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:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/APR/17	**Course name:** Astronomical instrumetation

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: 6

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
2 tests during semester. Each test for 15 points. Minimal amounts of points for an exam is 20. Oral examination and test.

Learning outcomes:
Acquaint students with construction of astronomical telescopes, correction of optical aberationss and light detectors in different spectral regions.

Brief outline of the course:
Principles of geometrical optics, optical errors and their corrections, types of telescopes and their construction, radio-telescopes, satellite UV and X-ray telescopes, detectors of the light: CCD, CMOS, principles of photometry, spectroscopy and polarimetry.

Recommended literature:
1. Howell : 2000, Handbook of CCD Astronomy, Cambridge University Press.
2. Cheng, J.: 2009, The Principles of Astronomical Telescope Design, Springer-Verlag
3. Lena et al.: 1996, Observational Astrophysics, Springer-Verlag
4. Martinez a Klotz: 1998, A practical giude to CCD Astronomy, Cambridge University Press.
5. Romano: 2009, Geometric Optics: Theory and Design of Astronomical Optical Systems Using Mathematica 6. Schroeder: 1999, Astronomical Optics, Academic Press

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 6

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

Provides: doc. Mgr. Štefan Parimucha, PhD.

Date of last modification: 26.09.2017

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/MSSAA/14	**Course name:** Astronomy and Astrophysics

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/NME/17,ÚFV/TAF1/13,ÚFV/TAF2/13,ÚFV/ESP1/13,ÚFV/PHD/17,ÚFV/MPH1/13,ÚFV/FSL1/13

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
77.78	0.0	11.11	0.0	11.11	0.0

Provides:

Date of last modification: 23.05.2017

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ APMM/19	**Course name:** Atomistic Computer MOdeling of Materials

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: 2., 4.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:
Crash course to Many-body Schrödinger Equation, Introduction to Density Functional Theory, Numerical Methods for Realistic Calculations, Equilibrium Structures of Materials, Elastic Properties of Materials, Vibration of Molecules and Solids, Phonons and Vibrational Spectroscopy, Photoelectron Spectroscopy, Dielectric Function and Optical Spectra, Density Functional Theory and Magnetic Materials

Recommended literature:
1. F. Giustino, Materials Modelling using Density Functional Theory, Oxford University Press 2014;
2. J. Kohanoff, Electronic Structure Calculations for Solids and Molecules, Cambridge University Press 2006;
3. M. P. Marder, Condensed Matter Physics, John Wiley & Sons 2010;
4. R. M. Martin, Electronic Structure, Cambridge University Press 2004;
5. S. Bluegel et al., Computing Solids, Lecture Notes of the 45th IFF Spring School 2014.

Course language:

Notes:

Course assessment
Total number of assessed students: 5

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

Provides: RNDr. Martin Gmitra, PhD.

Date of last modification: 07.05.2020

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ NME/17	**Course name:** Celestial mechanics

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: 7

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
2 tests in the range of calculated examples on the exercises each for 10 point. Minimal amounts of points for an exam is 10.
Oral exam

Learning outcomes:
Acquaint students with foundations of the celestial mechanics, solution of two body problem and its application to bodies of the Solar system and will learn to perform a numerical integration of orbits of "n" bodies.

Brief outline of the course:

Recommended literature:
1. Andrle P., Základy nebeské mechaniky. Academia, Praha, 1971
2. Boccaletti D., Pucacco G.: Theory of Orbits (Vol. 1 and Vol. 2), Springer, Berlin, 2001.
3. Brouwer D., Clemence G. M.: Methods of Celestial Mechanics, Academia Press, New York and London, 1961
4. Everhart E.: An efficient integrator that uses Gauss-RADAU spacings. In: Dynamics of Comets: Their Origin and Evolution, eds. A. Carusi and G. B. Valsecchi, Reidel, Dordrecht, pp. 185$-$202.
5. Puankare A.: Lekcii po nebesnoj mechanike. Nauka, Moskva, 1965.
6. Roy A. E., Orbital Motion, Adam Hilger Ltd., Bristol, 1978
7. Vanýsek V., Základy astronomie a astrofyziky, Academia, Praha, 1980.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 7

A	B	C	D	E	FX
57.14	0.0	14.29	0.0	28.57	0.0

Provides: Mgr. Marián Jakubík, PhD.
Date of last modification: 26.09.2017
Approved:

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: PhDr. Dušan Hruška, PhD.	
Date of last modification: 03.05.2015	
Approved:	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ KKV1/15	**Course name:** Classical and quantum computations
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: 6	
Recommended semester/trimester of the course: 1., 3.	
Course level: II.	
Prerequisities:	
Conditions for course completion: Written work Writen and oral examination	
Learning outcomes: To provide information on quantum computer and quantum computations. To compare classical and quantum models and methods.	
Brief outline of the course: The basics of classical theory of computation: Turing machines, Boolean circuits, parallel algorithms, probabilistic computation, NP-complete problems, and the idea of complexity of an algorithm. Introduction of general quantum formalism (pure states, density matrices, and superoperators), universal gate sets and approximation theorems. Grover's algorithm, Shor's factoring algorithm, and the Abelian hidden subgroup problem. Parallel quantum computation, a quantum analogue of NP-completeness, and quantum error-correcting codes.	
Recommended literature: 1. BERMAN,G.P., DOOLEN,G.D., MAINIERI, R., TSIFRINOVIC, V.I. Introduction to Quantum Computers. World Scientific, 2003. 2. GRUSKA, J. Quantum Computing. McGraw-Hill, 1999. 3. JOHNSON, G. A Shortcut Through Time: The Path to the Quantum Computer, Knopf 2003. 4. KITAEV, A.Y., SHEN, A.H., VYALYI, M.N. Classical and Quantum Computation. American Mathematical Society, 2002. 5. NIELSEN, M.A., CHUANG, I.L. Quantum Computation and Quantum Information. Cambridge University Press, 2000. 6. HIRVENSALO, M., Quantum Computing, Springer 2004	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 136

A	B	C	D	E	FX
25.0	35.29	13.97	12.5	6.62	6.62

Provides: prof. RNDr. Gabriel Semanišin, PhD., RNDr. Zuzana Bednárová, PhD.

Date of last modification: 03.05.2015

Approved:

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: 24.06.2021
Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ POF1b/99	**Course name:** Computational Physics II

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: 1.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Continuous evaluation is based on students' presence and activity in the classroom and work on assignments. Examination and all assignments submitted electronically with the attached computer code.

Learning outcomes:
To teach students to create simulation projects to help to solve physical problems. To acquaint students with basic simulation methods of multiparticle systems by Monte Carlo and molecular dynamics.

Brief outline of the course:
1. Methods of Monte Carlo (MC) simulations of lattice spin systems.
2. Local and cluster perturbation algorithms.
3. Errors and histogram analysis of MC data.
4. Reweighting by simple and histogram methods.
5. Universality and finite-size scaling.
6. Determination of order of phase transitions and calculation of critical exponents.
7. Basics of quantum MC simulations.
8. MC simulations of stochastic processes.
9. Diffusion equation.
10. Stochastic processes in financial analysis.
11.Basics of molecular dynamics method.
12. Discretization schemes of molecular dynamics.

Recommended literature:
- D. P. Landau, K. Binder: A Guide to Monte Carlo Simulations in Statistical Physics, Cambridge Univ. Press, 5-th edition, 2021.
- B. A. Berg: Introduction to Markov Chain Monte Carlo Simulations and Their Statistical Analysis (http://www.worldscibooks.com/etextbook/5904/5904_intro.pdf)
- W. Janke: Monte Carlo Simulations of Spin Systems (http://www.physik.uni-leipzig.de/~janke/Paper/spinmc.pdf)

Course language:

Notes:

Course assessment
Total number of assessed students: 53

A	B	C	D	E	FX
52.83	16.98	16.98	9.43	1.89	1.89

Provides: prof. RNDr. Milan Žukovič, PhD.

Date of last modification: 30.06.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ PAST/17	**Course name:** Computer astrophysics

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: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Software project

Learning outcomes:
Inform students of astronomy as well as other interested people about basic numerical methods used in astronomy and astrophysics, give them basic informations about problems of scientific writting and basic work with astronomical packages

Brief outline of the course:
Introduction to LaTex system., Sources of astronomical informations on web, VIZIER, NASA ADS Abstract Service. FITS format of astronomical data. Reduction of CCD and photoelectric photometry Introduction to MIDAS and IRAF. Numerical procedures for JD computation, stellar time, air mass, reduction of precession, nutation, aberation, refraction and proper motion. Heliocentric and barycentric correction of time and velocity. Period determination in astronomical data. Transformation of photometric systems and calibration of spectra. Minima times determinations.

Recommended literature:
1. Ghedini: 1982, Software for Photometric astronomy
2. Press et al., 1992, Numerical Recipes in C, The art of scientific Computing, CUP
3. manual for software packages 4. published papers and internet sources

Course language:
Slovak, English

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. Mgr. Štefan Parimucha, PhD.

Date of last modification: 02.04.2020

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ KOZM/13	**Course name:** Cosmology

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: 4

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
Test within the curriculum presented during the course; seminar essay.
Oral exam with preparation; 3 questions within the curriculum presented during the course.

Learning outcomes:
Become acquainted with basic knowledge of fundamental cosmological theories, structure and evolution of the universe.

Brief outline of the course:
Structure and distribution of matter in the universe. Historical development of cosmological theories; Olbers' paradox; gravitational paradox. General theory of relativity; relativistic cosmology; other cosmological theories. The origin and evolution of the universe; cosmological problems.

Recommended literature:
1. Contopoulos, D. Kotsakis, Cosmology, the structure and evolution of the Universe, Springer, 1984;
2. Weinberg, S., Gravitation and Cosmology, Wiley, New York, 1971;
3. Narlikar, J.V., An Introduction to Cosmology, Cambridge University Press, Cambridge, 2002;

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 27

A	B	C	D	E	FX
77.78	18.52	3.7	0.0	0.0	0.0

Provides: doc. RNDr. Rudolf Gális, PhD.

Date of last modification: 26.09.2017

Approved:

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: 65

A	B	C	D	E	FX
70.77	18.46	6.15	1.54	3.08	0.0

Provides:

Date of last modification: 03.05.2015

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ EKF/04	**Course name:** Econophysics

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:
Continuous evaluation is based on students' presence and activity in the classroom and work on assignments. Examination and all assignments submitted electronically with the attached computer code.

Learning outcomes:
To teach student to employ the aquired knowledge from physics in different disciplines such as economy, finantial analysis and sociology.

Brief outline of the course:
1. Introduction. Pareto and Bachelier approach.
2. The physical "philosophy" in the formulation of models of social and economic models.
3. The system of measurable quantities in economy, the logarithmic price, the uints of time and price in economy.
4. The stochastic models, random processess and distribution functions, stability of distributions, infinitely divisible process.
5. Scaling of distribution functions, Gauss and Lévy distribution, the simulation of random processes via computer.
6. Selected parallels between economy and fluid turbulence, market volatility and intermittence.
7. Correlations of markets, the markets in mutual correlations and anticorrelations.
8. Autocorrelations and analysis of time series.
9. Portfolio taxonomy and the strategy of the joining of enterprises and formation of corporations.
10. Computer modeling of GARCH and ARCH random processes with variable dispersion of volatility.
11. Models based on the stochastic diferential equations, Black-Scholes model of the rational option price.
12. Internet as a source of current economic information, M&P 500 indices, DJIA.

Recommended literature:
Basic literature:
- An Introduction to Econophysics: Correlations and Complexity in Finance, R. N. Mantegna, H. E. Stanley, Cambridge University Press 2000.
Other literature:

- The Statistical Mechanics of Financial Markets, J. Voit, Springer 2003.
- Econophysics: An Introduction, Sitabhra Sinha, A. Chatterjee, A. Chakraborti, B. K. Chakrabarti, Wiley VCH 2011.

Course language:

Notes:

Course assessment
Total number of assessed students: 16

A	B	C	D	E	FX
75.0	18.75	6.25	0.0	0.0	0.0

Provides: prof. RNDr. Milan Žukovič, PhD.

Date of last modification: 01.07.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ESP1/13	**Course name:** Extrasolar Planets

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:
semestral essay
oral exam

Learning outcomes:
Acquaint students wit problematic of exoplanets, their detections, formation and properties.

Brief outline of the course:
Definition of planets and exoplanets, known exoplanets, methods of their detection, protostelar disks and formations of planets, creation of giant planets and their dynamics in systems.

Recommended literature:
1. Barnes, R.:2010, Formation and Evolution of Exoplanets, Wiley-VCH
2. Cassen et al:2006, Extrasolar planets, Springer
3. Haswell C. A.: 2010, Transiting exoplanets, Cambridge University Press
4. Lena et al.: 2011, Observational Astrophysics, Springer-Verlag
5. Mason, J.: 2008, Exoplanets: Detection, Formation, Properties, Habitability, Springer
6. Perryman, M.: 2011, The Exoplanet Handbook, Cambridge University Press

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 13

A	B	C	D	E	FX
76.92	23.08	0.0	0.0	0.0	0.0

Provides: doc. Mgr. Štefan Parimucha, PhD.

Date of last modification: 27.09.2016

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/GEA1/13	**Course name:** Galactic and Extragalactic Astronomy

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: 2.

Course level: II.

Prerequisities: ÚFV/TAF1/13

Conditions for course completion:
Test

Learning outcomes:
Acquaint students with the structure of our Galaxy, stellar streams and stellar statistics, galactic neighborhood, division of galaxies, their dynamic and evolution.

Brief outline of the course:
Determination of distances of the universe. Movement of the stars in Galaxy and Solar neighbouhood. Movement os the Sun in space. Stelar statistics. Structure of the Galaxy, subsystems, populations of the stars and spiral structure. Galaxies in universe, classification. Local group of galaxies, clusters of galaxies. Evolution of galaxies and large scale structure

Recommended literature:
1. Bertin a Lin: 1996, Spiral Structure in Galaxies, The MIT Press.
2. Combes et al.: 2003, Galaxies and Cosmology, Springer, Berlin
3. Harwitt: 1998, Astrophysical Concepts, Springer, Berlin
4. Mihalas: 1968, Galactic Astronomy, Freeman Publishing

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 14

A	B	C	D	E	FX
78.57	14.29	7.14	0.0	0.0	0.0

Provides: doc. Mgr. Štefan Parimucha, PhD.

Date of last modification: 02.04.2020

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ TRV1/00	**Course name:** General Theory of Relativity

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:
Continuous elaboration of homework during the semester. During the oral exam five random homework problems are selected and their physical content will be discusses. Base on the answers final mark will be given.

Learning outcomes:

Brief outline of the course:
Overview of the special theory of relativity (STR). Uniformly accelerated motion in STR. Local principle of equivalence - Eotvos experiment. Tensor calculus in pseudoriemann's metric. Einstein equations of gravitational field. Schwarzschild's solution for spherically symetric field. Experimental tests of the general theory of relativity. Black holes. Solutions for homogeneous and isotropic distribution of mass. Cosmological applications.

Recommended literature:
1. Hughston, L. P., Tod K. P.: An Introduction to General Relativity, London Mathenatical Society Student Texts 5. CUP, Cambridge, 1990.
2. Wald, R.W.: General Relativity, University of Chicago Press, Chicago, 1984.
3. Misner, C.W., Thorne, K.S., Wheller, J.A.: Gravitation, Freeman, San Francisco, 1973.
4. Landau L.D., Lifshitz E.M.: The classical theory of fields. Addison- Wesley, Reading, Mass., USA, 1977.

Course language:
1. Slovak,
2. English

Notes:

Course assessment
Total number of assessed students: 96

A	B	C	D	E	FX
86.46	6.25	7.29	0.0	0.0	0.0

Provides: RNDr. Tomáš Lučivjanský, PhD.

Date of last modification: 27.03.2020
Approved:

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: 742

A	B	C	D	E	FX
60.78	13.88	12.67	8.63	3.37	0.67

Provides: Doc. PhDr. Peter Nezník, CSc., PhDr. Katarína Mayerová, PhD., doc. Mgr. Róbert Stojka, PhD.

Date of last modification: 25.03.2020

Approved:

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: 10

A	B	C	D	E	FX
90.0	10.0	0.0	0.0	0.0	0.0

Provides: Doc. PhDr. Peter Nezník, CSc.

Date of last modification: 12.02.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ MPH1/13	**Course name:** Interpalnetary Matter

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

Number of ECTS credits: 6

Recommended semester/trimester of the course: 3.

Course level: II.

Prerequisities:

Conditions for course completion:
test
Exam

Learning outcomes:
The knowledge on the physical and dynamic properties of asteroids, comets and meteors.

Brief outline of the course:
Asteroids, comets, meteors - discoveries, orbits, astrometry, photometry, mass, rotation and size, composition, collision with Earth, formation and evolution, space research, relationships and context.

Recommended literature:
J.S. Lewis: Physics and Chemistry of the Solar System, London, Academic Press, 1997 (kapitoly VI, VII, VIII).
Bottke, W.F., Cellino, A., Paolicchi, P., Binzel, R.P.: Asteroids III, Tucson, University of Arizona Press, 2002.
Brandt, J.C., Chapman, D.: Introduction to comets, Cambridge, Cambridge University Press, 2004.
Murad, E., Williams I.P.: Meteors in the Earth`s Atmosphere, Cambridge, Cambridge University Press, 2002.

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 14

A	B	C	D	E	FX
71.43	14.29	14.29	0.0	0.0	0.0

Provides: doc. RNDr. Ján Svoreň, DrSc.

Date of last modification: 03.05.2015

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚINF/ UNS1/15	**Course name:** Introduction to neural networks

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:
The condition for passing the course is the realization of a project with the application of neural networks, successful completion of two written tests in the field of neural networks and genetic algorithms, as well as successful completion of the written and oral part of the exam.

Learning outcomes:
The result of the education is an understanding of the basic principles of neural networks and genetic algorithms. The student will gain the ability to apply the acquired knowledge in intelligent data analysis and also work with a selected tool for modeling neural networks.

Brief outline of the course:
1. Basic concept arising from biology. Linear threshold units, polynomial threshold units, functions calculable by threshold units.
2. Perceptrons. Linear separable objects, adaptation process (learning), convergence of perceptron learning rule, higher order perceptrons.
3. Forward neural networks, hidden neurons, adaptation process (learning), backpropagation method.
4. Recurrent neural networks. Hopfield neural networks, properties, associative memory model, energy function, learning, optimization problems (business traveler problem).
5. Model of gradually created network. ART network, architecture, operations, initialization phase, recognition phase, search and adaptation phase. Use of the ART network.
6. Applications of studied models in solving practical problems.
7. Written test I.
8. Motivation to model genetic elements. Genetic algorithm. Application of genetic algorithms.
9. Genetic programming, root trees, Read's linear code. Basic stochastic optimization algorithms: blind algorithm and climbing algorithm. Forbidden search method.
10. Genetic and evolutionary programming with typing, examples of use. Grammatical evolution.
11. Special techniques of evolutionary computations. Selection mechanisms in evolutionary algorithms.
12. Use of genetic algorithms in training neural networks. Artificial life.
13. Written test II.

Recommended literature:

1. AGGARWAL, Charu C. Neural networks and deep learning: a textbook. Cham: Springer, 2018. ISBN 978-3319944623.
2. KVASNIČKA, Vladimír. Úvod do teórie neurónových sietí. [Slovenská republika]: IRIS, 1997. ISBN 80-88778-30-1.
3. KVASNIČKA, Vladimír. Evolučné algoritmy. Bratislava: Vydavateľstvo STU, 2000. Edícia vysokoškolských učebníc. ISBN 80-227-1377-5.
4. MITCHEL, Melanie. An Introduction to Genetic Algorithms. Cambridge: MIT Press, 2002. ISBN 0-262-63185-7.
5. SINČÁK, Peter, ANDREJKOVÁ, G. Úvod do neurónových sietí, I. diel, Košice: ELFA, 1996. ISBN 808878638X

Course language:
Slovak or English

Notes:
Content prerequisites:
Basics of programming in Python, or another alternative programming language suitable for data analysis

Course assessment
Total number of assessed students: 439

A	B	C	D	E	FX
14.12	17.08	22.55	19.13	22.78	4.33

Provides: RNDr. Ľubomír Antoni, PhD., RNDr. Šimon Horvát

Date of last modification: 26.08.2021

Approved:

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: 1.

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:
1. The concept of temperature. Thermodynamic absolute temperature. International Practical Scale ITS - 90. Overview of the properties of cryogenic liquids. Phase diagram of 4He. Thermal properties of 4He. Transport properties of 4He.
2. Superfluidity of 4He - Two-component theory, Bose condensation, Landau's theory of He-II, criterion of superfluidity. Thermodynamic functions of He-II. Wave propagation in helium. Quantum vortices. Motion of charged particles in He.
3. Properties of 3He - phase diagram of 3He. Manifestation of Fermi-Dirac statistics on the properties of liquid 3He. Landau's theory of Fermi fluid. Zero sound in Fermi fluid. Superfluid phases of 3He and their properties. Topology of superfluid phases 3He. Description of 3He superfluidity using an order parameter.
4. Properties of liquid solutions of 3He-4He. Elementary excitations in 3He-4He solutions. Properties of solid 4He. Properties of solid 3He. Phase transition in solid 3He. Solid solutions of 3He-4He. Quantum crystals. Quantum diffusion. Kapitza resistance.
5. Basic properties of superconductors, penetration depth, coherence length. Classification of superconductors.
6. Phenomenological theory of superconductivity and basics of BCS theory. High temperature superconductivity.
7. Tunneling phenomena in superconductors. Quantum interference and SQUID.
8. Electrical conductivity of metals at low temperatures. Classical and quantum size effects. Mesoscopic objects (Quantum Hall effect, ballistic transport, properties of 2D electron gas).
9. Heat capacity at low temperatures. Lattice and electron specific heat. Schottky's contribution. Heat capacity of superconductors and semiconductors. Thermal conductivity of metals. Electron

and phonon component and their separation. Thermal conductivity of semiconductors, insulators and superconductors.
10. Methods of measuring low and very low temperatures. Gas thermometer. Condensation thermometers. Resistance thermometers. Thermocouples. Paramagnetic thermometers. Nuclear orientation thermometer. NMR thermometry. Noise thermometer.
11. 4He cryostats, 3He refrigerator. 3He-4He refrigerator. Pomeranchuk refrigerator. Adiabatic demagnetization of paramagnetic salts. Cryocoolers - pulsed-tube refrigerator.
12. Nuclear demagnetization. Hyperfine nuclear cooling. Nuclear magnetism in metals. Nanokelvin and negative temperatures.

Recommended literature:

Skrbek L. a kol.: Fyzika nízkych teplôt, Matfyzpress, MFF KU Praha, 2011.
C. Enss, S. Hucklinger, Low-Temperature Physics, Springer, 2005.
Jánoš Š.: Fyzika nízkych teplôt, ALFA Bratislava, 1980.
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: 63

A	B	C	D	E	FX
90.48	3.17	6.35	0.0	0.0	0.0

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

Date of last modification: 30.08.2021

Approved:

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: 114

A	B	C	D	E	FX	N	P
40.35	15.79	9.65	2.63	1.75	1.75	0.88	27.19

Provides: prof. RNDr. Peter Kollár, DrSc.

Date of last modification: 26.03.2020

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/ MPA/19	**Course name:** Markov's processes and their applications

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: 6

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
To obtain at least 50% in written tests during the semester. Total evaluation based on written tests and oral exam.

Learning outcomes:
Student should obtain the knowledge about modelling of stochastic processes and the ability to apply theoretical knowledge in practical problems solving.

Brief outline of the course:
Stochastic (random) processes, their distributions and characteristics. Trajectory of the process. Classification of processes -homogenous,ergodic and stacionary process. Markov chains with discrete time, classification of states of the process. Evaluation of transitions, optimal strategies, Howard´s algorithm. Markov chains with continuous time, intensity of transition. Kolmogorov´s differential equations, methods of solutions. Poisson process. Birth-and-death processes. General linear process. Applications in queuing theory. Kendall´s classification of queuing systems, opened and closed systems, systems with waiting. Applications in renewal theory and reliability. Markov chains in discrete renewal models. Renewal process with continuous time. Limit theorems of renewal theory.

Recommended literature:
1. Skřivánková V.: Náhodné procesy a ich aplikácie, UPJŠ, Košice, 2004 (in Slovak)
2. Beichelt F.: Applied Probability and Stochastic Processes, 2nd Ed., Chapman and Hall, 2016
3. Ross S. M.: Introduction to Probability Models, 10th ed., Academic Press, 2009
4. Janková, K. a kol. Markovove reťazce a ich aplikácie, epos, 2014 (in Slovak)
5. Prášková Z., Lachout P.: Základy náhodných procesu, MFF UK, Praha, 1998 (in Czech)

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 60

A	B	C	D	E	FX
18.33	13.33	21.67	25.0	18.33	3.33

Provides: RNDr. Martina Hančová, PhD., RNDr. Andrej Gajdoš, PhD.

Date of last modification: 18.03.2019

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ NSF/10	**Course name:** Non-Equilibrium Statistical Physics

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: 3.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:
To give basic knowledges about modern trends and theoretical methods in description of non-equlibrium phenomena in physics.

Brief outline of the course:
Problems of kinetic theory - formulations of basic tasks. Distribution function. Liouville theorem. Liouville operator. Kinetic Boltzman equation. H-theorem. Maxwell distribution. Transport phenomena. Conservation laws. Derivation of the macroscopic eduqtions in leading and next-to-leading approximation. Hydrodynamic approximation. Set of equations for density, mean velocity and temperature. Derivation of continuity equation, Navier-Stokes equation, heat conductivity equation. Derivation of vicosity and diffusivity coefficients from microscopic description. Stokes laws. Reynolds number. Dynamical derivation of kinetic equation. Liouville (master) equation for N-particle distribution function. Bogolyubov set of equations for distribution functions.
Principle of weakening of statistical correlations. Equation for one-particle distribution function. Brown motion. Langevin equation. Fokker-Planck equation and specific tasks.

Recommended literature:
1. Landau L.D., Lifshitz E.M.: Teoreticheskaja fizika X: Lifshitz E.M., Pitaevskij L.P.: Fizicheskaja
kinetika, Moskva, Fizmatlit 2002
2. K. Huang: Statistical mechanics, John Wiley and Sons, Inc., New York-London, 1963.
D.N.Zubarev: Neravnovesnaja statisticheskaja termodinamika, Moskva, Nauka, 1971.
A.N.Vasiliev Kvantovopolevaja renormgruppa v teorii kriticeskogo povedenija i stochasticeskoj dinamike, Sankt-Peterburg, Izd. Peters. Inst. Of. Nuclear physics (1998) 773 (The Field Theoretic Renormalization Group in Critical Behavior Theory and Stochastic Dynamics, Chapman & Hall CRS Press Company New York, 2004)

Course language:
slovak and english

Notes:

Course assessment
Total number of assessed students: 24

A	B	C	D	E	FX
66.67	8.33	12.5	12.5	0.0	0.0

Provides: prof. RNDr. Michal Hnatič, DrSc., RNDr. Tomáš Lučivjanský, PhD.

Date of last modification: 03.05.2015

Approved:

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: 85

A	B	C	D	E	FX
69.41	16.47	8.24	2.35	3.53	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 03.05.2015

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ NOT1b/03	**Course name:** Nontraditional Optimization Techniques II

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: 2.

Course level: I., II.

Prerequisities:

Conditions for course completion:
Presentation of the project in written form. Oral exam and discussion of the presented project. Should corona-virus quarantine persist, written report and answer to posed questions suffice.

Learning outcomes:
By using examples from the biology to learn applications of optimization techniques on study and interpretation of complex systems. Introduction to new paradigms in the area of systems biology, including parasite/host coevolution.

Brief outline of the course:
Complex systems, emergent behavior. Evolutionary theory and memetics. Application of optimization techniques on complex systems. Application of methods /genetic algorithms, simulated annealing, taboo search/ on selected problems of biomolecular simulations. Molecular dynamics, protein folding. Population dynamics, metabolic networks and complexity in bioinformatics.

Recommended literature:
The actual scientific papers.

Course language:

Notes:

Course assessment
Total number of assessed students: 50

A	B	C	D	E	FX
88.0	4.0	6.0	2.0	0.0	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 27.03.2020

Approved:

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:
Oral examination

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

Brief outline of the course:
1. Thermodynamics and phase transitions.
2. Conditions of stability of the equilibrium state of the magnetic system.
3. Phase equilibrium, phase transitions. Clausius-Clapeyron equation.
4. Classical (Ehrenfest) classification of phase transitions: phase transitions of the first and second kind.
5. Landau's description of phase transitions of the second kind.
6. Critical indices, universality. Definition of critical indices for the magnetic system. Thermodynamic relations between critical indices.
7. Basic microscopic models of magnetic phase transitions. Heisenberg and Ising model.
8. Exact solutions of microscopic models: one-dimensional and two-dimensional Ising model.
9. Thermodynamic functions for a one-dimensional Ising model.
10. Some approximate methods of solving the Ising model.
11. Phenomenological theory of phase transitions.
12. Landau's theory of phase transitions.

Recommended literature:
Basic literature:
- A. Bobák, Phase Transitions and Critical Phenomena, Project 2005/NP1-051 11230100466, European Social Fund, Košice 2007.
- Stanley H.G.: Introduction to Phase Transitions and Critical Phenomena, Clarendon Press Oxford, 1971.
Other literature:
- Reichl L.E.: A Modern Course in Statistical Physics, University of Texas Press, Austin, 1980.
- Plischke M., Bergersen B.: Equilibrium Statistical Physics, World Scientific, Singapore, 1994.
- 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: 122

A	B	C	D	E	FX
56.56	11.48	11.48	14.75	5.74	0.0

Provides: prof. RNDr. Andrej Bobák, DrSc., prof. RNDr. Milan Žukovič, PhD.

Date of last modification: 01.07.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ PSP/19	**Course name:** Practical Guide to Scientific Routine for Students
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., 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: RNDr. Martin Gmitra, PhD.
Date of last modification: 30.03.2020
Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/PRA/13	**Course name:** Practice in Astronomy

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: ÚFV/APR/17

Conditions for course completion:

Learning outcomes:
Acquaint students with a basic reduction of photometric observations and with astrometric determination of position of objects.

Brief outline of the course:
Photometric observations, reduction and calibration, measurements of brightness of stars. Astrometric transformation, WCS system

Recommended literature:
1. Howell : 2000, Handbook of CCD Astronomy, Cambridge University Press.
2. Lena et al.: 1996, Observational Astrophysics, Springer-Verlag
3. Martinez a Klotz: 1998, A practical giude to CCD Astronomy, Cambridge University Press.

Course language:
Slovak, 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: Mgr. Marek Husárik, PhD.

Date of last modification: 03.05.2015

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/PRAF/13	**Course name:** Practice in Astrophysics

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities: ÚFV/TAF1/13

Conditions for course completion:
Continual valuation based on the partial fulfillment of tasks
Based on continual valuation.

Learning outcomes:
Acquaint students with a reduction of spectroscopical observations of the Sun and stellar objects.

Brief outline of the course:
Acquisition of spectra and their reduction, calibration, measurement of radial velocities and line's intensities, determination of the chemical composition of the atmosphere of the Sun and stars.

Recommended literature:
2. Appenzeller, I., Introduction to Astronomical Spectroscopy, Cambridge University Press, 2012

Course language:
Slovak, 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: doc. Mgr. Štefan Parimucha, PhD.

Date of last modification: 03.05.2015

Approved:

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:
Conditions for the continuous assessment during the semester:
Active work (maximum 5 points, 2 absences are allowed).
Preparation, presentation and discussion on a selected topic - max. 15 points.
Written examination (maximum 30 points).
Conditions for admission to the exam: min. 25 points.
Conditions for the final assessment:
Exam: written form (max. 50 points, min. 25 points)
Conditions for successful completion of the course: participation in lessons, fulfillment of assignments and at least 66 points from the overall evaluation.
Detailed information in the electronic bulletin board of the course in AIS2. The teaching of the subject will be realized by a combined method.

Learning outcomes:
The student will understand the basic concepts and theories of health psychology, can explain salutogenic factors as well as the consequences of risk behavior related to health. He is able to apply the knowledge 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: 07.07.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ KTP1a/03	**Course name:** Quantum Field Theory I

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: 6

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
homeworks; their presentation and common analysis of problem under consideration, exam

Learning outcomes:
To offer basic knowledges about modern trends and theoretical methods in description of microword and phenomena in physical systems with infinite degrees of freedom.

Brief outline of the course:
Conception of relativistic quantum field. Particles as quantum fluctuations of this field. Lagrange formalism. Symmetries and related conservation laws for currents. Euler-Lagrange equations. Basic fields - scalar, spinor, electromagnetic and vector. Equations for free classical fields - Klein-Gordon and Dirac equations, Maxwell equations. Lagrangeans and Hamiltonians for these fields. Quantization of free fileds. Basic commutating and anticommutating relatios for free quantum fields.

Recommended literature:
Bogoljubov N.N., Širkov D.V.: Vvedenie v teoriu kvantovannych polej, Moskva, 1957 (prvé vydanie); Moskva, Nauka 1984 (4. Vydanie).
Bjorken J.D., Drell S.D.: Relativistic quantum fields (dva diely), McGraw-Hill, New York, 1966.
Feynmann R.P.: Photon-Hadron Interactions, Benjamin,New York, 1972; ruský preklad: Vzaimodejstvije fotonov s adronami, Mir, Moskva, 1975.

Course language:
slovak and english

Notes:

Course assessment
Total number of assessed students: 67

A	B	C	D	E	FX
52.24	20.9	7.46	5.97	11.94	1.49

Provides: prof. RNDr. Michal Hnatič, DrSc., RNDr. Tomáš Lučivjanský, PhD.

Date of last modification: 09.08.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ KTP1b/03	**Course name:** Quantum Field Theory II

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: 6

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities: ÚFV/KTP1a/03

Conditions for course completion:
homeworks, their presentation and common analysis of the problem under consideration; exam

Learning outcomes:
To offer basic knowledges about modern trends and theoretical methods in description of microword and phenomena in physical systems with infinite degrees of freedom.

Brief outline of the course:
Interacting fields. The principle of symmetry and the form of interactions of quantum fields. Lagrange operator in QED. S – matrix. Wick theorems and Feynman diagrams. Perturbative calculation of S - matrix. S - matrix and cross section of the processes. Compton scattering of the proton on electron cross section calculation in QCD frame. Radiation corrections and the divergences of the Feynman graphs. Running coupling constant.

Recommended literature:
Bogoljubov N.N., Širkov D.V.: Vvedenie v teoriu kvantovannych polej, Moskva, 1957 (prvé vydanie); Moskva, Nauka 1984 (4. Vydanie)
Itzykon C., Zuber J.B.: Quantum field theory,McGraw-Hill, New York, 1986; ruský preklad: Icikon K., Zjuber Z.B.: Kvantovaja teoria polja,
Mir, Moskva, 1984.
Ryder L.H.: Quantum field theory, Cambridge University Press, 1985; ruský
preklad: Rajder L.: Kvantovaja teoria polja, Mir, Moskva, 1987.

Course language:
slovak and english

Notes:

Course assessment
Total number of assessed students: 59

A	B	C	D	E	FX
54.24	28.81	6.78	5.08	5.08	0.0

Provides: prof. RNDr. Michal Hnatič, DrSc., RNDr. Tomáš Lučivjanský, PhD.

Date of last modification: 09.08.2021
Approved:

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:

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:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/VTFTL/20	**Course name:** Selected Topics in Solid State Physics: Computational Physics Applications

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., 3.

Course level: II.

Prerequisities: ÚFV/TKL1/99

Conditions for course completion:

Learning outcomes:

Brief outline of the course:
Electrons in crystal, tight-binding model, Physics of graphene, Su-Schrieffer-Heeger model, Bloch Electrons in Strong Magnetic Field, Electronic properties of selected 2D materials, Time reversal symmetry, Berry phase, Topological insulators, Weyl semimetals, Majorana fermions.

Recommended literature:
1. S. M. Girvin, K. Yang, Modern Condensed Matter Physics, Cambridge University Press 2019
2. E. Kaxiras, J. D. Joannopoulos, Quantum Theory of Materials, Cambridge University Press 2019
3. M. L. Cohen, S. G. Louie, Fundamentals of Condensed Matter Physics, Cambridge University Press 2016

Course language:

Notes:
https://ktfa.science.upjs.sk/people/martin-gmitra/teaching/selected-topics-in-solid-state-computational-physics-application/

Course assessment
Total number of assessed students: 2

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

Provides: RNDr. Martin Gmitra, PhD.

Date of last modification: 07.05.2020

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SPTFAa/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:

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
83.87	9.68	0.0	0.0	6.45	0.0

Provides:

Date of last modification: 03.05.2015

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SPTFAb/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:

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
83.87	9.68	0.0	0.0	6.45	0.0

Provides:

Date of last modification: 03.05.2015

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SPTFAc/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:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 26

A	B	C	D	E	FX
76.92	7.69	15.38	0.0	0.0	0.0

Provides:

Date of last modification: 03.05.2015

Approved:

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:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ FSL1/13	**Course name:** Solar 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: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
solved exercises
Exam

Learning outcomes:
To give students a comprehensive, physical 'up-to date' image of the sun from the deepest central area to the visible surface, solar atmosphere and the effects of the solar activity on the interplanetary space. To show an importance of the solar physics for understanding the evolution of stars and other areas of astrophysics.

Brief outline of the course:
Preliminary definitions and assumptions, basic facts about the sun, solar interior, solar atmosphere. magnetic fields and the dynamics of the Sun, The Standard Solar Model, solar activity, solar cycle.

Recommended literature:
Zirin, H., Astrophysics of the Sun, Cambridge Univ. Press, Cambridge, 1988
Physics of the Sun I. II. III. Geophysics and Astrophysics Monorgaphs, eds: P.A. Sturrock, T. E. Holzer, D.M. Mihalas, R.K. Ulrich, Riedel Publ. Dodrecht 1968
M. Stix: The Sun, An Introduction, Springer, 2nd edition, 2002.
E. R. Priest: Solar Magnetohydrodynamics, Reidel, 1982.
K. R. Lang: The Sun from Space, Springer, 2000.

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 14

A	B	C	D	E	FX
71.43	7.14	21.43	0.0	0.0	0.0

Provides: Mgr. Peter Gömöry, PhD.

Date of last modification: 03.05.2015

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/SSA/13	**Course name:** Special Seminar in Astronomy

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:

Conditions for course completion:
Due to Covid-19 adapted to carry out distance learning:
Seminar essay.
On the basis of continuous assessment.

Learning outcomes:
Inform students about recent results of astronomical and astrophysical research.

Brief outline of the course:
Recent discoveries in astrophysical research from domestic and world institutes, like exoplanets, cataclysmic variables, quasars, dark matter and dark energy.

Recommended literature:
Current papers in astronomical and astrophysical journals, internet.

Course language:
Slovak, 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: doc. RNDr. Rudolf Gális, PhD., doc. Mgr. Štefan Parimucha, PhD.

Date of last modification: 30.03.2020

Approved:

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: Min. 80% of active participation in classes.	
Learning outcomes: Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.	
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, aikido, basketball, badminton, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, body-building, indoor football, S-M systems, step aerobics, table tennis, tennis, volleyball and chess. 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: 12859

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
87.01	0.08	0.0	0.0	0.0	0.04	8.1	4.77

Provides: Mgr. Agata Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Zuzana Küchelová, PhD., doc. PaedDr. Ivan Uher, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Marcel Čurgali, Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Bc. Richard Melichar, Mgr. Petra Tomková, PhD.

Date of last modification: 13.05.2021

Approved:

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:
active participation in classes - min. 80%.

Learning outcomes:
Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.

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, aikido, basketball, badminton, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, body-building, indoor football, S-M systems, step aerobics, table tennis, tennis, volleyball and chess.
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: 11675

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
84.52	0.56	0.02	0.0	0.0	0.05	10.63	4.22

Provides: Mgr. Agata Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Zuzana Küchelová, PhD., doc. PaedDr. Ivan Uher, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Marcel Čurgali, Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Bc. Richard Melichar, Mgr. Petra Tomková, PhD.
Date of last modification: 13.05.2021
Approved:

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:
min. 80% of active participation in classes

Learning outcomes:
Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.

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, aikido, basketball, badminton, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, body-building, indoor football, S-M systems, step aerobics, table tennis, tennis, volleyball and chess.
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: 7873

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
88.8	0.05	0.01	0.0	0.0	0.03	4.08	7.04

Provides: Mgr. Marcel Čurgali, Mgr. Agata Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Zuzana Küchelová, PhD., doc. PaedDr. Ivan Uher, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Bc. Richard Melichar, Mgr. Petra Tomková, PhD.
Date of last modification: 13.05.2021
Approved:

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:
min. 80% of active participation in classes

Learning outcomes:
Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.

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, aikido, basketball, badminton, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, body-building, indoor football, S-M systems, step aerobics, table tennis, tennis, volleyball and chess.
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: 5125

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
83.14	0.31	0.04	0.0	0.0	0.0	7.75	8.76

Provides: Mgr. Marcel Čurgali, Mgr. Agata Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Zuzana Küchelová, PhD., doc. PaedDr. Ivan Uher, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Bc. Richard Melichar, Mgr. Petra Tomková, PhD.
Date of last modification: 13.05.2021
Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/ NPR/19	**Course name:** Stochastic processes

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: 6

Recommended semester/trimester of the course: 4.

Course level: II.

Prerequisities:

Conditions for course completion:
Test and individual project work.
Exam

Learning outcomes:
To obtain knowledge of the stationary stochastic processes analysis in time domain and spectral domain.
To study properties of random processes with discrete time (time series) and continuous time and their application in finance.

Brief outline of the course:
1. Stationary precess, linear process, causal and invertible process.
2. Time domain analysis (autocovariance and partial autocovariance function)
3. Frequency domain analysis (spectral density and distribution function, periodogram)
4. Prediction of time series
5. Random processes with continuous time (fundamental concepts)
6. Brownian motion, Itô's process, Itô's lemma and its application
7. The Black-Scholes formula

Recommended literature:
1. Brockwell P., Davis R.: Introduction to Time Series and Forecasting, 3rd ed., Springer, New York, 2016
2. Prášková Z.: Základy náhodných procesů II, Karolinum, Praha, 2004 (in Czech)
3. Tsay R.: Analysis of Financial Time Series, 3rd ed., Wiley Interscience, New Jersey, 2010
4. Shumway R., Stoffer D.: Time Series Analysis and Its Applications with R Examples, 4th ed., Springer, New York, 2017
5. Melicherčík I., Olšarová L., Úradníček V.: Kapitoly z finančnej matematiky, Epos, Bratislava, 2005 (in Slovak)
6. Oksendal B.K.: Stochastic Differential Equations, 6th ed., Springer, 2014

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 58

A	B	C	D	E	FX
36.21	27.59	15.52	12.07	6.9	1.72

Provides: RNDr. Martina Hančová, PhD.

Date of last modification: 11.03.2019

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ SVK/13	**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:	
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: 50

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

Provides:	
Date of last modification:	
Approved:	

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:** 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:	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/PAF/13	**Course name:** Summer Practice in Astrophysics

Course type, scope and the method:
Course type: Practice
Recommended course-load (hours):
Per week: Per study period: 7d
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Observation project.
On the basis of continuous assessment.

Learning outcomes:
The aim of the practice is gaining practical experience with the photometric and spectroscopic observations and data processing.

Brief outline of the course:
Practical photometric and spectroscopic observations of variable stars using telescopes and detectors at Observatory at Kolonica saddle. Reduction and analysis of the observational data and interpretation of obtained results.

Recommended literature:
1. Howell, S. B., Handbook of CCD Astronomy, Cambridge University Press, Cambridge, 2000;
2. Léna, P., Rouan, D., Lebrun, F., Mignard, F., Pelat, D., Observational Astrophysics, Springer-Verlag, Berlin, 1996;
3. Martinez P., Klotz A., A practical guide to CCD Astronomy, Cambridge University Press, Cambridge, 1998;

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 12

abs	n	z
100.0	0.0	0.0

Provides:

Date of last modification: 26.09.2017

Approved:

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. Ladislav Kručanica, PhD.	
Date of last modification: 15.03.2019	
Approved:	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ TAF1/13	**Course name:** Theoretical Astrophysics I

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: 6

Recommended semester/trimester of the course: 1.

Course level: II.

Prerequisities:

Conditions for course completion:
2 written exams in the scope of problems solved during the course. More than half the number of points is required for continuous assessment.
Oral exam with preparation; 3 questions within the curriculum presented during the course.

Learning outcomes:
Become acquainted with knowledge about the structure and evolution of stars.

Brief outline of the course:
Properties of the stellar matter; the basic equations of stellar structure and the models of stars; sources of energy in stars; the origin, evolution and final evolutionary stages of stars.

Recommended literature:
1. Böhm-Vittense, E., Introduction to Stellar Astrophysics III, Stellar Structure and evolution, Cambridge University Press, Cambridge, 1989;
2. Kipenhahn, R., Weigert, A., Stellar Structure and evolution, Springer-Verlag, Berlin, 1990;
3. Hansen, C.J., Kawaler, S.D., Stellar Interiors – Physical Principles, Structure and Evolution, Springer-Verlag, New York, 1994;

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 14

A	B	C	D	E	FX
57.14	21.43	7.14	14.29	0.0	0.0

Provides: doc. RNDr. Rudolf Gális, PhD.

Date of last modification: 26.09.2017

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ TAF2/13	**Course name:** Theoretical Astrophysics II

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: 6

Recommended semester/trimester of the course: 2.

Course level: II.

Prerequisities:

Conditions for course completion:
Due to Covid-19 adapted to carry out distance learning:
1. Preparation of own notes on the topics covered on the basis of provided study materials. Sending notes to the lecturer in electronic form (scan / photo).
2. Oral exam within the curriculum of the course using electronic facilities (Skype/Hangouts).

Learning outcomes:
Become acquainted with the basics of spectra formation in stellar atmospheres.

Brief outline of the course:
Basic concepts of physics of stellar atmospheres; energy transfer by radiation and convection. Continuous absorption coefficient; model of photosphere. Line absorption coefficient. Properties of spectral lines.

Recommended literature:
1. Tennyson, J., Astronomical spectroscopy, Imperial College Press, London, 2005
2. Gray, D.F., The observation and analysis of stellar photospheres, Cambridge University Press, Cambridge, 1992;
3. Böhm-Vitense, E., Introduction to stellar astrophysics II, Stellar atmospheres, Cambridge University Press, Cambridge,1997;

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 11

A	B	C	D	E	FX
63.64	36.36	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Rudolf Gális, PhD.

Date of last modification: 28.03.2020

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ MSSTF/14	**Course name:** Theoretical 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:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment

Total number of assessed students: 12

A	B	C	D	E	FX
66.67	8.33	16.67	8.33	0.0	0.0

Provides:
Date of last modification: 03.05.2016
Approved:

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: 100

A	B	C	D	E	FX
57.0	11.0	17.0	7.0	8.0	0.0

Provides: RNDr. Martin Gmitra, PhD.
Date of last modification: 03.05.2015
Approved:

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: 12

A	B	C	D	E	FX
33.33	8.33	25.0	16.67	16.67	0.0

Provides: RNDr. Martin Gmitra, PhD.

Date of last modification: 07.05.2020

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ PHD/17	**Course name:** Variable and binary stars
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: 6	
Recommended semester/trimester of the course: 1.	
Course level: II.	
Prerequisities:	
Conditions for course completion: 2 tests during term. Each test for 15 points. Minimal amounts of points for an exam is 20. Oral examination and test.	
Learning outcomes: Acquaint students with properties of variable stars, their distribution and basic characteristics, as well as give introduction to binaries, their observations and analysis of light curve and radial velocities.	
Brief outline of the course: Definition of variable stars and historical review, searching for variability and periodicity of variations. Classification of variable stars and basic parameters. Visual and spectroscopic binaries. Two body problem and orbital parameters. Roche model, mass exchange in binaries and eclipsing binaries. Period changes.	
Recommended literature: 1. Egglecton: 2006: Evolutionary Processes in Binary and Multiple Stars, Cambridge University Press 2. Hilditch: 2001, Close binaries, Cambridge University Press 3. Kallrath J., Milone E.F.: 2009, Eclipsing Binary Stars - Modeling and Analysis, Springer 4. Lena et al.: 1996, Observational Astrophysics, Springer-Verlag 5. Roth G.: 1994, Compendium of Practical Astronomy, Springer-Verlag 6. Sterken a Jashek, 1996, Light Curves of variable Stars, Cambridge University Press 7. Warner: 1995, Cataclysmic Variables, Cambridge University Press	
Course language: Slovak, English	
Notes:	

Course assessment
Total number of assessed students: 7

A	B	C	D	E	FX
57.14	42.86	0.0	0.0	0.0	0.0

Provides: doc. Mgr. Štefan Parimucha, PhD.

Date of last modification: 26.09.2017

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/UEM/17	**Course name:** Úvod do exaktne riešiteľných modelov štatistickej fyziky

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: 4.

Course level: II.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:
Exact solution for one-dimensional Ising models: combinatorial approach and transfer-matrix methods. Rigorous solution of the Ising model on Bethe lattices within exact recursion relations. Exact solution for one-dimensional classical Heisenberg model. Exact solutions for geometrically frustrated quantum Heisenberg models with the help of lattice-gas models, theory of localized magnons. Exact solutions for „six-vertex“ and „eight-vertex“ models, their equivalence with the Ising model.

Recommended literature:
1. R. J. Baxter, Exactly Solved Models in Statistical Mechanics (Academic, New York, 1982).
2. F. Y. Wu, Exactly Solvable Models: A Journey in Statistical Mechanics
(World Scientific, Singapore, 2008).
3. J. Strečka, Exactly Solvable Models in Statistical Physics, supportive textbook,
(ESF 2005/NP1-051 11230100466, Košice, 2008).

Course language:

Notes:

Course assessment
Total number of assessed students: 5

A	B	C	D	E	FX
20.0	80.0	0.0	0.0	0.0	0.0

Provides: doc. RNDr. Jozef Strečka, PhD.

Date of last modification: 26.09.2017

Approved: