CONTENT

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ IG/04	**Course name:** Acquirement of Internal Grant
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 10	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment

Total number of assessed students: 112

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ PVS/04	**Course name:** Author's patents, discoveries, software
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 36	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ CM/04	**Course name:** Citation in monograph
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 20	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 1	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ CZC/04	**Course name:** Citation in scientific journal published abroad
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 10	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 42

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ CDC/04	**Course name:** Citation in scientific journal published in the country of residence
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 0	

abs	n
0.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ SCI/04	**Course name:** Citation registered in Science Citation Index
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: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment

Total number of assessed students: 134

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ SMPR/04	**Course name:** Co-worker of project supported by international grant schemes
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 15	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 87	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ SDPR/04	**Course name:** Co-worker of project supported by national grant schemes
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 410	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ POCF/13	**Course name:** Computational 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: 8

Recommended semester/trimester of the course: 2.

Course level: III.

Prerequisities:

Conditions for course completion:
Examination

Learning outcomes:
To acquaint students with modern methods of computational physics and their application to different physical systems.

Brief outline of the course:
Brief outline of the course:
1. Modern Monte Carlo methods targeted for problematic complex systems with multimodal energy surfaces. Multicanonical methods. Parallel tempering (replica exchange) method. Calculation of density of states and free energy by using Wang-Landau method.
2. Molecular Dynamics. Hybrid Monte Carlo method and spin dynamics. Langevin equations. Cellular automata of lattice gas. Quantum Monte Carlo simulations of lattice systems based on Suzuki-Trotter relation. Ising model in transversal field. Anisotropic Heisenberg chain. Monte Carlo Renormalization Group (MCRG) methods. Mao and Swendsen method. Problems of dynamics.
3. Other models and applications. Fitting data with linear models. Pattern recognition. Recurrent neural networks and time series prediction. Hebbian learning. Principal component analysis. Stochastic signal processing. Simulations of neural networks. Socio-physical models motivated by spin models. Galam models. Voter model in hierarchical systems. Model of group decision making. The opinion dynamics. Sznajd model and its applications.

Recommended literature:
1. J.C. Principe, N.R. Euliano, Neural and adaptive systems, John Wiley & Sons. INC., New York, 2000.
2. K. Binder, D.W. Heermann, Monte Carlo simulation in statistical physics, Springer-Verlag, Berlin, 2002.
3. J.M. Haile, Molecular dynamics simulations, John Wiley & Sons. INC., New York, 1992.
4. N.G van Kampen, Stochastic processes in physics and chemistry, North-Holland, 1990.
5. B.K. Chakrabarti, A. Chakraborti, A. Chatterjee (Editors), Econophysics and sociophysics: Trends and perspectives, Wiley-VCH, 2006.

Course language:

Notes:	
Course assessment Total number of assessed students: 7	
N	P
0.0	100.0
Provides: doc. RNDr. Milan Žukovič, PhD.	
Date of last modification: 25.09.2017	
Approved: prof. RNDr. Michal Jaščur, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ODZP/14	**Course name:** Defence of Doctoral Thesis
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 30	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 58	

N	P
0.0	100.0

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

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ DZS/14	**Course name:** Dissertation examination

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: III.

Prerequisities:

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

Learning outcomes:
Evaluation of competences of the student according to his/her scientific profile.

Brief outline of the course:
Presentation of the results in the thesis for disertation exam, responding to referee´s comments, answering questions of exam committee. Two questions are selected subsequently from one compulsory and one optional subject, respectively. The subjects are selected by guarantee of the program according to the study plan and scientific profile of the student. The third question addresses the current state of work on dissertation thesis.

Recommended literature:

Course language:
english

Notes:

Course assessment
Total number of assessed students: 95

N	P
0.0	100.0

Provides:

Date of last modification: 03.05.2015

Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ VPBP/04	**Course name:** Elaboration of reviewer report
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 19	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: CJP/ AJD1/07	**Course name:** English Language for PhD Students 1

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: 1.

Course level: III.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 584

N	Ne	P	Pr	abs	neabs
0.0	0.0	56.85	0.0	43.15	0.0

Provides: PhDr. Helena Petruňová, CSc., Mgr. Zuzana Kolaříková, PhD.

Date of last modification: 03.10.2019

Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: CJP/ AJD2/07	**Course name:** English Language for PhD Students 2

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: 3

Recommended semester/trimester of the course: 2.

Course level: III.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 569

N	Ne	P	Pr	abs	neabs
0.0	0.0	92.44	1.41	6.15	0.0

Provides: PhDr. Helena Petruňová, CSc., Mgr. Zuzana Kolaříková, PhD., Mgr. Barbara Mitríková

Date of last modification: 26.02.2020

Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ERS/13	**Course name:** Exactly Solved Models in Statistical 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: 8

Recommended semester/trimester of the course: 4.

Course level: III.

Prerequisities:

Conditions for course completion:
Examination

Learning outcomes:
To become familiar with selected exactly solved models in statistical physics and to gain a deeper understanding of physical phenomena explained by these exactly solved models.

Brief outline of the course:
1. Exact solution for one-dimensional quantum Ising chain and quantum XY chain in a transverse magnetic field. Jordan-Wigner, Fourier and Bogoliubov transformations. Quantum critical points and anomalous behaviour of quantities in their close vicinity.
2. Exact solution for one-dimensional quantum Heisenberg chain within the framework of second-quantization formalism, the introduction to Bethe ansatz method. Elementary excitation spectrum, free and bound states of the Heisenberg model with two spin deviations.
3. Two-dimensional Ising model: dual transformation, star-triangle transformation, decoration-iteration transformation and theory of generalized algebraic transformations. Critical temperatures and universality in critical behaviour. The formulation of exact solution through the transfer-matrix method. Two-dimensional Ising model as model of binary alloys, and lattice model of liquid mixtures, Frenkel-Louis and Lin-Taylor model.
The selection from aforedescribed topics is made by the supervisor according to scientific orientation of the dissertation thesis.

Recommended literature:
1. R.J. Baxter, Exactly Solved Models in Statistical Mechanics, Academic, New York, 1989.
2. J.B. Parkinson, D.J.J. Farnell, An Introduction to Quantum Spin Systems, Lecture Notes in Physics 816, Springer, Berlin, 2010.
3. D.C. Mattis, The Many-Body Problem, World Scientific, Singapore, 1993.
4. F.Y. Wu, Exactly Solvable Models, World Scientific, Singapore, 2008.
5. D.A. Lavis, G.M. Bell, Statistical Mechanics of Lattice Systems, Volume 1, Springer, Berlin, 1999.
6. B. Nachtergaele, J.P. Solovej, J. Yngvason, Condensed Matter Physics and Exactly Soluble Models, Selecta of E. H. Lieb, Springer, Berlin, 2004.

7. J. Strečka, Exactly Solvable Models in Statistical Physics, supportive textbook, ESF 2005/ NP1-051 11230100466, Košice, 2008.

Course language:
EN - english

Notes:

Course assessment
Total number of assessed students: 9

N	P
0.0	100.0

Provides: doc. RNDr. Jozef Strečka, PhD.

Date of last modification: 03.05.2015

Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ DKZU/04	**Course name:** Home Conference with Foreign Participation
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 4	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 271	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ MK/04	**Course name:** International 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: 6	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 375

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ZKC/04	**Course name:** Journals Registered by Current Contets Database
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 20	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 382	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ZNC/04	**Course name:** Journals not registered in the Current Contents Connect database and published abroad

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

Number of ECTS credits: 5

Recommended semester/trimester of the course:

Course level: III.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 45

abs	n
100.0	0.0

Provides:

Date of last modification:

Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ DNC/04	**Course name:** Journals not registered in the Current Contents Connect database and published in the country of residence
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment

Total number of assessed students: 18

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ DKC/04	**Course name:** Journals registered in the Current Contents Connect database and published in the country of residence
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 15	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 8

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ MMTF/13	**Course name:** Mathematical Methods in Theoretical 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: 8

Recommended semester/trimester of the course: 1.

Course level: III.

Prerequisities:

Conditions for course completion:
Examination

Learning outcomes:
Improve the students in the use of mathematical methods in theoretical physics.

Brief outline of the course:
1. Differential equations of mathematical physics. Generalized functions. Delta function. Differential calculus of generalized functions. Fourier series of delta functions. Green's function for one-dimensional boundary value problems. Green's function for
Poisson's equation. Differential calculus in the plane. Two-dimensional delta function.
2. Complex analysis. Complex functions. Complex differentiation. Power series and analyticity. Harmonic functions. Applications in fluid mechanics. Complex integration. Cauchy theorem. Cauchy integral formula. Differentiation through integration. Analytical continuation to the plane and space.
3. Conformal mapping. Analytical maps. Conformality. Composition and Riemann mapping theorem. Anular domain. Applications of conformal mapping. Applications of harmonic functions and Laplace's equation. Applications in fluid flow. Poisson's equation and Green's function. Transformations and convolution.

Recommended literature:
1. E. Kreyszig, Advanced engineering mathematics, Wiley&Sons, New York, 1983.
2. M.L. Boas, Mathematical methods in the physical sciences, Wiley, New York, 2006.
3. K.F. Riley, M.P. Hobson, S.J. Bence, Mathematical methods for physics and engineering, Cambridge University Press, Cambridge, 2006.
4. K.F. Riley, M.P. Hobson, Student solutions manual for Mathematical methods for physics and engineering, Cambridge University Press, Cambridge, 2006.
5. H.F. Weinberger, A first course in partial differential equations, Willey&Sons, N.Y., 1965.
6. V.J. Arsenin, Matematická fyzika, Alfa, Bratislava, 1977.
7. P. J. Olver, Introduction to partial differential equations, 2012, http://www.math.umn.edu/~olver/pdn.html.
8. F.W.J. Olver, D.W. Lozier, R.F. Boisvert, C.V. Clark, NIST Handbook of mathematical functions, Cambridge University Press, Cambridge, 2010.

Course language:	
Notes:	
Course assessment Total number of assessed students: 2	
N	P
0.0	100.0
Provides: doc. RNDr. Milan Žukovič, PhD., RNDr. Tomáš Lučivjanský, PhD.	
Date of last modification: 03.05.2015	
Approved: prof. RNDr. Michal Jaščur, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ DK/04	**Course name:** National 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: 2	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 129	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ NZ/04	**Course name:** Non-reviewed collections of papers and monographs published abroad or in the country of residence
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 98	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ SAVFK/13	**Course name:** Physical Kinetics

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: 8

Recommended semester/trimester of the course: 2.

Course level: III.

Prerequisities:

Conditions for course completion:
Examination

Learning outcomes:
To become familiar with mathematical methods, which enable to solve the problem of particle transport in an inhomogeneous medium (interplanetary space).

Brief outline of the course:
Basic notions in plasma physics. Energetic particles in a proximity universe and the structure of heliosphere. Liouville equation as a basis for description of the kinetics of neutral and charged particles. Boltzmann equation and its application by solving the problem of a particle transport with low collision frequencies. Application of Vlasov equation for solving the problem of particle transport in a plasma. Introduction to hydrodynamics and magnetohydrodynamics. Small-angle scattering approximation, Fokker-Planck equation. The passive advection of high-energy charged particles in a turbulent magnetic field. The diffusion approximation and basic solutions of diffusion equations in an inhomogeneous stochastic environment. Application of the solutions of diffusion equations for a description of the transport of charged particles in a plasma.
The selection from aforedescribed topics is made by the supervisor according to scientific orientation of the dissertation thesis.

Recommended literature:
1. R.L. Liboff, Kinetic Theory, 3rd edition, Springer-Verlag, New York, 2003.
2. M. Plischke, B. Bergersen, Equilibrium Statistical Physics, 3rd edition, World Scientific, Singapore, 2006.
3. F.F. Chen, J.P. Chang, Lecture Notes on Principles of Plasma Processing, Springer-Verlag, Berlin, 2003.
4. E.M. Lifshitz, L.P. Pitaevskii, Course of Theoretical Physics: Physical Kinetics, Vol. 10, Pergamon Press, London, 1981 [translation from russian original: Nauka, Moskva, 1979].
5. P.M. Bellan, Fundamentals of Plasma Physics, Cambridge University Press, Cambridge, 2008.
6. K. Itoh, S.-I. Itoh, A. Fukuyama, Transport and Structural Formation in Plasmas, Institute of Physics Publishing, Bristol, 1999.
7. F.F. Chen, Úvod do fyziky plazmatu, Academia, Praha, 1984. (in Czech)
8. V.P. Silin, Úvod do kinetické teórie plynu, Academia, Praha, 1976. (in Czech)

Course language:	
Notes:	
Course assessment Total number of assessed students: 1	
N	P
0.0	100.0
Provides: RNDr. Milan Stehlík, CSc.	
Date of last modification: 03.05.2015	
Approved: prof. RNDr. Michal Jaščur, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ VYS/04	**Course name:** Presentation in Seminar
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:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 315

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ KTP/13	**Course name:** Quantum Field Theory

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: 8

Recommended semester/trimester of the course: 2.

Course level: III.

Prerequisities:

Conditions for course completion:
Examination

Learning outcomes:
To acquaint with quantum field theory methods and their application in theory of elementary particles and statistical physics.

Brief outline of the course:
1. Quantum field, Lagrange formalism, interacting quantum fields, Wick theorems and Feynman diagrammatic technique, higher orders of perturbation theory.
2. Application of quantum field theory in the theory of elementary particles: standard model, unified theories of elementary particles.
3. Application of quantum field theory in statistical physics. Feynman diagrams.
4. Critical dynamics and description of scaling at phase transitions by means of quantum-field technique and renormalization group.
Selection of aforementioned topics will be made by supervisor according to the content and aims of PhD thesis

Recommended literature:
1. L.H. Ryder, Quantum Field Theory, Cambridge University Press, Cambridge, 1996.
2.A. Zee, Quantum Field Theory in Nutshell, Princeton University Press, Princeton, 2010.
3. P. Ramond, Field Theory: A Modern Primer, Westview Press, 1990.
4. Zinn-Justin J., Quantum Field Theory and Critical Phenomena, Claredon Press, Oxford, 2004.
5. W. Greiner, J. Reinhardt, Field Quantization, Springer, Berlin, 1996.
6. W. Greiner, J. Reinhardt, Quantum Electrodynamics, Springer, Berlin, 2009.
7. W. Greiner, S. Schramm, E. Stein, Quantum Chromodynamics, Springer, Berlin, 2007.
8. A.N. Vasiliev, The Field Theoretic Renormalization Group in Critical Behavior Theory and Stochastic Dynamics, Chapman & Hall/CRC Press Company Boca Raton, London, 2004.

Course language:

Notes:

Course assessment Total number of assessed students: 7	
N	P
0.0	100.0
Provides: prof. RNDr. Michal Hnatič, DrSc.	
Date of last modification: 03.05.2015	
Approved: prof. RNDr. Michal Jaščur, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ KTMS/04	**Course name:** Quantum Theory of Many-Body Systems
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: 8	
Recommended semester/trimester of the course: 3.	
Course level: III.	
Prerequisities:	
Conditions for course completion: Examination	
Learning outcomes:	
Brief outline of the course: 1. Quantum theory of magnetism. Ferromagnetic, ferrimagnetic and antiferromagnetic quantum many-body systems. Theoretical model of quantum magnetism - Heisenberg, XY and Hubbard model. Second quantization, Jordan-Wigner, Bogolubov and Dyson-Maleeev transformation, density matrix renormalization group. 2. Green functions. Spectral representation of Green functions. Green functions in the theory of non-linear processes. Applications of the Green functions in solid state physics. Density states, Kubo-Greenwood formula. Theory of superconductivity. 3. Non-linear equations in mathematical physics: Korteweg-de Vries quation, solitons, non-linear Schrodinger equation, sin-Gordon equation. Applications of non-linear equations in physics: Josephson effect, domain wall, theory of dislocation.	
Recommended literature: 1. A. Auerbach, Interacting Electrons and Quantum Magnetism, Springer, New York, 1994. 2. S. Sachdev, Quantum Phase Transitions, Cambridge University Press, Cambridge, 1998. 3. S. V. Tjablikov, Methods in the Quantum Theory of Magnetism, Plenum, New York, 1967. 4. H. Haken, Quantenfeldtheorie das Festkorpers, B.G. Teubner, Stuttgart, 1973. 5. P.M. Morse, H. Feshbach, Methods of Theoretical Physics, McGraw Hill, New York, 1953. 6. E.T. Whittaker, G.N. Watson, A Course of Modern Analysis, Cambridge University Press UK, 1997.	
Course language:	
Notes:	

Course assessment Total number of assessed students: 8	
N	P
0.0	100.0
Provides: doc. RNDr. Peter Kopčanský, CSc., RNDr. Pavol Farkašovský, DrSc.	
Date of last modification: 03.05.2015	
Approved: prof. RNDr. Michal Jaščur, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SAVKSM/13	**Course name:** Quantum-Statistical Methods for Strongly-Correlated Systems

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: 8

Recommended semester/trimester of the course: 2.

Course level: III.

Prerequisities:

Conditions for course completion:
Examination

Learning outcomes:
To improve student knowledge for employing analytical and numerical methods in the theory of many-particle systems.

Brief outline of the course:
Introduction to microscopic models of strongly correlated many-particle systems and their basic properties. Terminology, second quantization, fermions, bosons.
Analytical methods: method of canonical transformations, Bogoliubov transformation, perturbation theory, variational principle. Exact solution for Hubbard and Anderson model, Bethe ansatz method. Green function method, Heisenberg, Schrödinger, iteration reprezentation, S-matrix, Wick theorem, Feynman's diagrams.
Numerical methods: exact diagonalization, Lanczos algorithm, modified Lanczos method, variational Monte Carlo technique, density matrix renormalization group.
The selection from aforedescribed topics is made by the supervisor according to scientific orientation of the dissertation thesis.

Recommended literature:
1. P. Fazekas, Lecture Notes on Electron Correlation and Magnetism, World Scientific, 1999.
2. F.H.L. Essler, H. Frahm, F. Gohmann, A. Klumper, V.E. Korepin, The One-Dimensional Hubbard Model, Cambridge University Press, Cambridge, 2005.
3. A. Montorsi, The Hubbard Model, World Scientific, Singapore, 1992.
4. H. Haken, Kvantovopoľová teória tuhých látok, Alfa, Bratislava, 1987.
5. S. Doniach, E. H. Sondheimer, Green's Functions for Solid State Physicists, W. A. Benjamin, Inc., Massachusetts, 1974.
6. C.P. Enz, A Course on Many-Body Theory, World Scientific, Singapore, 1998.
7. M.E.J. Newman, G.T. Barkema, Monte Carlo Methods in Statistical Physics, Clarendon Press, Oxford, 1999.
8. S. R. White, Physics Reports 301 (1998) 187-204.
9. P. Farkašovský, H. Čenčariková, Kooperatívne javy v sústavách silne korelovaných fermiónov, Slovenská fyzikálna spoločnosť, Košice, 2011. (in Slovak)

Course language:	
Notes:	
Course assessment Total number of assessed students: 4	
N	P
0.0	100.0
Provides: RNDr. Pavol Farkašovský, DrSc.	
Date of last modification: 03.05.2015	
Approved: prof. RNDr. Michal Jaščur, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ RZ/04	**Course name:** Reviewed Proceedings
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 183	
abs	n
100.0	0.0
Provides:	
Date of last modification:	
Approved: prof. RNDr. Michal Jaščur, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/VKTF/15	**Course name:** Selected Topics from Theoretical 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: 8

Recommended semester/trimester of the course: 1.

Course level: III.

Prerequisities:

Conditions for course completion:
Examination

Learning outcomes:
To enhance knowledge of students in Theoretical Physics The emphasis is put on basic principles and universally applicable techniques.

Brief outline of the course:
1. Lagrange's and Hamilton's equations. Canonical transformations. Hamilton-Jacobi equation.
2. Relativistic quantum mechanics. Klein-Gordon and Dirac equations. Angular momentum operator, spin and spinors.
3. Ideal Fermi and Bose gases. Degenerate electron gas. Magnetism of an electron gas. Relativistic degenerate electron gas. Degenerate Bose gas.

Recommended literature:
1. W.Greiner, Classical Mechanics, Systems of Particles and Hamiltonian Dynamics, Springer, Berlin, 2010.
2. W. Greiner, Relativistic Quantum Mechanics, Springer, Berlin, 2000.
3. R.K. Pathria, P. D. Beale, Satistical Mechanics, Elsevier, Amsterdam, 2011.

Course language:
1. Slovak,
2. English

Notes:

Course assessment
Total number of assessed students: 8

N	P
0.0	100.0

Provides: prof. RNDr. Michal Jaščur, CSc., prof. RNDr. Andrej Bobák, DrSc., doc. RNDr. Jozef Strečka, PhD.

Date of last modification: 03.05.2015

Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ VKTKL/15	**Course name:** Selected Topics of Condensed Mattter Theory
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: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 3

N	P
0.0	100.0

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

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ SSOL/04	**Course name:** Self-motivated Study on Scientific Literature
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:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 170

N	P
0.0	100.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: Dek. PF UPJŠ/JSD/14	**Course name:** Spring School for PhD Students
Course type, scope and the method: **Course type:** Lecture **Recommended course-load (hours):** **Per week: Per study period:** 4d **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 135

abs	n
100.0	0.0

Provides: prof. RNDr. Vladimír Zeleňák, DrSc.
Date of last modification: 03.05.2015
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ STATF/13	**Course name:** Statistical 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: 8

Recommended semester/trimester of the course: 2.

Course level: III.

Prerequisities:

Conditions for course completion:
Examination

Learning outcomes:
To acquaint students with a modern theory of phase transitions, nonequilibrium thermodynamics and modern statistical physics of macromolecules.

Brief outline of the course:
1. Phase transitions and critical phenomena. Critical indices. Universality. Static scaling hypothesis. Kadanoff block spins. Theory of the renormalization group. Phase diagrams and fixed points. The perturbative renormalization group. Random systems.
2. Nonequilibrium statistical thermodynamics. Equilibrium and nonequilibrium processes. Linear nonequilibrium thermodynamics. Phenomenological equations and Onsager relations. Fluctuation dissipation theorem. Kinetic theory. Master equation, Boltzmann equation, Langevin equation and Fokker-Planck equation.
3. Statistical physics of macromolecules. Thermodynamics properties of polymer solutions and mixtures. Polymer gels. Molecular motion of the polymeric systems
Selection from this topics makes supervisor depending on the scope of the dissertation.

Recommended literature:
1. M. Plischke, B. Bergersen, Equilibrium Statistical Physics, World Scientific, Singapore, 2006.
2. S.K. Ma, Statistical Mechanics, World Scientific, Singapore, 1993.
3. L.P. Kadanoff, Statistical Physics: Statics, Dynamics and Renormalization, World Scientific, Singapore, 2000.
4. J. Cardy, Scaling and Renormalization in Statistical Physics, Cambridge, 2002.
5. S.R. de Grot, P. Mazur, Non-equilibrium Thermodynamics, Dover Publications, Inc., New York, 1984.
6. N.G. Van Kampen, Stochastic Processes in Physics and Chemistry, Elsevier, 2007.
7. M. Doi, Introduction to Polymer Physics, Clarendon, Oxford, 1995.

Course language:
1. Slovak,
2. English

Notes:	
Course assessment Total number of assessed students: 12	
N	P
0.0	100.0
Provides: prof. RNDr. Andrej Bobák, DrSc.	
Date of last modification: 03.05.2015	
Approved: prof. RNDr. Michal Jaščur, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ZSP/04	**Course name:** Study Stay Abroad
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 241	
abs	n
100.0	0.0
Provides:	
Date of last modification:	
Approved: prof. RNDr. Michal Jaščur, CSc.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ VPSV/04	**Course name:** Supervision of Student's Scientific Activity
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 6	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 15	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ VBP/04	**Course name:** Supervisor/consultant of bacelor thesis
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 6	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 37	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ PPC/04	**Course name:** Teaching activities
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 1	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 221	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ PPC/04	**Course name:** Teaching activities
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 1	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 221

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SAVTFE/13	**Course name:** Theory and Phenomenology Elementary Particles

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: 8

Recommended semester/trimester of the course: 2.

Course level: III.

Prerequisities:

Conditions for course completion:
Examination

Learning outcomes:
To acquaint students with a modern theory and phenomenology of the elementary particles.

Brief outline of the course:
1. Particle Phenomenology: Leptons, Quarks and Hadrons. Lepton Multiplets and Lepton Numbers. Neutrinos an Neutrino Masses. Quark Model Spektroskopy. Hadron Magnetic Moments and Masses.
2. Quark Dynamics: The Strong Interaction. Quark-Gluon Plasma. Jets and Gluons. Inelastic Scattering and Nucleon Structure. Quark-parton Model.
3. Weak Interactions and Electroweak Unification. Symmetries of the Weak Interaction. Spin Structure of the Weak Interaction. Neutrinos, Neutrino Scattering. Particles with Mass: Chirality.
4. Elementary Particles Dynamics. Quantum Elektrodynamics and Quantum Chromodynamics. Electrodynamics and Chromodynamics of Quarks. Top Quark. Testing of Standard Model.

Recommended literature:
1. D. Griffiths, Introduction to Elementary Particles, Wiley-VCH, Weinheim, 2008.
2. B.R. Martin, Nuclear and Particle Physics, John Wiley and Sons Ltd, Great Britain, 2009.
3. R.N. Cahn, G. Goldhaber, The Experimental Fundations of Particle Physics, Cambridge, 2009.
4. W.N. Cottingham, D.A. Greenwood, An Introduction to the Standard Model of Particle Physics, Cambridge, 2007.
5. W. Greiner, B. Müller, Gauge Theory of Weak Interactions, Springer, Berlin, 2009.

Course language:

Notes:

Course assessment
Total number of assessed students: 1

N	P
0.0	100.0

Provides: RNDr. Ivan Králik, CSc.
Date of last modification: 03.05.2015
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ POVK/04	**Course name:** Work in Organizing Committee of Conference
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 83	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ PDS/14	**Course name:** Writing Dissertation Work
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week: Per study period:** **Course method:** present	
Number of ECTS credits: 0	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 68	

abs	n
100.0	0.0

Provides:
Date of last modification:
Approved: prof. RNDr. Michal Jaščur, CSc.