# 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:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week: Per study period:**<br>**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**<br>Total number of assessed students: 141 | |

| abs | n |
|---|---|
| 100.0 | 0.0 |

| | |
|---|---|
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

# COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** 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:**
Patent filed, invention, software product created.

**Learning outcomes:**
The PhD student demonstrates the ability to create an innovative product in a given scientific field, or with impact on an interdisciplinary scale or in technical practice.

**Brief outline of the course:**

**Recommended literature:**

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 46

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:** 08.11.2022

**Approved:**

## 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:**

## 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: 74

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| | |
|---|---|
| **Course ID:** 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: 4

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** 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: 298

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

# COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** 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:**
Membership in the research team of an international project.

**Learning outcomes:**
Active involvement by solving a specific task within a team of international project solvers. The PhD student demonstrates the ability to work in a team, take responsibility for the assigned task, adhere to the time schedule and fulfill the project outputs. The PhD student gains personal experience from the implementation of an international project, participation in its key stages, creation of measurable outputs, grant funding of science

**Brief outline of the course:**

**Recommended literature:**

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 113

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:** 08.11.2022

**Approved:**

## 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: 616

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| | |
|---|---|
| **Course ID:** 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:**
To successfully complete the course, it is necessary for the student to demonstrate a sufficient degree of understanding of the principles of selected advanced computational methods. Lectures are organized in blocks, with a selection of topics reflecting the needs of currently registered students. The course ends with a final oral exam, the completion of which is conditioned by the submission of the project electronically and with the attached computer program. The credit evaluation of the course takes into account the following student workload: direct teaching (2 credits), self-study (2 credits), project work (2 credits), individual consultations (1 credit), and exam (1 credit). The minimum limit for completing the course is to obtain at least 50% of the total score.

**Learning outcomes:**
To acquaint students with modern methods of computational physics and their application to various physical and non-physical systems. Students have the opportunity to get acquainted with modern Monte Carlo methods and methods of molecular dynamics, developed for demanding simulations of complex systems using parallel programming, as well as their various interdisciplinary applications.

**Brief outline of the course:**
1. Modern Monte Carlo methods for application to problematic complex systems with rugged energy surfaces. Multicanonical methods. Parallel tempering method (replica exchange). Calculation of density of states and free energy using the Wang-Landau method. Massively parallelized Wang-Landau replica exchange method for petaflop supercomputers.
2. Molecular Dynamics. Advanced concepts of computer simulation techniques used in statistical physics and their importance for understanding physical systems. Approach of molecular dynamics and its application in problems of statistical physics. Cellular automata for lattice gas. Problems of dynamics.
3. Other models and applications. Sociophysical models based on spin models. Galam's models. Voting model in hierarchical systems. Group decision model. Dynamics of opinion formation. Sznajd's model and its applications. Applications of statistical physics approaches in modeling spatio-temporal data. Time series predictions and digital image processing. Geostatistical applications.

**Recommended literature:**
Basic literature:

LANDAU, D.P., BINDER, K.: A Guide to Monte Carlo Simulations in Statistical Physics, Cambridge Univ. Press, 5-th edition, 2021.
BOTTCHER, L., HERRMANN, H.J., Computational Statistical Physics, Cambridge Univ. Press, 2021.
BINDER, K., HEERMANN, D.W., Monte Carlo simulation in statistical physics, Springer-Verlag, Berlin, 2002.
HAILE, J.M., Molecular dynamics simulations, John Wiley & Sons. INC., New York, 1992.
KAMBERAJ, H., Molecular Dynamics Simulations in Statistical Physics: Theory and Applications, Springer Nature Switzerland AG, 2020.
VAN KAMPEN, N.G., Stochastic processes in physics and chemistry, North-Holland, 1990.
CHAKRABARTI, B.K. et al. (Editors), Econophysics and sociophysics: Trends and perspectives, Wiley-VCH, 2006.
GALAM, S., Sociophysics: A Physicist's Modeling of Psycho-political Phenomena, Springer, 2012.

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 11

| N | P |
|---|---|
| 0.0 | 100.0 |

**Provides:** prof. RNDr. Milan Žukovič, PhD.

**Date of last modification:** 16.11.2021

**Approved:**

# COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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|---|---|
| **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:**
The Dissertation thesis is the result of the student's own scientific research. It must not show elements of academic fraud and must meet the criteria of correct research practice defined in the Rector's Decision no. 21/2021, which lays down the rules for assessing plagiarism at Pavel Jozef Šafárik University in Košice and its constituents. Fulfillment of the criteria is verified mainly in the process of supervising and in the process of the thesis defense. Failure to do so is grounds for disciplinary action.

**Learning outcomes:**
The Dissertation thesis has elements of a scientific work and the student demonstrates extensive mastery of the theory and professional terminology of the field of study, acquisition of knowledge, skills and competences in accordance with the declared profile of the graduate of the field of study, as well as the ability to apply them in an original way in solving selected problems of the field of study. The student demonstrates the ability of independent scientific work in terms of content, formal and ethical aspects. Further details of the Dissertation thesis are determined by Directive no. 1/2011 on the essential prerequisites of final theses and by the Study Rules of Procedure at UPJŠ in Košice for doctoral studies.
The doctoral student demonstrated the ability and readiness for independent scientific and creative activity in the field of study of philology in accordance with the expectations of the relevant qualification framework and the profile of the graduate.

**Brief outline of the course:**

**Recommended literature:**

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 104

| N | P |
|---|---|
| 0.96 | 99.04 |

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|---|
| **Provides:** |
| **Date of last modification:** 08.11.2022 |
| **Approved:** |

## 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: 133

| N | P |
|---|---|
| 0.0 | 100.0 |

**Provides:**

**Date of last modification:** 03.05.2015

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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|---|---|
| **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: 23

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** CJP/ AJD1/07 | **Course name:** English Language for PhD Students 1 |
| **Course type, scope and the method:**<br>**Course type:** Practice<br>**Recommended course-load (hours):**<br>**Per week:** 2 **Per study period:** 28<br>**Course method:** present | |
| **Number of ECTS credits:** 2 | |
| **Recommended semester/trimester of the course:** 1. | |
| **Course level:** III. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>Completion of e-course English for PhD Students (lms.upjs.sk), consultations (1-3).<br>Written assignments - Professional/Academic CV, Short Academic Biography. | |
| **Learning outcomes:**<br>The development of students´ language skills - reading, writing, listening, speaking, improvement of their linguistic competence - students acquire knowledge of selected phonological, lexical and syntactic aspects, development of pragmatic competence - students can efectively use the language for a given purpose, with focus on Academic English and English for specific/professional purposes, level B2. | |
| **Brief outline of the course:**<br>Specific aspects of academic and professional English with focus on correct pronunciation, vocabulary development (noun and verb collocations, phrasal verbs, prepositional phrases, word-formation, formal/informal language, etc.), selected aspects of English grammar (prepositions, grammar tenses, passive voice, etc.), academic writing (professional/academic CV, Short Academic Biography). | |
| **Recommended literature:**<br>Moore, J.: Oxford Academic Vocabulary Practice. OUP, 2017.<br>Kolaříková, Z., Petruňová, H., Timková, R.: Angličtina v akademickom prostredí – cvičebnica. Košice, Vydavateľstvo ŠafárikPress, 2021.<br>Tomaščíková, S., Rozenfeld, J. Developing Academic English in Speaking and Writing. Vydavateľstvo ŠafárikPress, 2021.<br>McCarthy, M., O´Dell, F.: Academic Vocabulary in Use. CUP, 2008.<br>Štepánek, L., J. De Haff a kol.: Academic English-Akademická angličtina. Grada Publishing, a.s., 2011.<br>Armer, T.: Cambridge English for Scientists. CUP, 2011.<br>lms.upjs.sk | |
| **Course language:**<br>English, level B2 according to CEFR | |
| **Notes:** | |

**Course assessment**
Total number of assessed students: 738

| N | Ne | P | Pr | abs | neabs |
|---|---|---|---|---|---|
| 0.0 | 0.0 | 48.1 | 0.0 | 51.9 | 0.0 |

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

**Date of last modification:** 16.09.2022

**Approved:**

## 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:**<br>**Course type:** Practice<br>**Recommended course-load (hours):**<br>**Per week:** 2 **Per study period:** 28<br>**Course method:** present | |
| **Number of ECTS credits:** 3 | |
| **Recommended semester/trimester of the course:** 2. | |
| **Course level:** III. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>Test, oral exam in accordance with the exam requirements (https://www.upjs.sk/filozoficka-fakulta/cjp/doktorandi-upjs/) | |
| **Learning outcomes:**<br>The development of students´ language skills - reading, writing, listening, speaking, improvement of their linguistic competence - students acquire knowledge of selected phonological, lexical and syntactic aspects, development of pragmatic competence - students can efectively use the language for a given purpose, with focus on Academic English and English for specific/professional purposes, level B2. | |
| **Brief outline of the course:**<br>Academic communication (self-presentation, presenting at scientific meetings and conferences). Specific aspects of academic and professional English with focus on vocabulary development (formality, academic word-list), English grammar (passive voice, nominalisatio), language functions (expressing opinion, cause/effect, presenting arguments, giving examples, describing graphs/charts/schemes, etc.). Cross-language interference. | |
| **Recommended literature:**<br>Moore, J.: Oxford Academic Vocabulary Practice. OUP, 2017.<br>Kolaříková, Z., Petruňová, H., Timková, R.: Angličtina v akademickom prostredí (cvičebnica). UPJŠ Košice, 2021.<br>Tomaščíková, S., Rozenfeld, J. Developing Academic English in Speaking and Writing. Vydavateľstvo ŠafárikPress, 2021.<br>McCarthy, M., O´Dell, F.: Academic Vocabulary in Use. CUP, 2008.<br>Štepánek, L., J. De Haff a kol.: Academic English-Akademická angličtina. Grada Publishing, a.s., 2011.<br>Armer, T.: Cambridge English for Scientists. CUP, 2011. | |
| **Course language:**<br>B2 level according to CEFR | |
| **Notes:** | |

**Course assessment**
Total number of assessed students: 729

| N | Ne | P | Pr | abs | neabs |
|---|---|---|---|---|---|
| 0.27 | 0.0 | 93.83 | 1.1 | 4.8 | 0.0 |

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

**Date of last modification:** 10.03.2022

**Approved:**

# 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:**
The student has to prove sufficient understanding of basic notions, concepts and applications in the field of statistical physics of exactly solvable models in order to successfully complete the present subject. The knowledge of basic terms of statistical physics at the level of their mathematical definition as well as physical meaning is required in addition to concrete applications. The student has to learn the topics in order to be capable of active and creative solving of concrete tasks within the project and pass oral exam. Credit assignment of the subject accounts for the following engagement of the student: lectures (3 credits), independent studies (3 credits), individual consultations (1 credit) and examination (1 credit). The minimal requirement for passing through the subject is to show a good orientation in the curriculum as well as to deeper understand the subject matter. The evaluation scale uses the grades: pass and fail.

**Learning outcomes:**
After passing lectures the student will have sufficient physical knowledge and mathematical apparatus in order to be capable of independent solving a wide class of traditional as well as state-of-the-art scientific problems of statistical physics. The student will gain overview about diverse applications of statistical physics in the field of magnetism, solid-state physics, atomic and molecular physics.

**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. Exact calculation of critical temperatures of ferromagnetic ising models.
4. The formulation of exact solution of a two-dimensional Ising model through the transfer-matrix method. An equivalence of solving a two-dimensional Ising model with dimer covering problem, Pfaffian method.

5. The Ising model as a model of lattice gas, binary alloys, phase separation 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:**
1. Slovak; 2. English

**Notes:**

**Course assessment**
Total number of assessed students: 13

| N | P |
|---|---|
| 0.0 | 100.0 |

**Provides:** doc. RNDr. Jozef Strečka, PhD.

**Date of last modification:** 19.09.2021

**Approved:**

## 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:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week:** **Per study period:**<br>**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**<br>Total number of assessed students: 320 | |
| abs | n |
| 100.0 | 0.0 |
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚFV/ MK/04 | **Course name:** International Conference |
| **Course type, scope and the method:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week: Per study period:**<br>**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**<br>Total number of assessed students: 485 | |
| abs | n |
| 100.0 | 0.0 |
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** 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: 537

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚFV/ ZNC/04 | **Course name:** Journals not registered in the Current Contents Connect database and published abroad |
| **Course type, scope and the method:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week: Per study period:**<br>**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**<br>Total number of assessed students: 69 | |
| abs | n |
| 100.0 | 0.0 |
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** 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:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week: Per study period:**<br>**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**<br>Total number of assessed students: 25 | |
| abs | n |
| 100.0 | 0.0 |
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** 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:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week:** **Per study period:**<br>**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**<br>Total number of assessed students: 9 | |
| abs | n |
| 100.0 | 0.0 |
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

**COURSE INFORMATION LETTER**

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** 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:**
Final evaluation conditions:
Demonstration of knowledge through a test and a seminar paper on a selected topic. The total weight of the test and the seminar paper is 50%.
The content of the test covers the individual topics.
The credit evaluation of the course takes into account the following student workload: direct instruction (3 credits), self-study (2 credits) and assessment (3 credits).
Prerequisites for successful completion of the course:
Mastery of the midterm and final assessment requirements at a minimum of 50% overall.

**Learning outcomes:**
To improve students in the use of mathematical methods in theoretical physics.
The student will be able to apply methods such as Green's function, perturbation calculus, and complex analysis to analytical study of physics problems.

**Brief outline of the course:**
Week 1:
Differential equations of mathematical physics. Generalized functions. Delta function.
Differential calculus of generalized functions.
Week 2-3:
Fourier series of the delta function. Green's function for one-dimensional boundary value problems.
Green's function for the Poisson equation.
Week 4:
Asymptotic methods and perturbation theory. Classification of singular points.
Week 5:
The theory of asymptotic series. Asymptotic development of the integral. Laplace's method and the stationary phase method.
Week 6:
Regular and singular perturbation theory. Summation of divergent series. Padé summation.
Week 7:
Dynamical systems and chaos. Geometric interpretation.
Week 8:

Fixed points and their stability. Bifurcations.
Week 9:
Two-dimensional flows. Phase portrait. Strange attractors.
Week 10:
Complex analysis. Analytic continuation in plane and space. Conformal representations.
Week 11:
Applications to harmonic functions and Laplace's equation.
Week 12:
Applications in fluid flow. Poisson's equation and Green's function.

**Recommended literature:**

AHLFORS, Lars V. Complex analysis. An introduction to the theory of analytic functions of one complex variable. New York, McGraw-Hill Book Co., 1978.
ARFKEN, George. WEBER, Hans. Mathematical Methods for Physicists. Elsevier, 2012.
BENDER, Carl M. ORSZAG, Steven A. Advance Mathematical Methods for Scientists and Engineers I. New York, Springer, 1999.
LANDAU, Lev D. LIFSHITZ, Evgeni M. Fluid Mechanics: Volume 6. Butterworth-Heinemann, 1987.
OLVER, Peter J. Introduction to Partial Differential Equations. Cham, Springer, 2014.
STRAUSS, Walter A. Partial Differential Equations: An Introduction. John Wiley & Sons. 2nd edition, 2008.
STROGATZ, Steven H. Nonlinear dynamics and chaos. Boulder, Westview Press, 2015.

**Course language:**
1. Slovak
2. English

**Notes:**

**Course assessment**
Total number of assessed students: 6

| N | P |
|---|---|
| 0.0 | 100.0 |

**Provides:** prof. RNDr. Milan Žukovič, PhD., RNDr. Tomáš Lučivjanský, PhD.

**Date of last modification:** 26.09.2022

**Approved:**

# 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:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week: Per study period:**<br>**Course method:** present | |
| **Number of ECTS credits:** 2 | |
| **Recommended semester/trimester of the course:** | |
| **Course level:** III. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>Active participation in the home conference. | |
| **Learning outcomes:**<br>By actively participating in the national scientific conference, the PhD student demonstrates a high degree of ability to identify, evaluate, and apply correct scientific methods or research methodology in his scientific field. He demonstrates the ability to reflect on a specific scientific problem by using the latest approaches and applying them critically. Demonstrates competence in using existing theories and concepts in an innovative way, as well as generating new original scientific knowledge and communicating research results to a wider audience using adequate means and through the Slovak language. | |
| **Brief outline of the course:** | |
| **Recommended literature:** | |
| **Course language:** | |
| **Notes:** | |
| **Course assessment**<br>Total number of assessed students: 168 | |

| abs | n |
|---|---|
| 100.0 | 0.0 |

| | |
|---|---|
| **Provides:** | |
| **Date of last modification:** 08.11.2022 | |
| **Approved:** | |

## 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: 114

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

# COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** KPE/ PgVU/17 | **Course name:** Pedagogy for University Teachers |
| **Course type, scope and the method:**<br>**Course type:** Lecture<br>**Recommended course-load (hours):**<br>**Per week: Per study period:** 28s<br>**Course method:** present | |
| **Number of ECTS credits:** 5 | |
| **Recommended semester/trimester of the course:** | |
| **Course level:** III. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>1. Development of a teaching diary—100%<br>2. Compulsory active participation and attendance in accordance with the Study Regulations. | |
| **Learning outcomes:**<br>Students will be able to:<br>Apply didactic principles, methods, forms, and tools in the teaching of a specialised subject. Specify the educational procedures of a university teacher in subject teaching, pedagogical diagnostics, evaluation of learning outcomes, and self-reflection. Present rationalisation and streamlining possibilities in the teaching of specialised subjects. Apply educational competencies of university teachers taking into account the peculiarities of educating university students. | |
| **Brief outline of the course:**<br>The personality of a university teacher. Teaching styles. Student in university education. Student learning styles. Possibilities of adapting teaching styles and student learning styles. University teacher–student interaction and communication in the teaching process. Pedagogical competencies of a university teacher. Didactic analysis of the curriculum; teaching materials and textbooks. Forms of university teaching. Methods of university teaching. Verification methods and student assessment. Creation of a didactic test. Designing university teaching process. University teacher self-reflection. | |
| **Recommended literature:**<br>Čapek, R. (2015). Moderní didaktika. Lexikon výukových a hodnoticích metod. Praha, Grada Publishing, a.s.<br>Danek, J. (2014). Pedagogická komunikácia na vysokej škole. Trnava, Univerzita sv.Cyrila a Metoda v Trnave.<br>Dargová, J. (2001). Tvorivé kompetencie učiteľa. Prešov, Privat Press.<br>Dvořáček, J. (2014). Základy pedagogiky. Praha, Oeconomica.<br>Hupková, M., Petlák, E. (2004). Sebareflexia a kompetencie v práci učiteľa. Bratislava, IRIS.<br>Kyriacou, CH. (1996). Klíčové dovednosti učitele. Praha, Portál.<br>Mertin, V. a kol. (2012). Metody a postupy poznávaní žáka: pedagogická diagnostika. Praha, Wolters Kluwer.<br>Petty,G. (2013). Moderní vyučování. Praha, Portál. | |

Prucha, J. (2013). Moderní pedagogika. Praha, Portál.
Sirotová, M. (2014). Vysokoškolský učiteľ v edukačnom procese. Trnava, Univerzita sv.Cyrila a Metoda v Trnave.
Slávik, M. a kol. (2012). Vysokoškolská pedagogika. Praha, Grada.
Šebeň Zaťková, T. (2014). Úvod do vysokoškolskej pedagogiky. Trnava, Univerzita sv.Cyrila a Metoda v Trnave.
Turek, I. (2014). Didaktika. Bratislava, Wolters Kluwer, s.r.o.
Zormanová, L. (2014). Obecná didaktika. Praha, Grada.

**Course language:**
slovak

**Notes:**

**Course assessment**
Total number of assessed students: 78

| abs | n | neabs |
|---|---|---|
| 98.72 | 0.0 | 1.28 |

**Provides:** doc. PaedDr. Renáta Orosová, PhD.

**Date of last modification:** 07.09.2022

**Approved:**

## 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:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week:** **Per study period:**<br>**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**<br>Total number of assessed students: 383 | |

| abs | n |
|---|---|
| 100.0 | 0.0 |

| | |
|---|---|
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** KPPaPZ/PsVU/17 | **Course name:** Psychology for University Lecturers |
| **Course type, scope and the method:**<br>**Course type:** Lecture<br>**Recommended course-load (hours):**<br>**Per week: Per study period:** 28s<br>**Course method:** present | |
| **Number of ECTS credits:** 5 | |
| **Recommended semester/trimester of the course:** | |
| **Course level:** III. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>Case study, micro-output, its analysis<br>Current modifications of the course are listed in the electronic bulletin board of the course. | |
| **Learning outcomes:**<br>After completing the course, students can:<br>and Understand, summarize and explain selected psychological knowledge from cognitive psychology, emotion and motivation psychology, personality psychology, developmental, social, educational psychology and health psychology.<br>b) apply the above psychological knowledge necessary for the professional, competent performance of university teaching practice of doctoral students<br>c) to create and implement the teaching of a professional topic with applied psychological knowledge<br>d) evaluate their performance and the performance of their classmates, provide feedback | |
| **Brief outline of the course:**<br>The content of the course is based on selected psychological knowledge of cognitive psychology, psychology of emotions and motivation, personality psychology, developmental, social, educational psychology and health psychology. Teaching is realized by a combination of lectures with interactive, experiential methods, discussion, open communication with mutual respect, support of independence, activity and motivation of students. Syllabus: University teacher and his work in the teaching process with a focus on: teachers in relation to themselves (cognitive, personal, social and competencies in the use of methods), in relation to students and as part of the teacher-student relationship on the basis of selected areas of cognitive psychology, psychology of emotions and motivation, developmental psychology, social psychology, educational psychology and health psychology with application to the university environment | |
| **Recommended literature:**<br>Alexitch, L. R. (2005). Applying social psychology to education. Social Psychology.–Ed.: Schneider F., Gruman J., Coutts L.–Sage Publications, Inc, 205-228.<br>Fry, H., Ketteridge, S., & Marshall, S. (2008). A handbook for teaching and learning in higher education: Enhancing academic practice. Routledge.<br>Mareš, J.: Pedagogická psychologie. Portál, 2013. | |

Kniha psychologie. Universum, 2014
Čáp, J., Mareš, J.: Psychologie pro učitele. Praha: Portál 2007.
Vágnerová, M.: Školní poradenská psychológie pro pedagogy. Praha: Karolínum 2005.

**Course language:**
slovak

**Notes:**

**Course assessment**
Total number of assessed students: 70

| abs | n | neabs |
|---|---|---|
| 100.0 | 0.0 | 0.0 |

**Provides:** PhDr. Anna Janovská, PhD.

**Date of last modification:** 24.06.2022

**Approved:**

## 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:**<br>**Course type:** Lecture<br>**Recommended course-load (hours):**<br>**Per week:** 4 **Per study period:** 56<br>**Course method:** present | |
| **Number of ECTS credits:** 8 | |
| **Recommended semester/trimester of the course:** 2. | |
| **Course level:** III. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>Knowledge of the subject at a sufficient level, exam.<br>Credit evaluation of the course takes into account the following student workload: direct teaching and individual consultations (4 credits), self-study (2 credits), evaluation (2 credits). | |
| **Learning outcomes:**<br>To acquaint with quantum field theory methods and their application in theory of elementary particles and statistical physics. | |
| **Brief outline of the course:**<br>1. Quantum field, Lagrange formalism, interacting quantum fields, Wick theorems and Feynman diagrammatic technique, higher orders of perturbation theory.<br>2. Application of quantum field theory in the theory of elementary particles: standard model, unified theories of elementary particles.<br>3. Application of quantum field theory in statistical physics. Feynman diagrams.<br>4. Critical dynamics and description of scaling at phase transitions by means of quantum-field technique and renormalization group.<br>Selection of aforementioned topics will be made by supervisor according to the content and aims of PhD thesis | |
| **Recommended literature:**<br>1. L.H. Ryder, Quantum Field Theory, Cambridge University Press, Cambridge, 1996.<br>2.A. Zee, Quantum Field Theory in Nutshell, Princeton University Press, Princeton, 2010.<br>3. P. Ramond, Field Theory: A Modern Primer, Westview Press, 1990.<br>4. Zinn-Justin J., Quantum Field Theory and Critical Phenomena, Claredon Press, Oxford, 2004.<br>5. W. Greiner, J. Reinhardt, Field Quantization, Springer, Berlin, 1996.<br>6. W. Greiner, J. Reinhardt, Quantum Electrodynamics, Springer, Berlin, 2009.<br>7. W. Greiner, S. Schramm, E. Stein, Quantum Chromodynamics, Springer, Berlin, 2007.<br>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: 9

| N | P |
| --- | --- |
| 0.0 | 100.0 |

**Provides:** prof. RNDr. Michal Hnatič, DrSc.

**Date of last modification:** 15.12.2021

**Approved:**

## 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:**<br>**Course type:** Lecture<br>**Recommended course-load (hours):**<br>**Per week:** 4 **Per study period:** 56<br>**Course method:** present | |
| **Number of ECTS credits:** 8 | |
| **Recommended semester/trimester of the course:** 3. | |
| **Course level:** III. | |
| **Prerequisities:** | |

**Conditions for course completion:**

The student has to prove sufficient understanding of basic notions and concepts of selected numerical methods. The ability to create own functional numerical codes in arbitrary programming language is required. It is expected that the student will be capable to work with understanding with new-acquired notions, which result to their active utilisation for solving the concrete tasks within the project. The course finish with an oral exam. Credit assignment of the subject: lectures (2 credits), individual studies (1 credit), individual consultations (1 credit) and examination (1 credit). The minimal requirement for passing through the subject is to show a good orientation in the curriculum as well as to deeper understand the subject matter. The final evaluation scale: pass and fail.

**Learning outcomes:**

After passing lectures the student will have fundamental knowledge about advanced numerical methods, as a sufficient tool for analysing the selected problems in the condensed matter physics. After the course finishing the student should be able to create own numerical code of selected method with an appropriate processing of respective data for a subsequent analyse of physical problems.

**Brief outline of the course:**

1. Diagonalization methods, Lanczos method, Davidson method.
2. Density Matrix Renormalization Group (DMRG) Method.
3. Transfer Matrix Method and its application on the low-dimensional lattice-statistical models. Quantum-Classical correspondence.
4. Transfer Matrix Renormalization Group (TMRG) Method.
5. Corner Transfer Matrix Renormalization Group (CTMRG) Method. Application of CTMRG method on the study of relevant thermodynamics properties of selected quantum models

**Recommended literature:**


[1] E. Dagotto, Rev. Mod. Phys. 66 (1994) 763.
[2] E.R. Davidson, Comput. Phys. 17 (1975) 87.
[3] I. Peschel, X. Wang, M. Kaulke, K. Hallberg, Density Matrix Renormalization - A new Method in Physics, lecture notes in Physics, Springer Verlag Vol. 528 1999.
[4] S. R. White, Phys. Rev. Lett. 69 (1992) 2863. Phys. Rev. B 48 (1993) 10345.
[5] U. Schollwock, Rev. Mod. Phys. 77 (2005) 259.

[6] U. Schollwock, Ann. Phys. 326 (2011) 96.
[7] T. Nishino, K. Okunishi, J. Phys. Soc. Jpn. 65 (1996) 891.
[8] T. Nishino, K. Okunishi, J. Phys. Soc. Jpn. 66 (1997) 3040.

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 11

| N | P |
|---|---|
| 0.0 | 100.0 |

**Provides:** doc. RNDr. Peter Kopčanský, CSc., RNDr. Pavol Farkašovský, DrSc., prof. RNDr. Michal Jaščur, CSc.

**Date of last modification:** 18.12.2021

**Approved:**

## 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:**<br>**Course type:** Lecture<br>**Recommended course-load (hours):**<br>**Per week:** 4 **Per study period:** 56<br>**Course method:** present | |
| **Number of ECTS credits:** 8 | |
| **Recommended semester/trimester of the course:** 2. | |
| **Course level:** III. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>Successful passing test and final exam. | |
| **Learning outcomes:**<br>To provide students with models, methods and physical applications in the area of strongly correlated electron systems. | |
| **Brief outline of the course:**<br>Occupation number representation. Second quantization. Models of strongly correlated electron systems. Hubbard model. Periodic Anderson model. Falicov-Kimball model. t-J model. Analytical and numerical methods in the theory of strongly correlated electron systems. Method of canonical transformations. Green's function method. Perturbation theory. Gutzwiller variation method. Lanczos method. Quantum Monte Carlo method. Collective Phenomena. Valence transitions. Metal-insulator transitions. Formation of charge and spin ordering. Electronic ferroelectricity. Itinerant magnetism. Superconductivity. BCS theory. Ginzburg-Landau theory. | |
| **Recommended literature:**<br>[1] P. Farkašovský., H. Čenčariková, Cooperative phenomena in Strongly Correlated Systems, LAP Saarbucken 2011, ISBN: 978-3-8465-0611-0. | |
| **Course language:** | |
| **Notes:** | |
| **Course assessment**<br>Total number of assessed students: 6 | |
| N | P |
| 0.0 | 100.0 |
| **Provides:** RNDr. Pavol Farkašovský, DrSc. | |
| **Date of last modification:** 18.12.2021 | |
| **Approved:** | |

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| **Course ID:** ÚFV/ RZ/04 | **Course name:** Reviewed International or National 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: 280

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

**COURSE INFORMATION LETTER**

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

**Course ID:** ÚFV/ QFT/18 | **Course name:** Selected Topics from Quantum Field 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:** 5

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

**Course level:** III.

**Prerequisities:**

**Conditions for course completion:**
Final evaluation conditions:
Demonstration of knowledge through a test and a seminar paper on a selected topic. The total weight of both the test and the seminar paper is 50%.
The credit evaluation of the course takes into account the following student load: direct instruction (2 credits), self-study (1 credit) and assessment (2 credits).
Prerequisites for successful completion of the course:
Mastery of the midterm and final assessment requirements at a minimum of 50% overall.

**Learning outcomes:**
The aim of the course is to introduce the formalism of quantum and statistical field theory with emphasis on their applications in the theory of phase transitions. The student will be able to understand the construction of perturbation theory in the form of Feynman diagrams. The student can independently verify the correctness of of the numerical expressions to which the Feynman diagrams correspond. The student is able to apply the renormalization group method to analyse the critical behaviour of selected models. Is able to determine the values of critical indices.

**Brief outline of the course:**
Week 1.
Path integrals in quantum mechanics and field theory. Introduction and calculation of the path integral.
2-3. Week:
The path integral for the harmonic oscillator. Functional integral.
4-5. Week 4-5:
Functional methods and perturbation theory. Disturbance development in direct and momentum representation.
Week 6:
Rules for computing Feynman graphs. Continuous Feynman diagrams. Legendre transform. 1-irreducible Feynman graphs.
Week 7:
Renormalization. Canonical dimensions. Primitive and apparent divergences of Feynman diagrams.
Week 8:

Relevant, irrelevant and marginal operators. Renormalization of phi^3 theory.
Week 9:
Renormalization of phi^4 theory.
Week 10:
Dimensional regularization.
Week 11:
Solving the renormalization group equations. Callan-Symanzik equations.
Week 12:
The epsilon development technique.

**Recommended literature:**

VASILIEV, Alexander N. The field theoretic renormalization group in critical behavior theory and critical dynamics. Boca Raton, Chapman & Hall/CRC, 2004.
AMIT, Daniel J., MARTÍN-MAYOR V. Field theory, the renormalization group, and critical phenomena (3th edition). World Scientific, New Jersey, 2005.
ZINN-JUSTIN, Jean. Quantum field theory and critical phenomena. Oxford, Oxford University Press, 2002.
CARDY, John. Scaling and renormalization in statistical physics. Cambridge, Cambridge University Press, 1996.
MUSSARDO, Giuseppe. Statistical field theory. Oxford, Oxford University Press, 2010.

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 4

| abs | n |
|---|---|
| 100.0 | 0.0 |

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

**Date of last modification:** 26.09.2022

**Approved:**

## 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:**
To successfully complete the course, the student must demonstrate sufficient understanding of all the basic concepts of theoretical mechanics, electromagnetic field theory, quantum mechanics, thermodynamics and statistical physics within the course syllabus. Since the content of the lecture includes topics that the student has already partially acquainted with during the study at the bachelor's and master's level, each student must be able to actively master the content of this curriculum at a higher formal and content level through self-study and consultation with teachers. The condition for obtaining credits is the elaboration of home assignments and the successful completion of the final oral commission exam. The minimum limit for passing the exam is to obtain 51% of the total score, which takes into account all required activities with relevant weight.

**Learning outcomes:**
The educational goal of this lecture is to bring students' knowledge and skills in various areas of theoretical physics to the same starting level. By completing this course, all students will achieve a minimum knowledge of basic physical theories, concepts and mathematical procedures in various areas of theoretical physics, which are necessary for their further study and independent scientific research.

**Brief outline of the course:**
Theoretical mechanics:
1. Constrained motion of a system of material points. Constrains and their classification. The principle of virtual work; search for equilibrium positions. D'Alembert's principle. Lagrange equations of the first kind. Generalised coordinates, generalised forces and momentums.
2. Lagrange equations of the second kind, generalised potential.
3. Integral principles. Hamilton's principle. Hamilton's function. Hamilton's canonical equations.
Electromagnetic field theory:
1. System of Maxwell's equations in vacuum and in the material environment. Scalar and vector potential, wave equations for potentials.
2. Conservation law in electromagnetic field theory, Poynting vector, Maxwell voltage tensor.
3. Dielectric polarisation and magnetisation of magnets. Dielectric and magnetic susceptibility, permittivity and permeability. Boundary conditions at the interface of two dielectrics and magnets.

4. Quasi-stationary electromagnetic field, electromagnetic waves, refraction and reflection of a plane monochromatic wave at the interface of two media.
Quantum Mechanics:
1. Wave and matrix formulation of quantum mechanics, postulates of quantum mechanics.
Timeless and temporal Schrödinger equation, continuity equation.
2. Current immeasurability of physical quantities, Heisenberg uncertainty relations.
3. Particle in a rectangular potential well, bound and scattering states. Particle passage through a rectangular potential barrier, tunneling and barrier reflection.
4. Solution of Schrödinger equation for linear harmonic oscillator and hydrogen atom.
5. Spin and Pauli matrix. Principle of indistinguishability of identical particles, fermions and bosons. Pauli's exclusion principle.
6. Stationary and non-stationary perturbation theory for non-degenerate and degenerate quantum-mechanical systems with discrete, continuous and discrete-continuous energy spectrum.
7. Normal and anomalous Zeeman effect, linear and quadratic Stark effect.
8. Ritz's variational method and its applications in quantum mechanics.
9. Solution of Schrődinger equation for helium, multielectron atoms and hydrogen molecule.
Thermodynamics and statistical physics:
1. State of thermodynamic equilibrium. Thermodynamic temperature, internal energy, work and heat in thermodynamics. First, second and third laws of thermodynamics for quasi-static processes
3. Thermodynamic potentials for systems with constant and variable number of particles. Maxwell's relations. Mathematical formulation of the second law of thermodynamics for non-static processes. Heterogeneous systems. Gibbs phase rule.
4. Microcanonical, canonical and grand canonical ensemble in classical and quantum statistical physics. Canonical and grand canonical partition function, internal energy, entropy, free energy and grand canonical potential within classical and quantum statistical physics. Statistics of ideal fermion and boson gases.

**Recommended literature:**

1. W. Greiner: Classical Mechanics: Systems of Particles and Hamiltonian Dynamics (2nd ed.) Springer, Berlin, 2010.
2. L.D. Landau, E. M. Lifshitz: Mechanics, Butterworth-Heinemann, 1974.
3. W. Greiner: Classical Electrodynamics, Springer, New York, 1998.
4. G. Lehner: Electromagnetic Field Theory for Engineers and Physicists. Springer, Berlin, 2010.
5. L.D. Landau, E. M. Lifshitz: The classical theory of fields, Butterworth-Heinemann, Oxford, 1994.
6. W. Greiner, Quantum Mechanics, 4th edition, Springer, Berlin, 2000.
7. A. C. Philips, Introduction to Quantum Mechanics, Wiley, Weinheim, 2003.
8. D. J. Griffiths, Introduction to Quantum Mechanics, Prentice Hall, New Jersey, 1995.
9. G. Auletta, M. Fortunato, G. Parisi, Quantum Mechanics, Cambridge University Press, Cambridge, 2009.
10. L.D. Landau, E. M. Lifshitz: Quantum mechanics: non-relativistic theory, Pergamon Press, Oxford, 1991.
11. L.E. Reichl: A Modern Course in Statistical Mechanics, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, 2016.
12. R.K. Pathria, P.D. Beale: Statistical Mechanics, Elsevier, Amsterdam, 2011.
13. W. Greiner, L. Neise, H. Stöcker: Thermodynamics and Statistical Mechanics, Springer, Berlin, 2001.
14. L.D. Landau, E. M. Lifshitz: Statistical Physics, vol. I, Elsevier Science, Butterworth-Heinemann, Oxford, 2001.

**Course language:**
slovak, english

**Notes:**

**Course assessment**
Total number of assessed students: 14

| N | P |
|---|---|
| 0.0 | 100.0 |

**Provides:** prof. RNDr. Michal Jaščur, CSc., doc. RNDr. Jozef Strečka, PhD.

**Date of last modification:** 19.11.2021

**Approved:**

# 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 / Practice
**Recommended course-load (hours):**
**Per week:** 2 / 2 **Per study period:** 28 / 28
**Course method:** present

**Number of ECTS credits:** 8

**Recommended semester/trimester of the course:** 3.

**Course level:** III.

**Prerequisities:**

**Conditions for course completion:**
To successfully complete the course, the student must demonstrate a deep understanding of all basic concepts and applications of quantum statistical physics, which is the main theoretical tool for describing the thermodynamic properties of various models of crystalline solids. Based on lectures, which are carried out in the form of block teaching, the student must be able to acquire in detail the methods of theoretical calculations so that he can actively and creatively use the acquired knowledge in solving specific problems during exercises and independent homework. In addition to direct participation in classes, the student is obliged to study within the self-study current research topics assigned by the teacher and also to develop and present in the form of a seminar four home assignments. Mastering the solutions of specific theoretical model systems requires a high degree of independence of students in the study of book and current journal literature. The professional focus of individual home assignments is tied to the syllabus of the course. When studying and developing projects, students can actively consult professional problems with the teacher throughout the semester as needed.
In addition to attending classes, the condition for obtaining credits is the elaboration of home assignments. The minimum limit for passing the exam is to obtain 51% of the total score, which takes into account all required activities with relevant weight.

**Learning outcomes:**
After completing lectures and exercises, the student will acquire specific knowledge and skills aimed at creating model systems for various crystalline systems. The student will get acquainted in detail with advanced methods of quantum statistical physics enabling the calculation of all relevant physical quantities for various model systems and will be able to competently compare theoretical calculations with experimental data. Specific models for study are determined by the teacher in accordance with the current syllabus of the course.

**Brief outline of the course:**
Complex theory of solids. Identification of relevant energy contributions to the total energy of the solid and their theoretical description. Static lattice energy, Lenard-Jones and Morse potential of a solid. Vibrational, electron and magnetic contribution to crystal energy and construction of theoretical models within statistical physics. The need to take into account anharmonic effects. Volumetric expansion of the lattice due to temperature and magnetic field. Grüneisen's theory of

anharmonic oscillations of a lattice Anharmonic Debye and Einstein's theory of oscillations of a lattice. Theory of localized magnetic models with distance-dependent exchange interaction. Calculation of relevant thermodynamic quantities for various model systems. Exactly solvable low-dimensional complex models and their thermodynamics.

**Recommended literature:**

1. L. A. Girifalco: Statistical Mechanics of Solids, Oxford University Press (2000).
2. A.L. Kuzemsky: Statistical Mechanics and the Physics of Many-Particle Systems, World Scientific (2017).
3. T. Balcerzak, K. Szalowski ans M. Jaščur, A simple thermodynamic description of the combined Einstein and elastic models, Journal of Physics: Condensed Matter 22 (2010) 425401.
4. T. Balcerzak, K. Szalowski ans M. Jaščur, A self-consistent thermodynamic model of metallic systems. Application for the description of gold, Journal of Applied Physics 116 (2014).
5. T. Balcerzak, K. Szalowski ans M. Jaščur, Self-consistent model of a solid for the description of lattice and magnetic properties, Journal of Magnetism and Magnetic Materials 426 (2017) 310.
6. T. Balcerzak, K. Szalowski ans M. Jaščur, Thermodynamic model of a solid with RKKY interaction and magnetoelastic coupling, Journal of Magnetism and Magnetic Materials 452 (2018) 360.
7. 6. T. Balcerzak, K. Szalowski ans M. Jaščur, T
Thermodynamic properties of the one-dimensional Ising model with magnetoelastic interaction, Journal of Magnetism and Magnetic Materials 507 (2020) art. no. 166825.

**Course language:**
slovak, english

**Notes:**

**Course assessment**
Total number of assessed students: 6

| N | P |
|---|---|
| 0.0 | 100.0 |

**Provides:** prof. RNDr. Michal Jaščur, CSc.

**Date of last modification:** 19.11.2021

**Approved:**

## COURSE INFORMATION LETTER

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|---|---|
| **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:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week: Per study period:**<br>**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**<br>Total number of assessed students: 195 | |

| N | P |
|---|---|
| 0.0 | 100.0 |

| | |
|---|---|
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

# 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:**
Active participation in the Spring School of PhD students of UPJŠ.

**Learning outcomes:**
By actively participating in the Spring School of PhD Students of UPJŠ, the PhD student demonstrates a high level of ability to process the issues of his dissertation for a multidisciplinary audience with an emphasis on clarifying the motivation, scientific problem, processing methodology and own contribution to the solution of the selected topic. The PhD student demonstrates the ability to professionally discuss various research topics, present his own positions and accept a plurality of opinions. Demonstrates the ability to communicate research results to a wider professional audience with adequate means and through the Slovak language.

**Brief outline of the course:**
1. Interdisciplinary lectures from the fields of medicine, natural sciences, law, public affairs, humanities. Lecturers - top foreign or national experts from the mentioned fields.
2. Scientific lectures in sections created within related disciplines. Lecturers - top experts from UPJŠ from the mentioned fields.
3. Scientific contributions of PhD students in sections of related fields.
4. Panel discussions on the issue of PhD studies and current trends in the development of scientific disciplines at UPJŠ.

**Recommended literature:**
Proceedings of the Spring School of Doctoral Students.

**Course language:**

**Notes:**

**Course assessment**
Total number of assessed students: 187

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:** doc. RNDr. Marián Kireš, PhD.

| | |
|---|---|
| **Date of last modification:** 08.11.2022 |
| **Approved:** |

**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:**<br>**Course type:** Lecture<br>**Recommended course-load (hours):**<br>**Per week:** 4 **Per study period:** 56<br>**Course method:** present | |
| **Number of ECTS credits:** 8 | |
| **Recommended semester/trimester of the course:** 1. | |
| **Course level:** III. | |
| **Prerequisities:** | |
| **Conditions for course completion:**<br>To successfully complete the course, the student is required to understand various approximate approaches to the study of phase transitions and critical phenomena, the concept of nonequilibrium thermodynamics and the basics of statistical physics of polymers. Lectures are organized in blocks, with a selection of topics reflecting the needs of currently registered students. The condition for obtaining credits is successful completion of the final oral exam, the completion of which is conditioned by the submission of the project electronically and with the attached computer program. Credit evaluation of the course takes into account the following student workload: direct teaching (2 credits), self-study (2 credits), project work (2 credits), individual consultations (1 credit), and exam (1 credit). The minimum limit for completing the course is to obtain at least 50% of the total score. | |
| **Learning outcomes:**<br>To acquaint students with the modern theory of phase transitions, current ideas of nonequilibrium thermodynamics and modern statistical physics of polymers. Emphasis is placed on the nature, possibilities and limitations of using different approximate approaches to the solution of complex systems. | |
| **Brief outline of the course:**<br>1. Phase transitions and critical phenomena. Mean-field theory and its improvements. Critical indices. Concept of universality, static hypothesis of similarity and scaling. Kadanoff block spins transormation. Theory of the renormalization group. Phase diagrams and fixed points. The perturbative renormalization group. Random systems.<br>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.<br>3. Statistical physics of macromolecules. Thermodynamic properties of polymer solutions and mixtures. Polymer gels. Molecular motion of the polymeric systems<br>Selection from this topics makes supervisor depending on the scope of the dissertation. | |
| **Recommended literature:**<br>PLISCHKE, M., BERGERSEN, B., Equilibrium Statistical Physics, World Scientific, Singapore, 2006. | |

MA, S.K., Statistical Mechanics, World Scientific, Singapore, 1993.
STREČKA, J., JAŠČUR, M., A brief account of the Ising and Ising-like models: Mean-field, effective-field and exact results, Acta Physica Slovaca 65 (2015) 235–367.
KADANOFF, L.P., Statistical Physics: Statics, Dynamics and Renormalization, World Scientific, Singapore, 2000.
CARDY, J., Scaling and Renormalization in Statistical Physics, Cambridge, 2002.
DE GROT, S.R., MAZUR, P., Non-equilibrium Thermodynamics, Dover Publications, Inc., New York, 1984.
PRIGOGINE, I., Non-Equilibrium Statistical Mechanics, Dover Publications, 2017.
VAN KAMPEN, N.G., Stochastic Processes in Physics and Chemistry, Elsevier, 2007.
DOI, M., Introduction to Polymer Physics, Clarendon, Oxford, 1996.

**Course language:**
1. Slovak,
2. English

**Notes:**

**Course assessment**
Total number of assessed students: 21

| N | P |
|---|---|
| 0.0 | 100.0 |

**Provides:** prof. RNDr. Milan Žukovič, PhD.

**Date of last modification:** 16.09.2021

**Approved:**

## 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: 265

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

**COURSE INFORMATION LETTER**

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚFV/ VPSV/04 | **Course name:** Supervision of Student's Scientific Activity |
| **Course type, scope and the method:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week: Per study period:**<br>**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**<br>Total number of assessed students: 19 | |
| abs | n |
| 100.0 | 0.0 |
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

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|---|---|
| **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: 44

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

| | |
|---|---|
| **Course ID:** 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: 268

| abs | n |
|---|---|
| 100.0 | 0.0 |

**Provides:**

**Date of last modification:**

**Approved:**

## COURSE INFORMATION LETTER

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚFV/ PPC/04 | **Course name:** Teaching activities |
| **Course type, scope and the method:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week: Per study period:**<br>**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**<br>Total number of assessed students: 268 | |

| abs | n |
|---|---|
| 100.0 | 0.0 |

| | |
|---|---|
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

## COURSE INFORMATION LETTER

**University:** P. J. Šafárik University in Košice

**Faculty:** Faculty of Science

**Course ID:** 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:** |

## COURSE INFORMATION LETTER

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|---|---|
| **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:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week:** **Per study period:**<br>**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**<br>Total number of assessed students: 100 | |

| abs | n |
|---|---|
| 100.0 | 0.0 |

| | |
|---|---|
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |

**COURSE INFORMATION LETTER**

| | |
|---|---|
| **University:** P. J. Šafárik University in Košice | |
| **Faculty:** Faculty of Science | |
| **Course ID:** ÚFV/ PDS/18 | **Course name:** Writing Dissertation Work |
| **Course type, scope and the method:**<br>**Course type:**<br>**Recommended course-load (hours):**<br>**Per week:** **Per study period:**<br>**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**<br>Total number of assessed students: 22 | |
| N | P |
| 0.0 | 100.0 |
| **Provides:** | |
| **Date of last modification:** | |
| **Approved:** | |