05	**Course name:** Ancient Philosophy and Present Times
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 2.	
Course level: II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 31	

A	B	C	D	E	FX
80.65	6.45	6.45	0.0	6.45	0.0

Provides: Doc. PhDr. Peter Nezník, CSc.	
Date of last modification: 17.09.2020	
Approved: prof. Ing. Martin Orendáč, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ ARE1a/99	**Course name:** Automatization of Physical Experiments

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: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
2 tests during semester
Exam, according to the topics of the lectures.

Learning outcomes:
Design of automated setups for performing selected types of physical measurements. Discussion of properties of measuring and controlling subsystem.

Brief outline of the course:
Structure of systems of automated measurement and control. Characterization of instrumentation equiped with microcomputer. Sensors of physical quantities, principle of operation, technical realization of selected types of sensors. Elements for processing signal from sensors. Electronic regulators, software simulation of analog regulators. Standart communication protocols CAMAC, IEEE488, RS232. Universal microprocessors and microcomputers. Digital signal processing. Design of digital filters.

Recommended literature:
J. Uffenbeck, Microcomputers and microprocessors, Prentice Hall, 1985.
P. Horowitz, W. Hill, The Art of Electronics, Cambridge University Press 1989.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 58

A	B	C	D	E	FX
41.38	34.48	10.34	12.07	1.72	0.0

Provides: doc. RNDr. Erik Čižmár, PhD., prof. Ing. Martin Orendáč, CSc.

Date of last modification: 29.03.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ARE1b/99 | **Course name:** Automatization of Physical Experiments

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 3 **Per study period:** 42
Course method: present

Number of ECTS credits: 3

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities: ÚFV/ARE1a/99

Conditions for course completion:
Evaluation of results reached during solving given tasks.
Final evaluation of the obtained results.

Learning outcomes:
Obtaining practical skills in programing automated experimental setups. Extension of knowledge about properties of non-ideal digital to analog and analog to digital converters. Obtaining skills in practical programming of model situations for experimental setups designed for investigation of thermodynamic properties of solids as well as in design of digital filters. A student will also become familiar with handling selected automatedl setups designed for experimental studying solids.

Brief outline of the course:
Basic programing in Python language.
Problem solving for selected setups for automation:
Temperature controller. Nonlinearity of digital - analog and analog -digital converters. Analog - digital converter with feedback. Analog signal filtering. Study of heat flow in materials with low thermal conductivity. Digital filtering of signal.

Recommended literature:
Supporting material is available.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 32

A	B	C	D	E	FX
65.63	12.5	21.88	0.0	0.0	0.0

Provides: prof. Ing. Martin Orendáč, CSc.

Date of last modification: 29.03.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KF/KDF/05	**Course name:** Chapters from History of Philosophy of 19th and 20th Centuries (General Introduction)

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 2 **Per study period:** 28
Course method: present

Number of ECTS credits: 2

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 10

A	B	C	D	E	FX
50.0	20.0	10.0	0.0	10.0	10.0

Provides: doc. PhDr. Pavol Tholt, PhD., mim. prof.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KPPaPZ/KK/07	**Course name:** Communication and Cooperation

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 2 **Per study period:** 28
Course method: present

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 281

abs	n	z
98.22	1.78	0.0

Provides: Mgr. Ondrej Kalina, PhD., Mgr. Lucia Barbierik, PhD.

Date of last modification: 16.02.2021

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ PSM/18	**Course name:** Computer simulations in magnetochemistry

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 1 / 2 **Per study period:** 14 / 28
Course method: present

Number of ECTS credits: 3

Recommended semester/trimester of the course: 2., 4.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 3

A	B	C	D	E	FX
33.33	66.67	0.0	0.0	0.0	0.0

Provides: RNDr. Vladimír Tkáč, PhD., doc. RNDr. Erik Čižmár, PhD.

Date of last modification: 29.03.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ MSSFKL/15	**Course name:** Condensed Matter Physics

Course type, scope and the method:
Course type:
Recommended course-load (hours):
Per week: Per study period:
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course:

Course level: II.

Prerequisities: ÚFV/MKL/03,ÚFV/MSA1/03,ÚFV/FNT1/03,ÚFV/TKL1/99

Conditions for course completion:
Obtaining required number of the credits given by the study plane.

Learning outcomes:
Evaluation of the competences of the students according to the profile.

Brief outline of the course:
The state exam consists of defending diploma thesis and exam which has two blocks. The student is obliged to pass the exam from the compulsory block and one of two optional blocks.
I. Block – compulsory
Theory of condensed mater
1. Basic approximations in solid state physics. The Born-Oppenheimer adiabatic approximation. The Hartreeho-Fock method.
2. The definition of ideal crystal. The direct and reciprocal lattice. The Wigner-Seitz elementary cell.
3. Electrons in a periodic potential field. The effective mass.
4. The finite crystal and Born-Kárnan boundary conditions. Brilluoin zones.
5. The approximation of nearly-fee electrons. The band structure of energy spectrum.
6. The tight binding method. Differences of the band structure in comparison with the approximation of nearly-fee electrons.
7. The harmonic approximation and lattice vibrations . Vibrations of the linear chain with one atom per unit cell.
8. Vibrations of the linear chain with two atoms per unit cell.
9. Quantum theory of harmonic vibrations. Phonons.
10. The second quantization.
11. The electron-phonon interaction.
II. Optional block
Magnetic properties of solids
1. Magnetic moment of atom.
2. Diamagnetism.
3. Paramagnetis.
4. Ferromagnetism.
5. Antiferromagnetism.

6. Ferrimagnetism.
7. Energy of ferromagnets.
8. Domain structure.
9. Magnetization processes.
Experimental methods
10. Measurement of intensity a induction of magnetic field.
11. Measurement of magnetostriction and anisotropy.
12. Physical principle of electron microscopy, construction of electron microscop.
13. X – ray and electron diffraction and their applications in solid state physics.
14. Analytical methods for determination of surface chemical composition (EDX, WDX).
III. Optional block
Low temperature physics
1. Superfluidity of 4He.
2. Superfluidity of 3He.
3. Properties of liquid solutions 3He - 4He.
4. Quantum crystals.
5. Introduction to superconductivity – Josephson effect and its applications.
6. BCS a GLAG theories of superconductivity.
7. Unconventional superconductivity.
8. Transport of charge and heat at low temperatures.
9. Methods of reaching very low temperatures.
10. Methods of measurements of low temperatures.
Experimental methods
11. Specific heat at low temperatures - measurement techniques and data acquisition.
12. Low level signal measurements.
13. Electron - paramagnetic resonance.

Recommended literature:

Course language:
english

Notes:

Course assessment
Total number of assessed students: 16

A	B	C	D	E	FX
43.75	37.5	6.25	12.5	0.0	0.0

Provides:

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ DPO/14	**Course name:** Diploma Thesis and its Defence

Course type, scope and the method:
Course type:
Recommended course-load (hours):
Per week: **Per study period:**
Course method: present

Number of ECTS credits: 20

Recommended semester/trimester of the course:

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 53

A	B	C	D	E	FX
66.04	22.64	7.55	1.89	1.89	0.0

Provides:

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ DDS/15	**Course name:** Domain and Domain Walls

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: 2.

Course level: II., III.

Prerequisities:

Conditions for course completion:
Exam

Learning outcomes:
The objective is to acquaint the students witrh the basis of the domain and domain wall formation, their structure, static and dynamic properties in magnetic materials.

Brief outline of the course:
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:

Course assessment
Total number of assessed students: 6

A	B	C	D	E	FX	N	P
66.67	0.0	33.33	0.0	0.0	0.0	0.0	0.0

Provides: prof. RNDr. Rastislav Varga, DrSc.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ EMT1/03	**Course name:** Experimental Methods in Solid State Physics I

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: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
2 tests during semester,
Exam.

Learning outcomes:
Clarification of selected experimental techniques applied in the experimental study of solids. Discussion of physical phenomena associated with the techniques and design of model experimental setups.

Brief outline of the course:
Low level signal measurements. Study of dielectric properties. Dielectric polarization, susceptibility, permitivity. Capacitor partially filled with dielectric material. Capacitors for permitivity study in liquids and solids. Specific heat, thermal and electrical conductivity measurements. Introduction to vacuum technology. Studying Hall effect and magnetoresistance in semiconductors. Thermoelectric phenomena.

Recommended literature:
Supporting material is available.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 54

A	B	C	D	E	FX
37.04	37.04	14.81	7.41	3.7	0.0

Provides: prof. Ing. Martin Orendáč, CSc.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ EM1/03	**Course name:** Experimental Methods in Solid State Physics II

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: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Test
Oral Exam

Learning outcomes:
The subjects provides a basic overview of the solid state methods and techniques studying the surface structures as well as the quasiparticle spectra.

Brief outline of the course:
Experimental methods oriented on structural studies of solid state surfaces, superconducting vortices, magnetic and electrical surface structures. Spectroscopies with high energy resolution for studies of electron and other quasiparticles in solids.

Recommended literature:
Hajko V a kol.: Physics in Experiment, Veda, Bratislava 1998.
Kittel Ch.: Introduction to Solid State Physics, 7th edition, John Wiley and sons, NY, 1996
M. Tinkham: Introduction to Superconductivity, McGraw-Hill, Nwe York, 1996

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 62

A	B	C	D	E	FX
90.32	4.84	4.84	0.0	0.0	0.0

Provides: Mgr. Tomáš Samuely, PhD.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/GPP/18	**Course name:** Graphic programming

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: 2

Recommended semester/trimester of the course: 1., 3.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 7

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Erik Čižmár, PhD.

Date of last modification: 09.03.2018

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: KF/ DF2p/03	**Course name:** History of Philosophy 2 (General Introduction)
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 1 **Per study period:** 28 / 14 **Course method:** present	
Number of ECTS credits: 4	
Recommended semester/trimester of the course:	
Course level: I., II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 739	

A	B	C	D	E	FX
60.89	13.8	12.58	8.66	3.38	0.68

Provides: Doc. PhDr. Peter Nezník, CSc.	
Date of last modification: 25.03.2020	
Approved: prof. Ing. Martin Orendáč, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ DEJ1/99	**Course name:** History of Physics
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: 2	
Recommended semester/trimester of the course: 2., 4.	
Course level: I., II.	
Prerequisities:	
Conditions for course completion: written test and thesis exam	
Learning outcomes: Basic facts in the history of physics.	
Brief outline of the course: Evolution of knowledge before Galileo. Evolution of physics within the mechanical picture of the world. Evolution and limits of classical physics, phase of breakthrough in physics. Origin and evolution of the theory of relativity. Quantum physics and prospects of further evolution of physics and their application. Contemporary state of physical research and its application in technology, natural sciences and philosophy. Position of physics in our society.	
Recommended literature: 1. R.Zajac, J.Chrapan: Dejiny fyziky, skriptá, MFF UK, Bratislava, 1982. 2. V.Malíšek: Co víte o dějinách fyziky, Horizont, Praha, 1986. 3. I.Kraus, Fyzika v kulturních dějinách Evropy, Starověk a středověk, Nakladatelství ČVUT, Praha, 2006. 4. A.I.Abramov: Istoria jadernoj fiziky, KomKniga, Moskva, 2006. 5. L.I.Ponomarev: Pod znakom kvanta, Fizmatlit, Moskva, 2006. 6. I.Kraus, Fyzika v kulturních dějinách Evropy, Od Leonarda ke Goethovi, Nakladatelství ČVUT, Praha, 2007. 7. I.Kraus, Fyzika od Thaléta k Newtonovi, Academia, Praha, 2007. 8. I.Štoll, Dějiny fyziky, Prometheus, Praha, 2009. 9. www-pages. 10.Brandt S., The harvest of a century, Discoveries of modern physics in 100 episodes, Oxford, 2009.	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 31

A	B	C	D	E	FX
80.65	9.68	9.68	0.0	0.0	0.0

Provides: prof. RNDr. Stanislav Vokál, DrSc., doc. RNDr. Janka Vrláková, PhD.

Date of last modification: 30.03.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KF/ IH2/03	**Course name:** Idea Humanitas 2 (General Introduction)

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 2 **Per study period:** 28
Course method: present

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 9

A	B	C	D	E	FX
88.89	11.11	0.0	0.0	0.0	0.0

Provides: Doc. PhDr. Peter Nezník, CSc.

Date of last modification: 12.02.2021

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/KAK/14 | **Course name:** Liquid crystals

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: 2

Recommended semester/trimester of the course: 1., 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Discussion accompanied with the preparation and presentation of a short project

Learning outcomes:
Student will obtain basic information about structural, mechanical and optical properties of liquid crystals as well as about their applications in technical praxis.

Brief outline of the course:
Basic properties of liquid crystals. Classification of liquid crystals. Liquid crystalline phases and chemical structure. Optical anisotropy. Interaction of liquid crystals with electric and magnetic field – Freedericksz transitions. Applications. Composite systems based on liquid crystals.

Recommended literature:
1. P.G.de Gennes, The Physics of Liquid Crystals, Clarendon Press, Oxford 1974
2. N.Tomašovičová, P.Kopčanský, N.Éber: Magnetically Active Anisotropic Fluids Based on Liquid Crystals, Anisotropy Research: New Developments, ed. Hirpa Lemu, Nova Science Pub Incorporated, 2012.

Course language:
english

Notes:

Course assessment
Total number of assessed students: 4

A	B	C	D	E	FX
75.0	0.0	0.0	0.0	25.0	0.0

Provides: RNDr. Natália Tomašovičová, CSc.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ FNT1/03	**Course name:** Low Temperature Physics

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 credits: 6

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Two tests during the semester. Final examination consists of the results of two tests and oral exam. The oral exam may be waived of if the tests results are better then D.

Learning outcomes:
The cours gives knowledge of methods and techniques used in low-temperature physics and information on basic physical properties of condensed matter at low temperatures.

Brief outline of the course:
Phase diagram of 4He. Thermal and transport propertie sof liquid helium-4. Superfluidity. Two-fluid model for superfluid He II. Hydrodynamics and thermodynamics for superfluid helium-4. Quantize vortices. Phase diagram of 3He. Order parameter. Properties of 3He-4He solutions. Quantum crystals. Superconductivity. Tunnel superconducting junctions. Application of superconductivity. Transport properties (electrical and thermal) of solids at low temperatures. Macroscopic quantum effects and mesoscopic systems. Specific heat of solids at low temperatures. Reaching low and very low temperatures. Thermometry. New problems of low-temperature physics.

Recommended literature:
A. Kent: Experimental low-temperature physics. Mac Millan Press Ltd., 1993.
D. S. Betts: An introduction to Milikelvin Technology. Cambridge University Press, 1989.
P. V. E. McClintok et al.: Low-Temperature Physics. Blackie, Galsgow and London 1992.
F. Pöbell: Matter an Methods at Low Temperatures. Springer - Verlag, Berlin, 1992

Course language:

Notes:

Course assessment
Total number of assessed students: 62

A	B	C	D	E	FX
91.94	3.23	4.84	0.0	0.0	0.0

Provides: doc. RNDr. Erik Čižmár, PhD., Dr.h.c. prof. RNDr. Alexander Feher, DrSc.

Date of last modification: 03.05.2015	
Approved: prof. Ing. Martin Orendáč, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ MKL/03	**Course name:** Magnetic Properties of Solids

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 credits: 6

Recommended semester/trimester of the course: 2.

Course level: II., III.

Prerequisities:

Conditions for course completion:
Elaboration of written texts.
Distance oral exam.

Learning outcomes:
To obtain a general view on basic magnetic phenomena, intrinsic magnetic properties of various magnetic materials, magnetization processes and domain structure.

Brief outline of the course:
Magnetic materials and magnetization. Magnetic quantities. Carriers of magnetic moment. Vector model of the atom. Magnetic field sources. Measurements of magnetic field. Diamagnetism. Paramagnetism. Ferromagnetism. Antiferromagnetism. Ferrimagnetism. Mgnetic behavior and structure of materials. Neutron diffraction. Magnetic anisotropy. Hall effect, magnetoresistance. Domain structure. Magnetostriction. Technical magnetization. Dynamic magnetization processes. Susceptibility. Thin films.

Recommended literature:
S. Chikazumi: Physics of Magnetism, Oxford University Press 2009
D. Jiles: Introduction to magnetism and magnetic materials, Chapman&Hall, London, New York, Tokyo, Melbourne, Madras, 1991

Course language:
english

Notes:

Course assessment
Total number of assessed students: 108

A	B	C	D	E	FX	N	P
39.81	16.67	10.19	2.78	1.85	1.85	0.93	25.93

Provides: prof. RNDr. Peter Kollár, DrSc.

Date of last modification: 26.03.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ MAG/08/08	**Course name:** Magnetochemistry

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Exam

Learning outcomes:
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.

Brief outline of the course:
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.

Recommended literature:
1.R.L. Carlin, A.J. Duyneveldt: Magnetic properties of transition metal compounds. New York, inc. Springer Verlag, 1977.
2. A.B.P.Lever, Inorganic electronic spectroscopy, Elsevier, Amsterdam, 1987.

Course language:
english

Notes:

Course assessment
Total number of assessed students: 22

A	B	C	D	E	FX
54.55	18.18	18.18	4.55	4.55	0.0

Provides: doc. RNDr. Alžbeta Orendáčová, DrSc., RNDr. Róbert Tarasenko, PhD.
Date of last modification: 03.05.2015
Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/MOP/14 | **Course name:** Magnetooptics

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: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
exam

Learning outcomes:
The goal is to teach students the basics on magnetooptical parameters, measurements and overview of magnetooptical materials.

Brief outline of the course:
Introduction, polarized light, magneto-optical phenomena, microscopic mechanisms the magnetooptical activity, magneto-optical materials, dielectrics, ferrites, metals and their alloys, applied magnetooptics

Recommended literature:
Zvezdin AK, Kotov VA, Modern magnetooptics and magnetooptical materials, Taylor & Francis ,1997
Sugano S., Kojima N., Magneto-optics, Springer, 1999

Course language:
slovak or english

Notes:

Course assessment
Total number of assessed students: 3

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: RNDr. Kornel Richter, PhD.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ MNK/17	**Course name:** Mechanika kontinua
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 0 **Per study period:** 28 / 0 **Course method:** present	
Number of ECTS credits: 3	
Recommended semester/trimester of the course: 2.	
Course level: II., III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes: This course follows the basics of continuum mechanics presented within Theoretical mechanics in order to focus on more advanced problems of continuum mechanics. The main objective of this course is to provide an introduction to the continuum mechanics, where mechanical properties of materials are modeled as continuous mass rather than as discrete particles.	
Brief outline of the course: Approximation of continuum nature of matter assumes that the substance of the object completely fills the space it occupies. Such consideration ignores the fact that matter is made of atoms, completely ignoring its microphysical structure. However, on lengths scales much greater than that of interatomic distances, such models are highly accurate. Fundamental physical laws such as the conservation of mass, the conservation of momentum, and the conservation of energy may be applied to such models to derive differential equations describing the behavior of solids and liquids within the frame of continuous mechanics. At the beginning of the course, a brief introduction to the mathematical apparatus of the continuum mechanics is provided. Next, deformation of solids and classical theory of elasticity are studied. Hook law and dynamical equation of isotropic homogeneous media will be evaluated. Within the frame of continuum mechanics, a propagation of waves in unlimited media will be studied (transverse and longitudinal modes) and equations of wave propagation for geometrically confined solids (wave reflection, Rayleigh waves). Equations of free and forced oscillations of strings, membranes rods will be evaluated. Finally, basic equations of mechanics of liquids will be evaluated.	
Recommended literature: 1. M. Brdlička, L. Samek, B. Sopko, Mechanika kontinua, Praha : Academia, 2011. 878 s. ISBN 978-80-200-2039-0. 2. M. Okrouhlík, C. Höschl, J. Plešek, S. Pták, J. Nadrchal, Mechanika poddajných těles,numerická matematika a superpočítače, Ústav termomechaniky AV ČR, 1997. 3. G.A.Holzapfel: Nonlinear Solid Mechanics, Wiley, 2000.	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 0

abs	n
0.0	0.0

Provides: RNDr. Kornel Richter, PhD.

Date of last modification: 20.02.2017

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ MSA1/03	**Course name:** Methods of Structural Analysis
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 3 / 2 **Per study period:** 42 / 28 **Course method:** present	
Number of ECTS credits: 7	
Recommended semester/trimester of the course: 2.	
Course level: I., II., III.	
Prerequisities:	
Conditions for course completion: Elaboration of theoretical projects on EM topics and practical lab session on TEM: 50% Elaboration of practical RTG project: - 50%	
Learning outcomes: The course is oriented on modern methods of structural analysis of metals. Main topics are: optic microscopy, electron microscopy (TEM, SEM),electron microprobe analysis and X-ray diffractometry.	
Brief outline of the course: Optic microscopy. Electron microscopy: Electron beam instruments, Electron optics, Electron lences and deflection systems, Transmission electron microscopy - principle and construction. Electron – specimen interactions. Electron diffraction. Kikuchy lines. Scanning electron microscopy – principle and cnstrucion. Scanning transmission electron microscopy. High Voltage electron microscopy. Electron microprobe analysis: WDX spectrometer, EDX spectrometer, Auger electron spectrometer. Self-emision microscopy. Convergent beam diffraction. X-ray diffractometry: Scattering of x-rays, Neutrons and neutron scattering, CW - diffractometer, Ewald´s sphere, Diffraction on powder samples, The main characteristics of powder diffraction pattern, Structure factor, Ocupation factor, Atomic displacement factor, Peak intensity, shape and symmetry, Sherrer equation. Peak profile, Rietweld method. Qualitative phase analysis, parameters of elementary cell, Profile analysis of diffraction peak and interpretation of profile analysis.	
Recommended literature: 1.S. Amelincks, D.van Dyck, J. van Landyut, Electron Microscopy – Principles and Fundamentals of Electon Microscopy, 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	

Notes:

Course assessment
Total number of assessed students: 77

A	B	C	D	E	FX	N	P
37.66	24.68	9.09	1.3	0.0	0.0	0.0	27.27

Provides: prof. RNDr. Pavol Sovák, CSc., Ing. Karel Saksl, DrSc., Ing. Vladimír Girman, PhD.

Date of last modification: 29.03.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ MPN/14	**Course name:** Methods of preparation and characterization of nanostructures

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 3

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
powerpoint review of selected topic

Learning outcomes:
The goal of this course is to make an overview of methods used for fabrication of nanostructures and nanodevices.

Brief outline of the course:
This course teaches student about methods for fabrication of microelectromechanical devices, microanalytical devices and nanoobjects using top-down methods. I will make an overview of forces acting upon nanoobjects, thermodynamics on nanoscale. Overview of thin film preparation methods will be also given. I will talk about conventional and unconventional nanopatterning methods. Also application of nanostructures in fundamental and applied science will be described. Part of this course is also laboratory practice.

Recommended literature:
1. B. Bhushan Ed., Handbook of nanotechnology, Springer Academic Publishers, 2nd edition, 2007.
2. J. A. Rogers, H. H. Lee, Unconventional nanopatterning techniques and applications, Wiley, 1990.
3. G. Hornyak, J. Dutta, H. F. Tibbals, A. K. Rao, Introduction to nanocience CRC Press, 2008.
4. G. A. Ozin, A. C. Arsenault, L. Cademartiri, Nanochemistry A Chemical Approach to Nanomaterials, RSC Publishing, 2005.

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 44

A	B	C	D	E	FX	N	P
52.27	11.36	6.82	0.0	0.0	0.0	0.0	29.55

Provides: Mgr. Vladimír Komanický, Ph.D.
Date of last modification: 29.03.2020
Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ NANO/09	**Course name:** Nanomaterials and Nanotechnologies

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II., III.

Prerequisities:

Conditions for course completion:
Test or preparation of the ppt presentation on a selected topic in the field of nanomaterials.

Learning outcomes:
To acquaint students with the basic concepts of nanotechnology and to bring them knowledge about physical and chemical properties of nanomaterials. Provide students with a comprehensive view of the wide applications using nanomaterials.

Brief outline of the course:
Classification of nanomaterials (thin films and surfaces, carbon nanotubes, inorganic nanotubes, nanodots, biopolymers, nanoparticles, nanocomposites, fullerenes, dendrimers, quantum dots). Nanomanufacturing and fabrication techniques (chemical synthesis: reverse micelle method, sol-gel method, precipitation, self- assembly, positional assembly, chemical vapour deposition, MBE molecular beam epitaxy, ultra-precision, , lithography, SPD (spark plasma deposition). Possible adverse health, environmental and safety impacts. Magnetic nanomaterials, physical properties and structural properties of nanomaterials (superparamagnetism, quantum size effect, quantum of magnetization, effect of monodomains particles). Magnetic nanomaterials as advanced materials for information technology, biotechnology and industry.

Recommended literature:
1. Nanoscience and nanotechnologies, The Royal Society, London 2004.
2. C. Burda, X. Chen, et al., Chemical Review 105, (2005) 1025-1102.
3. J. A. Mydosh, Spin glasses, Taylor and Francis 1993.

Course language:

Notes:
Week 1:
Definition, history, present and future of nanotechnologies. Basic concepts and metrology in nanotechnologies.
Week 2:
Nanomaterials in 1D dimension: thin films, thin films and surfaces; nanomaterials in 2D dimensions: carbon nanotubes, inorganic nanotubes, nanowires, biopolymers, nanomaterials in 3D dimensions: nanoparticles, fullerenes, dendrimers, and quantum dots.

Week 3:
Preparation of nanomaterials. Preparation of nanomaterials by bottom-up techniques: chemical syntheses (micelle method, reverse micelle method, sol-gel method, precipitation), self-assembly, controlled assembly, spin coating, dip coating.
Week 4:
Bottom-up techniques PVD, CVD method (physical/chemical vapor deposition), MBE method (molecular beam epitaxy).
Week 5:
Preparation of nanomaterials by top-down techniques: cutting, grating, etching, lithography, SPD (spark plasma deposition).
Week 6:
Nnaocarbon: fullerens, nanocons, carnon nanotubes (SWCNT, MWCNT), properties and applications
Week 7:
Nanogold. Suface plasmon resonance. Preparation and classification nanogold materials.
Week 8:
Origin of nanomagnetism. Density of electron states.
Week 9:
The phenomenon of superparamagnetism in magnetic nanomaterials. Behavior of spin glass, comparison of theoretical models and experiment. Nanomagnetic models. Modeling of physical and structural properties of magnetic nanomaterials
Week 10:
Magnetic nanomaterials in biotechnology and nano-medicine: drug carriers, DNA chips, materials for MRI (magnetic resonance imaging), nanomaterials in the treatment of cancer.
Week 11:
Magnetic nanomaterials for industrial catalysis and gas separation: nanoparticles in ordered porous matrices.
Week 12:
Magnetic nanomaterials in information-telecommunication technologies and optoelectronics: computer chips, high-density recording media, hard disks, memories, sensors, quantum cryptographs, photon crystals for quantum computers.

Course assessment
Total number of assessed students: 38

A	B	C	D	E	FX	N	P
42.11	0.0	0.0	0.0	0.0	0.0	0.0	57.89

Provides: doc. RNDr. Adriana Zeleňáková, PhD.

Date of last modification: 25.03.2021

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ NAS/14	**Course name:** Nanoscopic systems
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: 2.	
Course level: II.	
Prerequisities:	
Conditions for course completion: Test or preparation of the ppt presentation on a selected topic in the field of nanoscale systems.	
Learning outcomes: Knowledge and understanding of nanotechnology with special emphasis on the physicochemical and physical principles in nanotechnology. Students gain knowledge in areas such as electronic structure of nanosystems, magnetic properties, dependence of thermodynamic properties on the size of the systems as well as an overview of the application potential of nanosystems and ethical implications of nanotechnology.	
Brief outline of the course: The Origin of Nanomagnetic Behavior. Sample Dimensions and Characteristic Lengths. Dimensionality and Density of Electronic States. Dimensionality and Reduced Coordination Number. Nanoscopic Samples and Proportion of Surface Atoms. Nanoscopic Samples and Magnetization Reversal. Dimensionality and Critical Behavior. Superparamagnetism. Magnetic behavior of nanosystems at different temperature. The practical application of nanoscopic systems.	
Recommended literature: 1. Emil Roduner, Nanoscopic Materials: Size-Dependent Phenomena, RSC Publishing 2006, ISBN: 0 85404 857.	
Course language: slovak, english	
Notes: 1. The Origin of Nanomagnetic Behavior. 2. Sample Dimensions and Characteristic Lengths. 3. Dimensionality and Density of Electronic States. 4. Dimensionality and Reduced Coordination Number. 5. Nanoscopic Samples and Proportion of Surface Atoms. 6. Nanoscopic Samples and Magnetization Reversal. 7. Dimensionality and Critical Behavior. 8. Superparamagnetism. 9. Magnetic behavior of nanosystems at different temperature.	

10. Termodynamical behavior of nanosystems.
11. The practical application of nanoscopic systems.

Course assessment
Total number of assessed students: 1

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Adriana Zeleňáková, PhD.

Date of last modification: 25.03.2021

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/NERO/14 | **Course name:** Neutron scattering in solids

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 1 **Per study period:** 28 / 14
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Final exam

Learning outcomes:
Lectures are devoted to the description of experimental methods based on elastic and inelastic neutron scattering and its application in condensed matter physics and materials research. Analysis and interpretation of experimental data will be shown for specific cases.

Brief outline of the course:
Properties of neutron, classification of neutron scattering. Fermi's golden rule. Coherent and incoherent scattering. Dynamic structure factor. Diffraction, static structure factor, Bragg's law, reciprocal lattice. Elastic and inelastic scattering, critical and diffusive scattering, small angle scattering. Neutron sources, three-axes and two-axes spectrometer, chopper time-of-flight spectrometer. Application of inelastic neutron scattering for the study of phonons and magnetic excitation spectra. Polarized neutrons.

Recommended literature:
Smetana, Šíma, Neutronová difrakce, MFF UK, Praha, 1982;Dianoux, Lander, Neutron Data Booklet, OCP Science, Grenoble, 2003; Pynn, A Neutron Scattering Primer, LANCSE, Los Alamos, 1990; http://www.ill.fr; http://www.isis.rl.ac.uk; http://www.esrf.fr

Course language:
english

Notes:

Course assessment
Total number of assessed students: 11

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: RNDr. Róbert Tarasenko, PhD.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ NKM1/99	**Course name:** Non-Conventionals Metallic 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 credits: 3

Recommended semester/trimester of the course: 1.

Course level: II., III.

Prerequisities:

Conditions for course completion:
The exam consists of writing three questions and an oral answers.

Learning outcomes:
The course gives information about basics of materials science, standard and advanced materials, and relations between structure states and mechanical and physical properties of metalic alloys.

Brief outline of the course:
Real metalic structures, Binary diagrams, Lattice imperfections, hyperstructures, Streghtening mechanisms, Precipitation and segregation processes, Defomation mechanisms, Crystallization. Fe - based alloys, advanced high-strenght alloys. Metallic biomaterials. Corrosive processes and materials for corrosion environment. Ti, Al, Co, Ni - based progressive materials. Materials dedicated to automotive, aircraft, armament and nuclear industry. Superplasticity, shape memory effect and its alloys. Materials for cryogenic applications. Intermetallics. Quasicrystals. High entropy alloys. Biodegradable metals. Metallic glasses.

Recommended literature:
1.D.R.Askeland and P.P. Phulé, The Science and Engineering of Materials, Thomson 2003.
2.Structure and Properties of Engineering Alloys, McGraw-Hill Genitons, 1993.
Š. Nižník: Základy Fyziky tuhých látok, Učebné texty, Košice, 2002
M. Fujda: Základné rovnovážne diagramy, Učebné texty, košice, 2010

Course language:
Slovak language

Notes:
None.

Course assessment
Total number of assessed students: 34

A	B	C	D	E	FX	N	P
35.29	17.65	0.0	2.94	2.94	0.0	0.0	41.18

Provides: Ing. Vladimír Girman, PhD.

Date of last modification: 28.09.2017
Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ NOT1a/03	**Course name:** Nontraditional Optimization Techniques I
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 2 **Per study period:** 28 / 28 **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course: 1.	
Course level: I., II.	
Prerequisities:	
Conditions for course completion: Monitoring progress in solving applied projects. examination (50%), quality of the project (50%) examination	
Learning outcomes: To familiarize students with biologically and physically inspired optimization, simulation and prediction techniques. To expand students' creativity and programming skills by applying heuristic techniques in solving applied problems.	
Brief outline of the course: Fundamentals of optimization theory. Basic optimization problems. Basic types of objective functions. Classification of optimization techniques. Gradient-based optimization techniques. Evolutionary algorithms. Genetic algorithms. Genetic algorithms as Markov processes. Statistical Mechanics Approximations of Genetic Algorithms. Monte Carlo simulation and simulated annealing. Swarm optimization. Cellular Automata and their applications in simulations of complex systems. Fractals. Agent-based models. Evolutionary games. Evolution of cooperation. Fundamentals of Neural Networks. Application of singular value decomposition to solve least squares problems.	
Recommended literature: Hartmann, A. K., Rieger, H., Optimization Algorithms in Physics, Wiley, 2002 Reeves, C. R., Rowe, J. E., Genetic Algorithms: Principles and perspectives, Kluwer, 2003 Mitchell, M., Complexity. A Guided Tour, Oxford University Press, 2009 Solé, R. V., Phase Transitions, Princeton University Press, 2011 Ilachinski, A., Cellular Automata. A Discrete universe, World Scientific, 2002 Haykin, S., Neural Networks. A Comprehensive Foundation, Prentice-Hall, 1999	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 81

A	B	C	D	E	FX
69.14	17.28	7.41	2.47	3.7	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ FPK1/07 | **Course name:** Phase Transitions and Critical Phenomena

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 credits: 4

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Examination

Learning outcomes:
To acquaint students with based problems of the phase transitions and critical phenomena.

Brief outline of the course:
Thermodynamics of phase transitions. Classification of phase transitions. Critical phenomena, universality. Microscopic models of the magnetic phase transitions. Ising model in one and two dimensions. Mean field theory of the Ising model. Landau theory of phase transitions.

Recommended literature:
1. Stanley H.G.: Introduction to Phase Transitions and Critical Phenomena, Clarendon Press Oxford, Oxford, 1971.
2. Reichl L.E.: A Modern Course in Statistical Physics, University of Texas Press, Austin, 1980.
3. Plischke M., Bergersen B.: Equilibrium Statistical Physics, World Scientific, Singapore, 1994.
4. Kadanoff L.P.: Statistical Physics, Statistics, Dynamics and Renormalization, World Scientific, Singapore, 2000.

Course language:
1. Slovak,
2. English

Notes:

Course assessment
Total number of assessed students: 119

A	B	C	D	E	FX
57.14	10.92	11.76	14.29	5.88	0.0

Provides: prof. RNDr. Andrej Bobák, DrSc.

Date of last modification: 19.02.2021

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ LEK1/02	**Course name:** Physical Principles of Medical Diagnostics and Therapy

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: 2

Recommended semester/trimester of the course: 1., 3.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 35

A	B	C	D	E	FX
85.71	11.43	2.86	0.0	0.0	0.0

Provides: doc. RNDr. Karol Flachbart, DrSc.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/FRKP/19 | **Course name:** Physical realization of quantum computer

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: 2., 4.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 4

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: Mgr. Tomáš Samuely, PhD., doc. RNDr. Erik Čižmár, PhD.

Date of last modification: 06.04.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ FTV/14	**Course name:** Physics and technics of vacuum

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: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Final test exam.

Learning outcomes:
Student will obtain basic knowledge about vacuum physics principles and technical Solutions for vacuum creation and measurement.

Brief outline of the course:
Overview of basic topics in vacuum physics - volume transport properties of gas, gas flow, gas on solids. Principles of the measurement and creation of low pressure conditions. Basics of the vacuum equipment construction and the leak-tightness testing. The use of vacuum technology in advanced material preparation and cryogenics.

Recommended literature:
J.F. O'Hanlon, A User's Guide to Vacuum Technology, Wiley-Interscience; 2003;

Course language:

Notes:

Course assessment
Total number of assessed students: 13

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Erik Čižmár, PhD.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ FMT/07	**Course name:** Physics of Materials
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 credits: 4	
Recommended semester/trimester of the course: 2.	
Course level: II.	
Prerequisities:	
Conditions for course completion: 70% written test 30% exam	
Learning outcomes: The course gives basic information about Physics of Metals. Main topics are: diffusion in metals, classification of surfaces, models of grain boundary, segregation kinetics, dislocations, plastic deformation.	
Brief outline of the course: Imperfections in crystal lattice. Diffusion in metals: 1st and 2nd Fick's laws, diffusion coefficient, solution of Ficks' laws for different marginal conditions, Kirkendall effect, diffusion-controlled growth of precipitates, up-hill diffusion, diffusion in dilute and alloy systems. Experimental methods of diffusion coefficient determination. Classification of surfaces, models of grain boundary. Grain boundary segregation in solids: equilibrium segregation (McLean's and Guttmann's models), site competition effect, non-equilibrium segregation, segregation kinetics. Dislocations: classification, properties, movement and dislocation reactions. Dilocation structure in bcc, fcc and hcp lattice. Elastic deformation. Elastic stretching. Plastic deformation. Mechanism of strain hardening. Mechanical properties and behaviour. Creep, Stress, Rupture and Stress Corrosion.	
Recommended literature: 1.Heumann: Diffusion in Metallen, Springer-Verlag, Berlin 1992 (in German). 2. W. Cahn and P. Haasen: Physical Metallurgy, Elsevier Science Publishers, Amsterdam 1996.Shewmon: Diffusion in solids, TMS, Warrendale 1989. 3. D.R. Askeland, P. Phulé, The Science and Engineering of Materials, Thomson, 2003.	
Course language: english	
Notes:	

Course assessment
Total number of assessed students: 14

A	B	C	D	E	FX
64.29	14.29	21.43	0.0	0.0	0.0

Provides: prof. RNDr. Pavol Sovák, CSc.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ PP1/99	**Course name:** Physics of Semiconductor Elements

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: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Exam, its contents is given by topics of lectures.

Learning outcomes:
Acquiring knowledge about principle of operation of semiconductor elements and their applications in experimental research and technology.

Brief outline of the course:
Basic properties of semiconductors. Termistors. Hall device, magnetoresistor, cryosar, Gunn device, varistor, tensoelektric elements. Semiconductor devices with one PN junction. Bipolar junction transistor. Junction field-effect transistors. MOS field-effect transistors. Contact metall-semiconductor. Silicon chip technology and fabrication techniques. Optoelektronic devices. Charge coupled devices

Recommended literature:
D.J. Roulston, An introduction to the physics of semiconductor devices, Oxford University Press, 1999

Course language:
english

Notes:

Course assessment
Total number of assessed students: 25

A	B	C	D	E	FX
76.0	16.0	8.0	0.0	0.0	0.0

Provides: prof. RNDr. Peter Kollár, DrSc.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ PCHZ/14	**Course name:** Preparation and characterization of metalic alloys

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 3 **Per study period:** 42
Course method: present

Number of ECTS credits: 3

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Active participation and preparation of measurement protocols.

Learning outcomes:
The ability of individually production of metal alloys using arc melting, casting into a copper mold, melt spinning, milling etc..

Brief outline of the course:
Production of alloys using arc melting. Production of alloys using casting into a copper mold. Production of alloys using melt spinning method. Production of alloys by milling of precursor.

Recommended literature:
Hilzinger R, Rodewald W, Magnetic materials, Vacuumschmelze, 2013
Chen CW, Magnetism and metalurgy of soft magnetic materials, Dover publications, 1986

Course language:
slovak or english

Notes:

Course assessment
Total number of assessed students: 18

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: Mgr. Vladimír Komanický, Ph.D., doc. RNDr. Ján Füzer, PhD., RNDr. Ladislav Galdun, PhD.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: KPPaPZ/PPZMg/12	**Course name:** Psychology and Health Psychology (Master´s Study)
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 1 / 2 **Per study period:** 14 / 28 **Course method:** present	
Number of ECTS credits: 4	
Recommended semester/trimester of the course:	
Course level: II.	
Prerequisities:	

Conditions for course completion:

a) Active work during the whole semester (according to the ongoing instructions of the lecturer and instructors); continuous control of study results at seminars during the teaching part of the semester in the range of maximum 5 points. Preparation, presentation and discussion on a selected topic - max. 15 points. A maximum of 2 absences are allowed.
b) Written examination of the topics of lectures in the 9th week of the semester at the time and place of the lecture. The written examination will consist of 10 questions of a factual nature (1 question / 3 points) with a maximum of 30 points.
Conditions for admission to the exam: completion of seminars and obtaining at least 25 points.
c) Exam: written form (50 points / 10 questions of factual-evaluation character of 5 points each)
You need to get at least half of the 50 points.
Rating:
65 and less FX;
66 - 72 E;
73 - 79 D;
80 - 86 C;
87 - 93 B;
94 - 100 A.
The final evaluation reflects the results obtained during the semester and in the exam:
A more detailed explanation of the assignment and the work schedule of students will be the subject of an agreement for the 1st exercise of the semester.
Any modifications to the implementation of the course in connection with the current order of the Rector are listed in the electronic board of the course.

Learning outcomes:

Students will be able to orient themselves in the basic concepts and theories of health psychology, which will be given an interesting and engaging explanation, accompanied by many examples from life. They will gain orientation in current topics, which are the content of health psychology or they are closely related to the issues not only of this discipline, but also of other psychological disciplines such as educational psychology, personality psychology and the like. Within the course, students are allowed to communicate freely with the teacher and discuss the topics with other classmates.

Students can practically apply the knowledge from the subject especially in the field of prevention of burnout syndrome and support of mental health in the work of a teacher.

Brief outline of the course:
1 Introduction to health psychology
2 Psychoimmunology
3 Personality factors and health
4 Social support as a protective factor in relation to health
5 Subjective well-being
6 Stress and stressful situations and ways to manage them
7 Burnout syndrome
8 Health-promoting behavior, mental hygiene
9 Health risk behavior
10 School as an important factor of health

Recommended literature:
Křivohlavý, J.: Psychologie zdraví. Portál, Praha 2001.
Křivohlavý, J.: Psychologie nemoci. Grada, Praha, 2002.
Křivohlavý, J.: Psychologie moudrosti a dobrého života. Grada, Praha, 2009.
Kebza, V.: Psychosociální determinanty zdraví. Academia, Praha 2005.
Kahneman, D., Diener, E., Schwarz, N.(Eds), Well-Being. The Foundations of Hedonic Psychology. New York, Russell Sage Foundation, 2003.
Kaplan, R. M.: Zdravie a správanie človeka. SPN, Bratislava 1996.
Sarafino, E. P.: Health Psychology. Biopsychosocial interactions. John Wiley and sons 1994.
Baštecký, J., Šavlík, J., Šimek, J. 1993. Psychosomatická medicína. Praha: Grada
Tress, W., Krusse, J., Ott,J.: Základní psychosomatická péče. Portál, Praha 2008.

Course language:
slovak

Notes:

Course assessment
Total number of assessed students: 226

A	B	C	D	E	FX
19.47	25.22	25.66	13.27	15.93	0.44

Provides: PhDr. Anna Janovská, PhD., Mgr. Lucia Barbierik, PhD.

Date of last modification: 16.02.2021

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ KTM/14	**Course name:** Quantum Theory of Magnetism

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 credits: 5

Recommended semester/trimester of the course: 3.

Course level: II., III.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:
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.

Recommended literature:
1. J. B. Parkinson, D. J. J. Farnell, An Introduction to Quantum Spin Systems, Lecture Notes in Physics 816 (Springer, Berlin Heidelberg, 2010).
2. U. Schollwock, J. Richter, D. J. J. Farnell, R. F. Bishop, Quantum Magnetism, Lecture Notes in Physics 645 (Springer, Berlin Heidelberg, 2004).
3. N. Majlis, The Quantum Theory of Magnetism (World Scientific, Singapore, 2000).

Course language:
EN - english

Notes:

Course assessment
Total number of assessed students: 22

A	B	C	D	E	FX	N	P
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: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ RPM/14	**Course name:** Relaxation processes in molecular magnets

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: 2

Recommended semester/trimester of the course: 1., 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Discussion accompanied with the preparation and presentation of a short project

Learning outcomes:
Student obtains basic knowledge about the dynamics of the energy transport between a lattice and spins, so called relaxation phenomena, demonstrating in spectroscopy, ac susceptibility, ac calorimetry, thermal conductivity, etc.

Brief outline of the course:
Spin-spin interactions. Interaction of spin with electromagnetic field. Spin-lattice relaxation due to phonons – Waller's mechanism. Spin-lattice relaxation due to crystal field modulation. Direct process. Orbach process. Raman process of the first and second order. Phonon bottleneck effect. Thermally activated magnetic relaxation. Superparamagnetism. Neél-Arrhenious law. Blocking temperature. Relaxation due to quantum tunnelling. Thermally asisted quantum tunnelling. Relaxation processes due to localized modes. E´ centres. „Rattling“ modes. Optical modes. Casimir and du Pré theory. Ac susceptibility. Cole-Cole diagram. Debye relaxation. Distribution of relaxation times. Examples of spin-lattice relaxation in molecular and single-ion magnets. Observation of relaxation phenomena using various experimental techniques.

Recommended literature:
1. D. Gatteschi et al. Molecular Nanomagnets, Oxford University Press, 2006.
2. A. Abragam and B. Bleaney, Electron Paramagnetic Resonance of Transition Ions, Clarendon Press Oxford 1970.

Course language:
english

Notes:

Course assessment
Total number of assessed students: 2

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Alžbeta Orendáčová, DrSc.
Date of last modification: 03.05.2015
Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice
Faculty: Faculty of Science
Course ID: ÚFV/ SKM/14 — **Course name:** Scanning probes microscopy of nanostructures
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: 2.
Course level: II.
Prerequisities:
Conditions for course completion: exam
Learning outcomes: The students will learn about various methods of visualization and fabrication of nanostructures on surfaces.
Brief outline of the course: Historical overview of microscopy, resolution limits of optical microscopy. Scanning and transmission electron microscopy – principles and applications. Basics of tunneling spectroscopy, local density of electron states, molecular orbitals. Scanning tunneling microscopy of molecules and organic nanostructures. Principles of atomic force microscopy, imaging of organic nanostructures. Force curves method. Overview and basic principles of various other scanning probes microscopies (magnetic force microscopy, Kelvin probe microscopy, electrochemical scanning tunneling microscopy, scanning near-field optical microscopy etc.). Scanning probe microscopy at low temperatures and in ultra-high vacuum. Dynamic visualization by scanning probe microscopies. Manipulation of nanostructures using scanning probe microscopies. The course includes practical demonstrations of some of the discussed techniques in the laboratory.
Recommended literature: 1. Roland Wiesendanger: Scanning Probe Microscopy and Spectroscopy: Methods and Applications, Cambridge University Press 1994 2. E.L. Wolf: Principles of electron tunneling spectroscopy, Oxford university press, 1989 3. N. Yao, Z. L. Wang (ed.), Handbook of microscopy for nanotechnology, Kluwer academic publishers 2005 4. P. Samuely (ed.), Kryofyzika a nanoelektronika, ÚEF SAV 2011
Course language: Slovak or English
Notes:

Course assessment
Total number of assessed students: 12

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: Mgr. Tomáš Samuely, PhD.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚTVŠ/ ÚTVŠ/CM/13	**Course name:** Seaside Aerobic Exercise

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: **Per study period:** 36s
Course method: combined, present

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: I., II.

Prerequisities:

Conditions for course completion:
Conditions for course completion:
Attendance

Learning outcomes:
Learning outcomes:
Students will be provided an overview of possibilities how to spend leisure time in seaside conditions actively and their skills in work and communication with clients will be improved. Students will acquire practical experience in organising the cultural and art-oriented events, with the aim to improve the stay and to create positive experiences for visitors.

Brief outline of the course:
Brief outline of the course:
1. Basics of seaside aerobics
2. Morning exercises
3. Pilates and its application in seaside conditions
4. Exercises for the spine
5. Yoga basics
6. Sport as a part of leisure time
7. Application of projects of productive spending of leisure time for different age and social groups (children, young people, elderly)
8. Application of seaside cultural and art-oriented activities in leisure time

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 41

abs	n
12.2	87.8

Provides: Mgr. Agata Horbacz, PhD.
Date of last modification: 15.03.2019
Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ VPM/18	**Course name:** Selected problems of numerical methods in micro- magnetism

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 credits: 2

Recommended semester/trimester of the course: 2., 4.

Course level: II., 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: 0

A	B	C	D	E	FX	N	P
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Provides: RNDr. Kornel Richter, PhD.

Date of last modification: 09.03.2018

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SPFKLa/14	**Course name:** Semestral work I

Course type, scope and the method:
Course type:
Recommended course-load (hours):
Per week: Per study period:
Course method: present

Number of ECTS credits: 2

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Succesful meeting the goals formulated by the supervisor at the beginning of the semester in required extent.

Learning outcomes:
Students become familiar and obtain skills in scientific work related to experimental study of solids by involving them in solving scientific problems in research teams.

Brief outline of the course:
Solving of selected problems associated with experimental study in solid state physics.

Recommended literature:
Selected scientific journals and books.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 28

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides:

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SPFKLb/14	**Course name:** Semestral work II

Course type, scope and the method:
Course type:
Recommended course-load (hours):
Per week: **Per study period:**
Course method: present

Number of ECTS credits: 6

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities: ÚFV/SPFKLa/14

Conditions for course completion:
Succesful meeting the goals formulated by the supervisor at the beginning of the semester in required extent.

Learning outcomes:
Students become familiar and obtain skills in scientific work related to experimental study of solids by involving them in solving scientific problems in research teams.

Brief outline of the course:
Solving of selected problems associated with experimental study in solid state physics.

Recommended literature:
Selected scientific journals and books.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 28

A	B	C	D	E	FX
92.86	0.0	7.14	0.0	0.0	0.0

Provides:

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/SPFKLc/14	Course name: Semestral work III

Course type, scope and the method:
Course type:
Recommended course-load (hours):
Per week: Per study period:
Course method: present

Number of ECTS credits: 6

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities: ÚFV/SPFKLb/14

Conditions for course completion:
Succesful meeting the goals formulated by the supervisor at the beginning of the semester in required extent.

Learning outcomes:
Students become familiar and obtain skills in scientific work related to experimental study of solids by involving them in solving scientific problems in research teams.

Brief outline of the course:
Solving of selected problems associated with experimental study in solid state physics.

Recommended literature:
Selected scientific journals and books.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 25

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Alžbeta Orendáčová, DrSc., prof. Ing. Martin Orendáč, CSc., doc. RNDr. Erik Čižmár, PhD., Mgr. Tomáš Samuely, PhD.

Date of last modification: 28.03.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/OSA1/99 | **Course name:** Seminar in Solid State Physics

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 1 **Per study period:** 14
Course method: present

Number of ECTS credits: 1

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Active participation at the seminars.

Learning outcomes:
Students will obtain informations about scientific results of various research groups from Košice and from their cooperating foreign institutions.

Brief outline of the course:
Contents is determined by the lectures and varies every year.

Recommended literature:
Scientific journals.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 46

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

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

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/OSB1/99	**Course name:** Seminar in Solid State Physics

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 1 **Per study period:** 14
Course method: present

Number of ECTS credits: 1

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Active participation at seminars.

Learning outcomes:
Students will obtain informations about scientific results of various research groups from Košice and from their cooperating foreign institutions.

Brief outline of the course:
Contents is determined by the lectures and varies every year.

Recommended literature:
Scientific journals.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 45

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

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

Date of last modification: 29.03.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ OSC1/99	**Course name:** Seminar in Solid State Physics
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 1 **Per study period:** 14 **Course method:** present	
Number of ECTS credits: 1	
Recommended semester/trimester of the course: 3.	
Course level: II.	
Prerequisities:	
Conditions for course completion: Active participation in seminars.	
Learning outcomes: To obtain informations about scientific results of various research group from Košice and from their cooperating foreign institutions.	
Brief outline of the course: Content is determined by the lectures and varies every year.	
Recommended literature: Scientific journals.	
Course language: slovak, english	
Notes:	
Course assessment Total number of assessed students: 46	

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: Dr.h.c. prof. RNDr. Alexander Feher, DrSc., prof. Ing. Martin Orendáč, CSc.	
Date of last modification: 03.05.2015	
Approved: prof. Ing. Martin Orendáč, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ OSD1/99 | **Course name:** Seminar in Solid State Physics

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 1 **Per study period:** 14
Course method: present

Number of ECTS credits: 1

Recommended semester/trimester of the course: 4.

Course level: II.

Prerequisities:

Conditions for course completion:
Making a presentation for selected scientific topic.

Learning outcomes:
To obtain informations about scientific results of various research group from Košiceand from their cooperating foreign institutions, supporting presentation skills of students.

Brief outline of the course:
Content is determined by the lectures and varies every year.

Recommended literature:
Scientific journals.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 40

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

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

Date of last modification: 28.03.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/SAA/18	**Course name:** Sensors and actuators based on selected physical phenomena

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 credits: 2

Recommended semester/trimester of the course: 2., 4.

Course level: II., 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: 2

A	B	C	D	E	FX	N	P
50.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0

Provides: prof. RNDr. Rastislav Varga, DrSc., RNDr. Ladislav Galdun, PhD.

Date of last modification: 09.03.2018

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KPPaPZ/SPVKE/07

Course name: Social-Psychological Training of Coping with Critical Life Situations

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 2 **Per study period:** 28
Course method: present

Number of ECTS credits: 2

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 126

abs	n	z
97.62	2.38	0.0

Provides: Mgr. Ondrej Kalina, PhD.

Date of last modification: 11.02.2021

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SPE1/03	**Course name:** Solid State Spectroscopy

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 3 / 1 **Per study period:** 42 / 14
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Exam interwiew.

Learning outcomes:
Explanation of the principles of Mössbauer spectroscopy, infrared spectroscopy and radiospectroscopy (electron paramagnetic resonance, nuclear magnetic resonance). The theoretical knowledge will be completed by the work in research laboratories.

Brief outline of the course:
Mössbauer spectroscopy: Mössbauer effect. Hyperfine coupling. Electric monopole and quadrupole, and magnetic dipole interactions. Mössbauer spectroscopy, analysis of Mössbauer spectra – intensity and width of lines, isomer shift, quadrupole splitting and magnetic splitting. Infrared spectroscopy: Harmonic and anharmonic oscilator. Vibrational spectra. IR spectrometers, techniques, sample preparation. NMR/EPR spectroscopy: Electron spin. Crystal field. Electron spectra and transitions. EPR technique. Interactions of nuclei with magnetic and electric fields. Nuclear paramagnetism. Continual wave and pulse nuclear magnetic resonance techniques. Relaxation processes in nuclear spin system. One dimensional 1H and 13C NMR of liquid samples. Two-dimensional NMR spectra. Principles, measuring techniques. Solid-state NMR. NMR of feromagnetics.

Recommended literature:
1. Dickson P.E., Berry F.J.: Mössbauer spectroscopy. Cambridge University Press, London 1986.
2. Slichter C. P.: Principles of Magnetic Resonance, Springer-Verlag, London, 1990.

Course language:
english

Notes:

Course assessment
Total number of assessed students: 41

A	B	C	D	E	FX
60.98	17.07	9.76	9.76	2.44	0.0

Provides: doc. RNDr. Alžbeta Orendáčová, DrSc., doc. RNDr. Ján Imrich, CSc., RNDr. Natália Tomašovičová, CSc.
Date of last modification: 29.03.2020
Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SPR1/00	**Course name:** Special Practical Exercises I

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 3 **Per study period:** 42
Course method: present

Number of ECTS credits: 3

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Participation in exercises, reports from all exercies.

Learning outcomes:
The objectives of the laboratory are:
a. To gain some physical inside into some of the concepts presented in the lectures.
b. To gain some practice in data collection, analysis and interpretation of resumance.
c. To gain experience and report writing presentation and results.

Brief outline of the course:
Measurement of basic magnetic properties at ac and dc magnetisation, domain structure observation.
Measurement of magnetic properties using a SQUID magnetometer. Measurement of the dynamics of domain walls and measurement of magnetostriction.

Recommended literature:
Tumanski S, Handbook of magnetic measurements, CRC press, 2011.
Fiorillo F, Characterization and Measurement of Magnetic Materials, Elsevier, 2004.
Dufek M., Hrabák J., Trnaka Z.: Magnetická měření, SNTL, 1964, Praha
Brož J. a kol.: Základy fysikálnich měření, SPN, 1974, Praha.

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 33

A	B	C	D	E	FX	N	P
100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Adriana Zeleňáková, PhD., doc. RNDr. Ján Füzer, PhD., RNDr. Ladislav Galdun, PhD.

Date of last modification: 28.09.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SPR2/09 | **Course name:** Special Practicum II

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 3 **Per study period:** 42
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Theoretical background of the practices, the activities and knowledges by the experiments. The analysis of the experimental data and quality of the experiment elaborates.
Summary of the work on practices (theoretical background of the practices, the activities and knowledges by the experiments. The analysis of the experimental data and quality of the experiment elaborates).

Learning outcomes:
To obtain fundamental theoretical and experimental skills in area of selected physical research of condensed matter, primarily at low temperatures.

Brief outline of the course:
Vacuum technology, Calibration of the thermometers, Heat capacity, Magnetocaloric effect, Electron-spin resonance, Magnetic susceptibility and magnetisation, Electrical resistivity: measurement, analysis of the data, characterisation of the system.

Recommended literature:
J. H. Moore and N. D. Spencer: Encyclopedia o Chemical Physics and Physical Chemistry Vol. I., II. and III., IoP Publishing Ltd. 2001, ISBN 0750303131.

Course language:

Notes:

Course assessment
Total number of assessed students: 29

A	B	C	D	E	FX	N	P
72.41	10.34	10.34	0.0	0.0	0.0	0.0	6.9

Provides: doc. RNDr. Erik Čižmár, PhD., prof. Ing. Martin Orendáč, CSc.

Date of last modification: 29.03.2020

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚTVŠ/TVa/11	**Course name:** Sports Activities I.

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 2 **Per study period:** 28
Course method: combined, present

Number of ECTS credits: 2

Recommended semester/trimester of the course: 1.

Course level: I., I.II., II.

Prerequisities:

Conditions for course completion:
Conditions for course completion:
Min. 80% of active participation in classes.

Learning outcomes:
Learning outcomes:
Increasing physical condition and performance within individual sports. Strengthening the relationship of students to the selected sports activity and its continual improvement.

Brief outline of the course:
Brief outline of the course:
Within the optional subject, the Institute of Physical Education and Sports of Pavol Jozef Šafárik University provides for students the following sports activities: aerobics, basketball, badminton, floorball, yoga, pilates, swimming, body-building, indoor football, self-defence and karate, table tennis, sports for unfit persons, streetball, tennis, and volleyball.
In the first two semesters of the first level of education students will master basic characteristics and particularities of individual sports, motor skills, game activities, they will improve level of their physical condition, coordination abilities, physical performance, and motor performance fitness. Last but not least, the important role of sports activities is to eliminate swimming illiteracy and by means of a special program of medical physical education to influence and mitigate unfitness.
In addition to these sports, the Institute offers for those who are interested winter and summer physical education trainings with an attractive program and organises various competitions, either at the premises of the faculty or University or competitions with national or international participation.

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 14050

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
88.48	0.07	0.0	0.0	0.0	0.04	7.51	3.9

Provides: Mgr. Dana Dračková, PhD., Mgr. Agata Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Zuzana Küchelová, PhD., doc. PaedDr. Ivan Uher, PhD., Mgr. Marek Valanský, prof. RNDr. Stanislav Vokál, DrSc., Mgr. Marcel Čurgali, Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD.

Date of last modification: 18.03.2019

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice
Faculty: Faculty of Science
Course ID: ÚTVŠ/ TVb/11 — **Course name:** Sports Activities II.
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** combined, present
Number of ECTS credits: 2
Recommended semester/trimester of the course: 2.
Course level: I., I.II., II.
Prerequisities:
Conditions for course completion: Conditions for course completion: Final assessment and active participation in classes - min. 75%.
Learning outcomes: Learning outcomes: Increasing physical condition and performance within individual sports. Strengthening the relationship of students to the selected sports activity and its continual improvement.
Brief outline of the course: Brief outline of the course: Within the optional subject, the Institute of Physical Education and Sports of Pavol Jozef Šafárik University provides for students the following sports activities: aerobics, basketball, badminton, floorball, yoga, pilates, swimming, body-building, indoor football, self-defence and karate, table tennis, sports for unfit persons, streetball, tennis, and volleyball. In the first two semesters of the first level of education students will master basic characteristics and particularities of individual sports, motor skills, game activities, they will improve level of their physical condition, coordination abilities, physical performance, and motor performance fitness. Last but not least, the important role of sports activities is to eliminate swimming illiteracy and by means of a special program of medical physical education to influence and mitigate unfitness. In addition to these sports, the Institute offers for those who are interested winter and summer physical education trainings with an attractive program and organises various competitions, either at the premises of the faculty or University or competitions with national or international participation.
Recommended literature:
Course language:
Notes:

Course assessment
Total number of assessed students: 11330

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
85.75	0.56	0.02	0.0	0.0	0.05	9.87	3.75

Provides: Mgr. Dana Dračková, PhD., Mgr. Agata Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Zuzana Küchelová, PhD., doc. PaedDr. Ivan Uher, PhD., Mgr. Marek Valanský, prof. RNDr. Stanislav Vokál, DrSc., Mgr. Marcel Čurgali, Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD.

Date of last modification: 18.03.2019

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚTVŠ/ TVc/11	**Course name:** Sports Activities III.

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 2 **Per study period:** 28
Course method: combined, present

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: I., I.II., II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 8383

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
90.11	0.05	0.01	0.0	0.0	0.02	4.04	5.76

Provides: Mgr. Marcel Čurgali, Mgr. Dana Dračková, PhD., Mgr. Agata Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Zuzana Küchelová, PhD., doc. PaedDr. Ivan Uher, PhD., Mgr. Marek Valanský, prof. RNDr. Stanislav Vokál, DrSc., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚTVŠ/ TVd/11	**Course name:** Sports Activities IV.

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 2 **Per study period:** 28
Course method: combined, present

Number of ECTS credits: 2

Recommended semester/trimester of the course: 4.

Course level: I., I.II., II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 5101

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
85.2	0.29	0.04	0.0	0.0	0.0	6.76	7.7

Provides: Mgr. Marcel Čurgali, Mgr. Dana Dračková, PhD., Mgr. Agata Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Zuzana Küchelová, PhD., doc. PaedDr. Ivan Uher, PhD., Mgr. Marek Valanský, prof. RNDr. Stanislav Vokál, DrSc., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/SVKK/99	Course name: Student Scientific Conference

Course type, scope and the method:
Course type:
Recommended course-load (hours):
Per week: Per study period:
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2., 4.

Course level: II.

Prerequisities:

Conditions for course completion:
Research activities of a student during semester
Presentation of the achieved results at the Scientific Student Conference at the faculty level.

Learning outcomes:
Students will obtain experience with presentation of achieved scientific results.

Brief outline of the course:
As required by individual topics of research.

Recommended literature:
According to requirements of individual topics of student works

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 53

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Adriana Zeleňáková, PhD.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/ LKSp/13	**Course name:** Summer Course-Rafting of TISA River
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** **Per study period:** 36s **Course method:** combined, present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course:	
Course level: I., II.	
Prerequisities:	
Conditions for course completion: Conditions for course completion: Attendance Final assessment: Raft control on the waterway (attended/not attended)	
Learning outcomes: Learning outcomes: Students have knowledge of rafts (canoe) and their control on waterway.	
Brief outline of the course: Brief outline of the course: 1. Assessment of difficulty of waterways 2. Safety rules for rafting 3. Setting up a crew 4. Practical skills training using an empty canoe 5. Canoe lifting and carrying 6. Putting the canoe in the water without a shore contact 7. Getting in the canoe 8. Exiting the canoe 9. Taking the canoe out of the water 10. Steering a) The pry stroke (on fast waterways) b) The draw stroke 11. Capsizing 12. Commands	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 153

abs	n
45.75	54.25

Provides: Mgr. Dávid Kaško, PhD.

Date of last modification: 18.03.2019

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ FPO/14	**Course name:** Surface science

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: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
report from selected scientific problems, exam

Learning outcomes:
The goal of this course is to introduce student to theory and physical properties of surfaces, processes and phenomena on surfaces and methods used for their study.

Brief outline of the course:
In the introduction i will make general overview of terminology in physics of surfaces, electronic structure of solids with application to surfaces. I will make detailed overview of experimental methods used for surface characterization. Student will learn about theory of adsorption and diffusion on surfaces, with thermodynamics and kinetics of processes on surfaces and growth of layers. I will show examples of physical and chemical processes on surfaces in real applications. Student will gain basic knowledge about theory of interfaces and about processes stimulated by laser and electrons and about manipulation on surfaces on nanoscale.

Recommended literature:
1. K. W. Kolasinski, Surface Science Foundations of Catalysis and Nanoscience, John Wiley and Sons, Ltd. 2008. 2. Ch. Kittel, Introduction to Solid State Physics, 7th edition, John Wiley and Sons, 1995. 3. A. Zangwill Physics at Surfaces, Cambridge university press, 1988

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 20

A	B	C	D	E	FX
60.0	40.0	0.0	0.0	0.0	0.0

Provides: Mgr. Vladimír Komanický, Ph.D.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice
Faculty: Faculty of Science
Course ID: ÚTVŠ/KP/12 — **Course name:** Survival Course
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week: Per study period:** 36s **Course method:** combined, present
Number of ECTS credits: 2
Recommended semester/trimester of the course:
Course level: I., II.
Prerequisities:
Conditions for course completion: Conditions for course completion: Attendance Final assessment: continuous fulfilment of all tasks within the course
Learning outcomes: Learning outcomes: Students will be familiarized with principles of safe stay and movement in extreme natural conditions as they will obtain theoretical knowledge and practical skills to solve the extraordinary and demanding situations connected with survival and minimization of damage to health. The course develops team work and students will learn how to manage and face the situations that require overcoming of obstacles.
Brief outline of the course: Brief outline of the course: Lectures: 1. Principles of behaviour and safety for movement and stay in unknown mountains 2. Preparation and leadership of tour 3. Objective and subjective danger in mountains 4. Principles of hygiene and prevention of damage to health in extreme conditions Exercises: 1. Movement in terrain, orientation and navigation in terrain (compasses, GPS) 2. Preparation of improvised overnight stay 3. Water treatment and food preparation.
Recommended literature:
Course language:
Notes:

Course assessment
Total number of assessed students: 393

abs	n
44.53	55.47

Provides: MUDr. Peter Dombrovský, Mgr. Marek Valanský

Date of last modification: 15.03.2019

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ZTE/03	**Course name:** Technology of Condensed Maters
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: 1.	
Course level: II.	
Prerequisities:	
Conditions for course completion: 50 % maintained output, written test 50% final output, wtitten test	
Learning outcomes: The course gives information about principles of solidification, precipitatin. Thermodynamics of phase transitions, Plastic deformation, strethenning and Racrystallisation and Hot working	
Brief outline of the course: Principles of solidification: solidification defects, casting processes for manufacturing components, ingot casting, directional solidification, single crystal growth and epitaxial growth, joining of metallic materials. Solid solutions and phase equilibrium: phase diagrams,solubility and solutions, solid-solution strengthening. Relationship between properties and phase diagram. Nonequiblirium solidificatin and segregation. Dispersion strengthening and eutectic phase diagram: intermetallic compounds, eutectic phase diagram, eutectic alloys. Dispersion strengthening by phase transformations and heat treatment: nucleation and growth in solid-state reactions, precipitation hardening, age hardening, eutectoid reaction – pearlite, bainite and martensitic reaction, Strain hardening snd annealing. Hot working, recrystallisation. Superplastic forming. Ferrous alloys.	
Recommended literature: 1. D.R.Askeland and P.P. Phulé, The Science and Engineering of Materials, Thomson 2003. 2. R.W. Cahn et al, Physical Metalurgy I, Elsevier, 1983, ISBN - 0-444-86786-4 3. R.W. Cahn et al, Physical Metalurgy I, Elsevier, 1983, ISBN - 0-444-86787-2	
Course language: English	
Notes:	

Course assessment
Total number of assessed students: 38

A	B	C	D	E	FX
60.53	36.84	2.63	0.0	0.0	0.0

Provides: prof. RNDr. Pavol Sovák, CSc.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KPPaPZ/UPR/03

Course name: The Art of Aiding by Verbal Exchange

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: 2 **Per study period:** 28
Course method: present

Number of ECTS credits: 2

Recommended semester/trimester of the course: 4.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 49

A	B	C	D	E	FX
85.71	4.08	2.04	2.04	2.04	4.08

Provides: Mgr. Ondrej Kalina, PhD.

Date of last modification: 18.03.2019

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ VOM/09	**Course name:** The Universe at Microscopic Level

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: 1., 3.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:
To provide the students with the recent knowledge of the structure of the Universe at the elementary particle level.

Brief outline of the course:
The lectures provide an insight into the microstructure of the Universe - starting with early cosmic phases like quark-gluon plasma, baryogenesis and first nuclei creation and continue with the structure of nowadays Universe: main sequence stars, white dwarfs, neutron stars, black holes, interstellar and inter galactic space, dark matter and dark energy and cosmic rays.

Recommended literature:
1. D. Griffiths: Introduction to Elementary Particles, Wiley-VCH, Weinheim, 2004
2. D. Perkins: Particle Astrophysics, Oxford University Press, Oxford, 2003
3. D. Prialnik: An Introduction to the Theory of Stellar Structure and Evolution, Cambridge University Press, Cambridge, 2000

Course language:

Notes:

Course assessment
Total number of assessed students: 21

A	B	C	D	E	FX
100.0	0.0	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Marek Bombara, PhD.

Date of last modification: 03.05.2015

Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ TKL1/99	**Course name:** Theory of Condensed Matter

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 4 / 2 **Per study period:** 56 / 28
Course method: present

Number of ECTS credits: 8

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
Successful passing of the final oral exam.

Learning outcomes:
To manage basic methods of quasiparticle formalism of Solid State Physics (electrons, phonons, electron-electron, electron-phonon interactions, magnons)

Brief outline of the course:
Born-Openheimer and Hartree-Fock aproximatins. The structure of solids and its theoretical description. The ideal crystal, direct and recipcal lattice. Brawaiss elementary cell. Electron in a periodic potential field, Bloch's theorem. Born-Karmán boundary conditions, Brillouin zones. Nearly free electron theory. Tight binding approximation. Existence of energy bands. Effective mass tensor. Lattice waves. Dynamical matrix. Linear monoatomic and diatomic lattices. Acoustic and optical modes. Phonons in solids. Electron-phonon interactions. The Fröhlich Hamiltonian. The atractive interaction between electrons.

Recommended literature:
[1.] Ch. Kittel: Quantum Theory of Solids, John Wiley & Sons Inc, 1985.
[2.] N.W. Ashcroft, N.D. Mermin: Solid State Physics, Harcourt College Publishers, 1976.
[3.] P.L. Taylor: A Quantum Approach to the Solid State, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1970.
[4.] J.M. Ziman, Principles of the Theory of Solids, University Press, Cambridge, 1972.
[5.] A.O.E. Animalu, Intermediate Quantum Theory of Crystalline Solids, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1981.

Course language:

Notes:

Course assessment
Total number of assessed students: 99

A	B	C	D	E	FX
57.58	11.11	16.16	7.07	8.08	0.0

Provides: prof. RNDr. Michal Jaščur, CSc.
Date of last modification: 03.05.2015
Approved: prof. Ing. Martin Orendáč, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ TRANS/18	**Course name:** Transport properties of solids
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 1 **Per study period:** 28 / 14 **Course method:** present	
Number of ECTS credits: 4	
Recommended semester/trimester of the course: 2., 4.	
Course level: II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course: Phenomenological approach, Electron transport in solids, DC conductivity in metals, Drude theory, Electron gas, electric and heat currents, Diffusive transport, Transport Boltzmann equation, Linear response, Electronic transport in mesoscopic systems, Ballistic transport, Resistance of ballistic condutor, Landauer formula and its applications, Quantum Hall effects, Tunneling and Coulomb blockade, Quantum dots, Single molecule transport, STEM basics, Spin polarized transport, Anomalous Hall effect, Berry curvature	
Recommended literature: 1. K. Hirose, N. Kobayashi, Quantum Transport Calculations for Nanosystems, Pan Standford Publishing 2014 2. D. K. Ferry, An Introduction to Quantum Transport in Semiconductors, Pan Standford Publishing 2018 3. M. Galperin, Quantum Transport, Lecture Notes 1998 4. S. Datta, Electronic Transport in Mesoscopic Systems, Cambridge University Press 1995 5. T. Heinzel, Mesoscopic Electronics in Solid State Nanostructures, Wiley-VCH 2003 6. N. W. Ashcroft, N. D. Mermin, Solid State Physics, Harcourt College Publisher 1976 7. M. P. Marder, Condensed Matter Physics, Wiley 2010 8. J. B. Ketterson, The Physics of Solids, Oxford University Press 2016 9. J. Sólyom, Fundamentals of the Physics of Solids, Volume 2 – Electronic Properties, Springer 2009	
Course language:	
Notes: https://ktfa.science.upjs.sk/people/martin-gmitra/teaching/transport-properties-in-solid-state/	

Course assessment
Total number of assessed students: 9

A	B	C	D	E	FX
33.33	11.11	22.22	22.22	11.11	0.0

Provides: RNDr. Martin Gmitra, PhD.

Date of last modification: 07.05.2020

Approved: prof. Ing. Martin Orendáč, CSc.