CONTENT

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice
Faculty: Faculty of Science
Course ID: CJP/ PFAJAKA/07 — **Course name:** Academic English
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:
Course level: I.
Prerequisities:
Conditions for course completion: Active classroom participation, assignments handed in on time, 2 absences tolerated 1 test (13th week), no retake. Presentation on chosen topic Final evaluation- average assessment of test (50%), and presentation (50%). Grading scale: A 93-100%, B 86-92%, C 79-85%, D 72-78%, E 65-71%, FX 64% and less
Learning outcomes: 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, level B2.
Brief outline of the course: Formal and informal English Academic English and its specific features Key academic verbs and nouns Linking words in academic writing, writing a paragraph, word-order, topic sentences Word-formation - affixation abstract Selected aspects of English pronunciation, academic vocabulary Selected functional grammar structures - defining, classifying, epressing opinion, cause-effect, paraphrasing
Recommended literature: Seal B.: Academic Encounters, CUP, 2002 T. Armer :Cambridge English for Scientists, CUP 2011 M. McCarthy M., O´Dell F. - Academic Vocabulary in Use, CUP 2008 Zemach, D.E, Rumisek, L.A: Academic Writing, Macmillan 2005 Olsen, A. : Active Vocabulary, Pearson, 2013 www.bbclearningenglish.com Cambridge Academic Content Dictionary, CUP, 2009

Course language:
English language, level B2 according to CEFR.

Notes:

Course assessment
Total number of assessed students: 435

A	B	C	D	E	FX
36.09	22.3	14.94	9.89	5.75	11.03

Provides: Mgr. Viktória Mária Slovenská

Date of last modification: 11.09.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/ ALG4a/22	**Course name:** Algebra I for physicists

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 1.

Course level: I.

Prerequisities:

Conditions for course completion:
According to the results from the semester and in view of the results of the written and oral final exam.

Learning outcomes:
To obtain basic knowledge from linear algebra concerning systems of linear equations. To be able to apply it in concrete excercises.

Brief outline of the course:
Systems of linear equations, Gauss elimination. Maps, permutations. Computing with matrices. Determinants, Cramer rule.

Recommended literature:
T. Katriňák a kol.: Algebra a teoretická aritmetika 1, Alfa Bratislava, 1985.
T.S Blyth, E.F. Robertson: Basic linear algebra, Springer Verlag, 2001.
K. Jänich: Linear algebra, Springer Verlag, 1991.

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 909

A	B	C	D	E	FX
10.78	12.65	19.69	18.04	27.61	11.22

Provides: RNDr. Lucia Kőszegyová, PhD., Mgr. Martin Vodička, Dr. rer. nat., Mgr. Radka Schwartzová

Date of last modification: 16.04.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚMV/ ALG4b/22	**Course name:** Algebra II for physicists
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 2 **Per study period:** 28 / 28 **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course: 2.	
Course level: I.	
Prerequisities: ÚMV/ALG4a/22	
Conditions for course completion: Exam	
Learning outcomes: To provide deeper knowledge on vector spaces, linear transformations and Euclidean spaces.	
Brief outline of the course: Vector spaces, subspaces. A basis, a dimension and a characterization of n-dimensional vector spaces. The rank of a matrix. Linear transformations and their matrices. Operations with linear tranformations, matrices of sums and compositions of linear tranformations. Regular linear transformations, regular matrices. Similar matrices. Characteristic vectors and characteristic values of linear transformations. Affine spaces, subspaces and their positions. Euclidean spaces, the distance of subspaces. Conics and quadrics.	
Recommended literature: G. Birkhoff, S. Mac Lane: A Survey of Modern Algebra, New York 1965 T. Katriňák a kol.: Algebra a teoretická aritmetika 1, Alfa Bratislava, 1985 M. Sekanina, L. Boček, M. Kočandrle, J.Šedivý: Geometrie 1, SPN Praha 1986 M. Hejný, V. Zaťko, P. Kršňák: Geometria 1, SPN Bratislava 1985 J. Eliaš, J. Horváth, J. Kajan: Zbierka úloh z vyššej matematiky 1, Alfa Bratislava A. F. Beardon: Algebra and Geometry, Cambridge University Press, 2005	
Course language: Slovak	
Notes:	
Course assessment Total number of assessed students: 331	

A	B	C	D	E	FX
16.31	10.27	13.29	18.43	31.42	10.27

Provides: doc. RNDr. Roman Soták, PhD., Mgr. Martin Vodička, Dr. rer. nat.
Date of last modification: 16.04.2022
Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ ZPF1a/03	**Course name:** Bachelor 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: 2

Recommended semester/trimester of the course: 5.

Course level: I.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 115

abs	n
100.0	0.0

Provides:

Date of last modification: 03.03.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ BPO/14	**Course name:** Bachelor Thesis and its Defence

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

Number of ECTS credits: 4

Recommended semester/trimester of the course:

Course level: I.

Prerequisities:

Conditions for course completion:
Required number of credits gained basedon submitting the bachelor thesis.

Learning outcomes:

Brief outline of the course:
Oral presentation of the bachelor's thesis results before the examination committee.
Answering questions from the supervisor and members of the examination committee regarding the topic of the bachelor's thesis.

Recommended literature:

Course language:
Slovak or English

Notes:

Course assessment
Total number of assessed students: 74

A	B	C	D	E	FX
86.49	6.76	4.05	2.7	0.0	0.0

Provides:

Date of last modification: 17.03.2025

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ZPF1b/03	**Course name:** Bachelor 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: 6.	
Course level: I.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
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: 03.03.2022	
Approved: doc. RNDr. Jozef Strečka, PhD.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/SBF/12	**Course name:** Biophysical Seminary

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: 5.

Course level: I.

Prerequisities:

Conditions for course completion:
The active presence on the seminars, preparation of the presentations on selected scientific papers.

Learning outcomes:
Students will obtain informations about scientific results of research groups from Department of Biophysics at Faculty of Science of UPJŠ and they will be prepared for the discussions on selected scientific topics.

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

Recommended literature:
Selected scientific journals.

Course language:
English language

Notes:

Course assessment
Total number of assessed students: 12

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

Provides: prof. Mgr. Daniel Jancura, PhD.

Date of last modification: 17.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: CJP/ PFAJKKA/07	**Course name:** Communicative Competence in English

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:

Course level: I.

Prerequisities:

Conditions for course completion:
Active participation in class and completed homework assignments. Students are allowed to miss two classes at the most.
2 credit tests (presumably in weeks 6/7 and 12/13) and an oral presentation in English.
Final evaluation consists of the scores obtained for the 2 tests (50%).
Final grade will be calculated as follows: A 93-100 %, B 86-92%, C 79-85%, D 72-78%, E 65-71%, FX 64 % and less.

Learning outcomes:

Brief outline of the course:

Recommended literature:
www.bbclearningenglish.com
Štěpánek, Libor a kol. Academic English-Akademická angličtina. Praha: Grada Publishing, a.s., 2011.
McCarthy M., O'Dell F.: English Vocabulary in Use, Upper-Intermediate. CUP, 1994.
Fictumova J., Ceccarelli J., Long T.: Angličtina, konverzace pro pokročilé. Barrister and Principal, 2008.
Peters S., Gráf T.: Time to practise. Polyglot, 2007.
Jones L.: Communicative Grammar Practice. CUP, 1985.
Additional study materials.

Course language:
English language, B2-C1 level according to CEFR

Notes:

Course assessment
Total number of assessed students: 303

A	B	C	D	E	FX
45.21	21.12	17.49	7.59	5.94	2.64

Provides: Mgr. Barbara Mitríková, Mgr. Viktória Mária Slovenská

Date of last modification: 06.02.2025
Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: CJP/ PFAJGA/07	**Course name:** Communicative Grammar in English

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:

Course level: I.

Prerequisities:

Conditions for course completion:
Active classroom participation (maximum 2 absences tolerated), homework assignments completed by given deadlines.
Presentation of a topic related to the study field.
Final Test - end of semester, no retake
Final assessment = average of test and presentation.
Grading scale: A 93-100%, B 86-92%, C 79-85%, D 72-78%, E 65-71%, FX 64% and less

Learning outcomes:
The development of students´ language skills - reading, writing, listening, speaking, improvement of their communicative 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 on level B2.

Brief outline of the course:
Selected aspects of English grammar and pronunciation
Word formation
Contrast of tenses in English
The passive voice
Types of Conditionals
Phrasal verbs and English idioms
Words order and collocations, prepositional phrases

Recommended literature:
Vince M.: Macmillan Grammar in Context, Macmillan, 2008
McCarthy, O'Dell: English Vocabulary in Use, CUP, 1994
www.linguahouse.com
esllibrary.com
bbclearningenglish.com
ted.com/talks

Course language:

English language, level B2 according to CEFR.

Notes:

Course assessment
Total number of assessed students: 446

A	B	C	D	E	FX
41.48	19.51	15.7	7.85	5.61	9.87

Provides: Mgr. Viktória Mária Slovenská, Mgr. Lýdia Markovičová, PhD.

Date of last modification: 08.02.2025

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: KGER/NJKG/07	**Course name:** Communicative Grammar in German Language
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:	
Course level: I.	
Prerequisities:	
Conditions for course completion: Active participation in class and completed homework assignments. Students are allowed to miss 2 classes at the most (2x90 min.). 2 control tests during the semester. Final grade will be calculated as follows: A 93-100 %, B 86-92%, C 79-85%, D 72-78%, E 65-71%, FX 64 % and less.	
Learning outcomes: The aim of the course is to identify and eliminate the most frequent grammatical errors in oral and written communication, learning language skills of listening comprehension, speaking, reading and writing, increasing students 'language competence (acquisition of selected phonological, lexical and syntactic knowledge), development of students' pragmatic competence (acquisition of the ability to express selected language functions), development of presentation skills, etc.	
Brief outline of the course: The course is aimed at practicing and consolidating knowledge of morphology and syntax of German in order to show the context in grammar as a whole. The course is intended for students who often make grammatical errors in oral as well as written communication. Through the analysis of texts, audio recordings, tests, grammar exercises, monologic and dialogical expressions of students focused on specific grammatical structures, problematic cases are solved individually and in groups. Emphasis is placed on the balanced development of grammatical thinking in the communication process, which ultimately contributes to the development of all four language skills.	
Recommended literature: Dreyer, H. – Schmitt, R.: Lehr- und Übungsbuch der deutschen Grammatik. Hueber Verlag GmbH & Co. Ismaning, 2009. Krüger, M.: Motive Kursbuch, Lektion 1 – 30. Huebert Verlag GmbH & Co. Ismaning, 2020. Brill, L.M. – Techmer, M.: Deutsch. Großes Übungsbuch. Wortschatz. Huebert Verlag GmbH & Co. Ismaning, 2011. Földeak, Hans: Sag's besser!. Grammatik. Arbeitsbuch für Fortgeschrittene. Huebert Verlag GmbH & Co. Ismaning, 2001. Geiger, S. – Dinsel, S.: Deutsch Übungsbuch Grammatik A2-B2. Huebert Verlag GmbH & Co. Ismaning, 2018. Dittelová, E. – Zavatčanová, M.: Einführung in das Studium der deutschen Fachsprache. Košice: ES UPJŠ, 2000.	

Course language:
German, Slovak language

Notes:

Course assessment
Total number of assessed students: 58

A	B	C	D	E	FX
62.07	10.34	8.62	3.45	8.62	6.9

Provides: Mgr. Ulrika Strömplová, PhD.

Date of last modification: 13.08.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚMV/ FKP/10	**Course name:** Complex analysis
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 3 / 1 **Per study period:** 42 / 14 **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course: 4., 6.	
Course level: I.	
Prerequisities: ÚMV/MAN1c/22 or ÚMV/MAN2d/22 or ÚMV/FRPb/19	
Conditions for course completion: Two written test during semeter and activity student to practice. Final evaluation is given by continuous assessment, written and oral part of the exam.	
Learning outcomes: The purpose of the course is to provide introductory knowledge in differential and integral calculus of complex functions and develop the ability to use this theory.	
Brief outline of the course: Complex numbers, complex sequences and series. Function of a complex variable - limits, continuity, differetiability, Cauchy-Riemann equations. Integration in the complex plane - Cauchy's theorems and its consequences. Laurent's series, residues and Cauchy's residue theorem. Laplace and Fourier transform and their applications.	
Recommended literature: 1. Kluvánek, I. - Mišík, L. - Švec, M.: Matematika II; SVTL, Bratislava, 1959. 2. Galajda, P. - Schrötter, Š.: Funkcia komplexnej premennej a operátorový počet. ALFA, Bratislava,1991. 3. Privalov, I. I.: Analytické funkce. Nakladatelství ČAV, Praha, 1955. 4. Demidovič, B. P.: Sbírka úloh a cvičení z matematické analýzy, Fragment, Praha, 2003. 5. Eliaš, J. - Horváth, J. - Kajan, J.: Zbierka úloh z vyššej matematiky 2, 3, 4, Alfa, Bratislava, 1971. 6. Priestley, H.A.: Introduction to Complex Analysis. Oxford University Press, Oxford, 2004. 7. Sveshnikov, A. - Tikhonov, A.: The Theory of Functions of a Complex Variable. Mir Publishers, Moscow, 1973.	
Course language: Slovak	
Notes:	

Course assessment Total number of assessed students: 64					
A	B	C	D	E	FX
18.75	9.38	29.69	9.38	21.88	10.94

Provides: prof. RNDr. Ondrej Hutník, PhD.

Date of last modification: 16.04.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/POF1a/99	**Course name:** Computational Physics I

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 6.

Course level: I., II.

Prerequisities: ÚFV/NUM/10

Conditions for course completion:
To successfully complete the course, the student must demonstrate a sufficient degree of understanding of the principles of computer solution of some typical physical problems. The basis of continuous assessment is participation and activity in exercises and work on assignments. The course ends with a final oral exam, the completion of which is conditional on the submission of all four assignments (projects) electronically and with the attached computer program. The credit evaluation of the course takes into account the following student workload: direct teaching (2 credits) and individual work on projects (2 credits). The minimum threshold for completing the course is to obtain at least 50% of the total score, using the following rating scale: A (90-100%), B (80-89%), C (70-79%), D (60- 69%), E (50-59%), F (0-49%).

Learning outcomes:
To teach the basic principles of computer solution of some typical physical problems. The course covers both the area of deterministic methods for solving problems by ordinary and partial differential equations as well as the area of stochastic Monte Carlo simulations and thus forms the basis for further study of more advanced computer methods contained in the follow-up course Computational Physics II.

Brief outline of the course:
1. Introduction to dynamical systems.
2. Numerical solution of systems of ordinary differential equations with initial condition.
3. Euler's method, convergence, error estimation and order of the method. One-step methods, Tylor-type and Runge-Kuta (RK2, RK4) methods.
4. Multistep methods, general linear method (explicit, implicit). Methods based on numerical quadrature.
5. Boundary value problems for ordinary differential equations.
6. Numerical solution of partial differential equations (PDE). Difference methods, their consistence, convergence and stability. Elliptic PDE.
7. Parabolic PDE, diffusion equation. Explicit and implicit methods.
8. Introduction to the Monte Carlo method. Monte Carlo integration and application in statistical physics.

9. Basics of probability theory. Monte Carlo estimate of mean and standard deviation. Central theorem of Monte Carlo sampling.
10. Simple and importance sampling. Markov chain. Perron-Frobenius theorem. Metropolis algorithm, detailed balance condition.
11. Monte Carlo simulations of lattice spin systems - application to Ising model.
12. Statistical analysis of Monte Carlo data.

Recommended literature:
Basic literature:
POZRIKIDIS, C.: Num. Comp. in Science and Engineering, Oxford Univ. Press, 2008.
GARCIA A.L.: Numerical Methods for Physics, Prentice-Hall, 1994.
LANDAU D.P., BINDER K.: A Guide to Monte Carlo Simulations in Statistical Physics, Cambridge Univ. Press, 5-th edition, 2021.
Other literature:
BERG, B.A.: Introduction to Markov Chain Monte Carlo Simulations and Their Statistical Analysis (http://www.worldscibooks.com/etextbook/5904/5904_intro.pdf)
JANKE, W.: Monte Carlo Simulations of Spin Systems (http://www.physik.uni-leipzig.de/~janke/Paper/spinmc.pdf)

Course language:

Notes:

Course assessment
Total number of assessed students: 140

A	B	C	D	E	FX	N	P
29.29	17.86	12.14	14.29	19.29	2.86	0.0	4.29

Provides: prof. RNDr. Milan Žukovič, PhD.

Date of last modification: 14.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ELP1/01	**Course name:** Electonics Practical
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 3 **Per study period:** 42 **Course method:** present	
Number of ECTS credits: 3	
Recommended semester/trimester of the course: 6.	
Course level: I.	
Prerequisities: ÚFV/ELE1/07 or ÚFV/ELEM1/15	

Conditions for course completion:

For successful exam of the subject, the student must demonstrate sufficient understanding of selected problems from electronics. Knowledge of student will be tested by talk during practices. It is necessary to properly process the theoretical preparation of the topic for the preparation of the experiment. Subsequently analyze and interpret experimental results. Condition for obtaining credits is to perform all tasks and passing protocols from measurements. Credit assessment of the subject takes into account the following student burden: performing experimental measurements (1 credit), self-study and theoretical preparation (1 credits) and drafting protocols (1 credits). The minimum boundary for completing the subject is to obtain at least 50% of the total point evaluation, using the following evaluation scale: A (90-100%), B (80-89%), C (70-79%), D (60- 69%), E (50-59%), F (0-49%).

Learning outcomes:

Practical work of students in the design, construction and properties of the measurements of electronic circuits and interpretation of the results obtained to verify and consolidate the theoretical knowledge acquired in lectures on the subject Electronics.

Brief outline of the course:

1. Combinatorial logical circuits.
2.Logical memory circuits.
3. Logical sequence circuits.
4. Rectifiers, filters, stabilizers.
5. Generators of harmonic signals.
6. Operational amplifiers and operational network interfaces.
7. Digital-to-analog converters.
8. Analog-to-digital converters.
9. Reserve.

Recommended literature:

1. Delaney C.F.G.: Electronics for the Physicist with Aplications. John Willey & Sons, New York, 1980.
2. Zbar P.B., Malvino A.P., Miller M.A.: Basic Electronics: a Text-Lab Manual. Macmillan/ McGraw – Hill, New York, 1994.

Course language:
1. Slovak
2. English

Notes:

Course assessment
Total number of assessed students: 43

A	B	C	D	E	FX
90.7	2.33	2.33	4.65	0.0	0.0

Provides: RNDr. Vladimír Tkáč, PhD.

Date of last modification: 20.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ELE1/07	**Course name:** Electronics
Course type, scope and the method: **Course type:** Lecture **Recommended course-load (hours):** **Per week:** 3 **Per study period:** 42 **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course: 3., 5.	
Course level: I.	
Prerequisities: ÚFV/VF1b/03	
Conditions for course completion: Exam	
Learning outcomes: To explain physical principles of classical electronic components and systems and technologies of their realization. To perform analysis of properties and functions of basic electronic elements, electronic circuits and information transmission and processing systems. To introduce student into basic elements and devices in area of nanoelectonics and to explain methods of their fabrication and principles of their functioning.	
Brief outline of the course: 1. Introduction to electronics: Basic components of electronic circuits, basic electrical laws 2. Passive components, basic properties of semiconductors 3. Semiconductors without PN junction, components with PN junction 4. Semiconductors with PN junction 5. Transistor phenomenon, transistor 6. Electronic circuit with transistor 7. Operational amplifiers 8. Sources and generators 9. Two-value logic algebra, combinational logic circuits 10. Digital memory circuits 11. Sequential logic circuits 12. Digital-analog converters, analog-digital converters	
Recommended literature: 1. Brown P.B., Frantz G.N., Moraff H.: Electronics for the Modern Scientist. Elsevier, 1982. 2. Delaney C.F.G.: Electronics for the Physicist with Aplications. John Willey & Sons, 1980. 3. Wolt E. L.: Quantum Nanoelectronics, An introduction to electronic nanotechnology and quantum computing, Wiley-VCh, 2009	
Course language: Slovak	
Notes:	

Course assessment
Total number of assessed students: 279

A	B	C	D	E	FX
29.75	26.88	27.24	7.53	4.66	3.94

Provides: RNDr. Vladimír Tkáč, PhD.

Date of last modification: 02.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: CJP/ PFAJ4/07	**Course name:** English Language of Natural Science

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 4.

Course level: I.

Prerequisities:

Conditions for course completion:
Active participation in class and completed homework assignments. Students are allowed to miss 2 classes at the most
Continuous assessment:
1 credit test taken presumably in weeks 6/7
1 project (quiz on the topic of the student´s field of study) 25% of the continuous assessment
5 LMS quizzes (25% of the continuous assessment)
In order to be admitted to the final exam, a student has to score at least 65 % from the continuous assessment
The exam test results represent 50% of the final grade for the course, continuous assessment results represent the other 50% of the final grade.
The final grade for the course will be calculated as follows:
A 93-100, B 86-92, C 79-85, D 72-78, E 65-71, FX 64 and less.

Learning outcomes:
Enhancement of students' language skills (speaking, writing, reading and listening comprehension) in English for specific and academic purposes and development of students' linguistic competence. Students obtain knowledge of selected phonological, lexical and syntactic aspects of professional English, improve their pragmatic competence - students can effectively use the language for a given purpose, and acquire presentation skills at B2 level (CEFR) with focus on terminology of natural sciences.

Brief outline of the course:
1. Introduction to studying language
2. Selected aspects of scientific language
3. Talking about academic study
4. Discussing science
5. Defining scientific terminology and concepts
6. Expressing cause and effect
7. Describing structures
8. Explaining processes
9. Comparing objects, structures and concepts

10. Talking about problem and solution
11. Referencing authors
12. Giving examples
13. Visual aids and numbers
14. Referencing time and place
Presentation topics related to students´study fields.

Recommended literature:
lms.upjs.sk - e-kurz Odborný anglický jazyk pre prírodné vedy.
Redman, S.: English Vocabulary in Use, Pre-intermetdiate, Intermediate. Cambridge University Press, 2003.
Armer, T.: Cambridge English for Scientists. CUP, 2011.
Wharton J.: Academic Encounters. The Natural World. CUP, 2009.
P. Fitzgerald : English for ICT studies. Garnet Publishing, 2011.
https://worldservice/learningenglish, https://spectator.sme.sk
www.isllibrary.com
linguahouse.com

Course language:
English, level B2 (CEFR)

Notes:

Course assessment
Total number of assessed students: 3246

A	B	C	D	E	FX
38.63	26.31	16.3	9.52	7.18	2.06

Provides: Mgr. Viktória Mária Slovenská

Date of last modification: 06.02.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ ZPU1/03	**Course name:** Essentials of UNIX Programming

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 4.

Course level: I.

Prerequisities:

Conditions for course completion:
monitoring of student's programming skills
unsupervised creation of the program to solve the given task at the end

Learning outcomes:
To provide students with basic programming skills necessary for solving problems which require applications of numeric methods, simulation techniques and computer data processing.

Brief outline of the course:
1st week: Linux Basics: Characteristics. Linux distributions. UNIX/LINUX filesystem. Wildcards (*,?). File ownership and permissions. Command line. Shell. Basic LINUX commands for file management. Manual pages.
2nd week: C programing language. Source code. C language syntax. Structure of C programs. GCC Compiler. Formatted output (printf). Declarations and types of variables. Operator sizeof. Arithmetic operators. Assignement operators. Indexed variables (arrays). Text strings as arrays.
3th week: Control flow. Control structures. Statements and blocks. Increment and decrement operators. Loops "while", "for" and "do ... while". Break and continue statements. Relational and logical operators. Conditional expressions. Syntax of the "switch" statement.
4th week: Functions. Declaration of function. Arguments of functions. Return of values by functions. User defined functions. Scope and lifetime of variables. Storage classes - static and automatic variables.
5th week: Library functions. Header files. Mathematical library (math.h). Basic mathematical functions (cos, sin, exp, log). Generator of random numbers (function rand). Rounded values (rint, round, floor, ceil). Symbolic constants. The C preprocessor: macro substitution, conditional inclusion. Bit operators.
6th week: Pointers and addresses (&). Operator of dereferencing (*). Dynamic memory allocation. Functions for memory allocation and deallocation (malloc, calloc, free). Pointers and function arguments. Formatted input (scanf). Structures and unions. Structure FILE. Formatted writing to/ reading from file (functions fprintf, fcanf).
7th week: Summary.

8th week: Basics of C++. OOP (Object oriented programming) paradigm. Data abstraction. Class, object. Data encapsulation. Member functions. Public and private parts of class. Difference between class and structures.
9th week: Constructor and destructor. Dynamic allocation and deallocation of memory by operators new and delete. Operator overloading. Polymorfism and inheritance.
10th week: Memory Layout of a Process in Linux. Monitoring of runing processes (commands ps, top). Filesystem /proc. Process priorities and scheduling. Signals. Running, stopping and ending processes in background. Ignoring hangup signal by command nohup. Commands bg, fg, jobs. Delayed start of processes - commands at, atq and atrm.
11th week: The Linux programming Interface. System calls. Process identifier (PID), function getpid. Signals -fundamental concepts. Interprocess communication via signals. Signal mask. Commands "kill" and "raise". Changing signal dispositions. Designing signal handlers, commands signal and sigaction. System data types.
12th week: Time Functions: time a gettimeofday. Time-conversion functions. Structures timeval, timespec and tm. Real vs. CPU time. Sleepers, functions sleep, usleep. Interval timers. Nanosecond timers and sleepers.
13th week: Multithreading (API Pthread). Thread ID. Thread creation and termination. Threads synchronization - mutexes. Communication between threads. Thread signal mask. Thread timers via signals.

Recommended literature:

William E. Shotts, Jr., The Linux Command Line: A Complete Introduction, No Starch Press, 2012
Kernighan, B. W., Ritchie, D. M., C programming language, 2nd edition, Prentice Hall PTR, 1988
Stroustrup, B., The C++ Programming Language, Pearson Education, 2013
Kerrisk, M, The Linux Programming Interface: A Linux and UNIX System Programm ing Handbook, No Starch Press, 2010

Course language:

Notes:

Course assessment
Total number of assessed students: 179

A	B	C	D	E	FX
54.19	18.44	20.11	3.91	3.35	0.0

Provides: RNDr. Branislav Brutovský, CSc.

Date of last modification: 20.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ ZAA/13	**Course name:** Foundations of Astronomy

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 5.

Course level: I.

Prerequisities:

Conditions for course completion:
To successfully complete the course, the student must demonstrate sufficient understanding of basic astronomical concepts, quantities and how to determine them. Knowledge of the coordinate systems used in astronomy and their mutual transformation relations, changes in the coordinates of objects, the basics of time measurement and the theory of motion of a mass body in the central field is required. During the semester, the student must continuously master the content of the curriculum so that he can use the acquired knowledge in solving computational tasks during the exercises and pass written tests taken into account in the overall evaluation of the subject. The condition for obtaining credits is passing 2 written tests during exercises and an oral exam, which consists of three theoretical questions in the scope of the lectured subject matter. The credit evaluation of the course considers the following student workload: direct teaching (2 credits), self-study (1 credit) and assessment (2 credits). The minimum threshold for completing the course is to obtain at least 50% of the total score, using the following rating scale: A (90-100%), B (80-89%), C (70-79%), D (60- 69%), E (50-59%), Fx (0-49%).

Learning outcomes:
After completing lectures and exercises, the student will master the basic astronomical concepts, quantities, and methods of their determination. It will also have sufficient physical knowledge and mathematical apparatus to enable independent solution of a wide range of basic astronomical problems.

Brief outline of the course:
1. Introduction to astronomy: basic astronomical concepts, an overview of the history of astronomy.
2. Coordinate systems in astronomy: spherical coordinate systems, nautical triangle, angular distance of celestial objects.
3. Horizontal coordinate system, equatorial coordinate systems and their mutual transformations.
4. Ecliptic and galactic coordinate systems and their mutual transformations.
5. Modifications of sky positions: astronomical refraction and aberration.
6. Precession and nutation.
7. Diurnal and annual parallaxes of celestial objects, methods to determine distances in the universe.
8. Proper motion of stars, reduction of positions, catalogues and yearbooks.
9. Time and calendar: sidereal time, apparent and mean solar time, time equation.

10. Basic time units, types of time, transformations.
11. Motion in a central field: Two-body problem, equations of motion, Kepler's laws, parametric equation of conic sections, orbital velocity.
12. orbital position, anomalies, Kepler's equation, orbital elements.

Recommended literature:

1. Böhm-Vitense, E., Introduction to stellar astrophysics, Basic stellar observations and data, Cambridge University Press, Cambridge, 1997;
2. Carrol, B.W., Ostlie, D.A., An introduction to modern astrophysics, Addison-Westley Publ. Comp., New York, 1996;
3. Pasachoff, J.M., Filippenko, A., The Cosmos: Astronomy in the New Millennium, Cambridge University Press, 2013;
4. Vanýsek, V., Základy astronomie a astrofyziky, Academia, Praha, 1980;
5. Minnaert, M.G., Praktická astronómia, Obzor, Bratislava, 1979;

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 17

A	B	C	D	E	FX
64.71	23.53	11.76	0.0	0.0	0.0

Provides: doc. RNDr. Rudolf Gális, PhD.

Date of last modification: 14.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚMV/FRPa/19	**Course name:** Function of real variable
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 4 **Per study period:** 28 / 56 **Course method:** present	
Number of ECTS credits: 7	
Recommended semester/trimester of the course: 1.	
Course level: I.	
Prerequisities:	
Conditions for course completion: Continuous assessment of student's work during the semester (submission of compulsory homework, writing three tests). Final test and oral discussion on the topics of the subject.	
Learning outcomes: The course provides an introductory knowledge on basic tools of differential and integral calculus of real functions of one real variable, and a development of certain calculation skills in the field.	
Brief outline of the course: 1. Basics of mathematical logic and notations (1 week) 2. Real functions - basic notions, operation, graphs and their transformations (2 weeks) 3. Continuity of a real-valued function (1 week) 4. Derivative of a function using the geometric concepts, rules of differentiation (2 weeks) 5. Basic of differential calculus - relations with monotonicity and convexity, extremas, using in optimisation, geometric and physics tasks (2 weeks) 6. Primitive function, methods of their finding (3 weeks) 7. Newton definite integral - methods of its computation, using in geometric and physics tasks (2 weeks)	
Recommended literature: 1. Kulcsár, Š. - Kulcsárová, O.: Zbierka úloh z matematickej analýzy I., UPJŠ, 2002. 2. Kulcsár, Š. - Kulcsárová, O.: Zbierka úloh z matematickej analýzy II., UPJŠ, 2003. 3. Hutník, O. - Kulcsár, Š. - Kulcsárová, O. - Mojsej, I.: Zbierka úloh z matematickej analýzy III., UPJŠ, 2011. 4. Demidovič, B. P.: Sbírka úloh a cvičení z matematické analýzy, Fragment, Praha, 2003. 5. Brannan, D.: A First Course in Mathematical Analysis, Cambridge University Press, Cambridge 2006. 6. Bruckner, A. M., Bruckner J. B., Thomson, B. S.: Real Analysis, Second Edition, ClassicalRealAnalysis.com, 2008. 7. Zorich, V. A.: Mathematical Analysis I, Springer-Verlag 2002.	
Course language: Slovak	

Notes:

Course assessment
Total number of assessed students: 946

A	B	C	D	E	FX
8.25	8.14	17.12	20.3	29.7	16.49

Provides: prof. RNDr. Ondrej Hutník, PhD., RNDr. Lenka Halčinová, PhD., RNDr. Jana Borzová, PhD., RNDr. Miriam Kleinová, PhD., RNDr. Kristína Hurajová

Date of last modification: 16.04.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/FRPb/19	**Course name:** Function of real variables

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 4 / 3 **Per study period:** 56 / 42
Course method: present

Number of ECTS credits: 8

Recommended semester/trimester of the course: 2.

Course level: I.

Prerequisities: ÚMV/FRPa/19

Conditions for course completion:
Ongoing evaluation takes the form of small tests, projects and one main test during the semester. Overall evaluation is given by ongoing evaluation (60%), written and oral part of the exam (40%).

Learning outcomes:
The course provides students the basics of mathematical analysis necessary to study physics and computer science and related fields. The students also learn mathematical culture, notation and mathematical way of thinking and expression.

Brief outline of the course:
1. Numerical sequences.
2. Metric space, normed space - Euclid space, some topological properties of points and sets.
3. Function of several real variables - basic notions, limit and continuity.
4. Infinite series of numbers.
5. The integral calculus of function of one real variable:
a) Definite Riemann integral - definition, basic properties, calculation methods, classes of integrable functions, applications;
b) improper integral.
6. Differential calculus of functions of one variable. Functional, power and Taylor series of functions of one variable.
7. Ordinary differential equations - basic notions, equations of the first order (equations leading to separable and linear), linear equations of 2nd order with constant coefficients.
8. Differential calculus of functions of several real variables - partial derivative, differentiability and total differential (also of higher order), Taylor polynomial, directional derivative, local and global extrema, constrained local extrema.
9. Double (two-dimensional) integral - definition, calculation, applications.

Recommended literature:
1. B. Mihalíková, J. Ohriska: Matematická analýza 1, 2, vysokoškolský učebný text, UPJŠ v Košiciach, Košice, 2000, 2007.
2. L. Kluvánek, I. Mišík, M. Švec: Matematika I, II, SVTL, Bratislava, 1959.
3. Z. Došlá, O. Došlý: Diferenciální počet funkcí více proměnných, vysokoškolský učebný text, Masarykova univerzita v Brne, Brno, 2003.

4. J. Kopáček: Matematická analýza nejen pro fyziky I, II, Matfyzpress, Praha, 2004, 2007.
5. J. C. Robinson: An introduction to ordinary differential equations, Cambridge University Press, Cambridge, 2004.
6. R. E. Williamson, H. F. Trotter: Multivariable mathematics, Prentice Hall (Pearson), Upper Saddle River, 2004.
7. B. S. Thomson, J. B. Bruckner, A. M. Bruckner: Elementary real analysis, Prentice Hall (Pearson), Lexington, 2008.

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 582

A	B	C	D	E	FX
11.0	12.71	16.67	21.31	32.82	5.5

Provides: doc. Mgr. Jozef Kiseľák, PhD., RNDr. Jaroslav Šupina, PhD.

Date of last modification: 15.04.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ VBF1/08	**Course name:** General Biophysics I

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 1.

Course level: I.

Prerequisities:

Conditions for course completion:
Exam.
During an exam, a student should be able to demonstrate his/her knowledge from the parts of Biophysics which are described in the brief outline of the course.

Learning outcomes:
To provide information about the object, significance and role of biophysics in science. The main emphasis will be given on the understanding of the principles determining the structure and function of the most important biological structures (nucleis acids, proteins, biomembranes) as well as on the thermodynamics and kinetics of selected chemical and biophysical processes.

Brief outline of the course:
Week 1
Areas of interest of biophysics and its importance and position in science. Structure of biophysics. Characterization of molecular, cellular, medical, environmental and radiation biophysics. Scientific disciplines related to biophysics. The future of biophysics.
Week 2
Intra-molecular and intermolecular interactions. Covalent bonds. Coulomb (ionic) interactions. Van der Waals forces. Lennard - Jones potential. Hydrogen bonds. The role of hydrogen bonds in biological macromolecules. Hydrophobic interactions. Hydrating forces. Empirical analytical form for the potential energy of intramolecular interactions. Stabilizing non-covalent interactions in biopolymers (proteins, nucleic acids, biological membranes).
Week 3
Thermodynamics in biological systems. Definition of thermodynamics. Thermodynamic system. 1st law of thermodynamics (law of conservation of energy). Internal energy and enthalpy. Heat capacity. Examples of the use of the study of enthalpy change in biological processes. 2nd law of thermodynamics (law of process spontaneity). Entropy. 3rd law of thermodynamics. Gibbs energy. Dependence of Gibbs energy on temperature - Gibbs - Helmoltz equation. Dependence of Gibbs energy on pressure. Chemical potential. Chemical potential in liquids. Equilibrium constant of chemical reaction. Influence of temperature on the equilibrium constant - van‘t Hoff's equation. Calorimetric and van’t Hoff enthalpy of protein and nucleic acid denaturation.
Week 4

Molecular associations. Examples of molecular associations in biological systems. Dissociation and association equilibrium constants. Determination of equilibrium constants of ligand - macromolecule interactions. Langmuir isotherm. Graphical analysis of equilibrium binding data. Multiple independent binding sites. Ligand-macromolecule binding cooperativity. Cooperativity - simultaneous ligand binding, Hill's equation. Cooperativity - gradual binding of ligands. Allosteric interactions.

Week 5

Kinetics of biological and physico-chemical processes. Importance of the study of the kinetics of chemical processes. Rates of chemical reactions. Rate constants and rate law of chemical reactions. Order of chemical reaction. First order chemical reactions. Second order chemical reactions. Consecutive reactions - the rate determining step of the reactions. Reverse chemical reactions. Relaxation processes. Temperature dependence of rate constants - Arrhenius equation. Experimental techniques for determining the rate of chemical reactions.

Week 6

Physical kinetics. Macroscopic diffusion. 1st Fick's law. 2nd Fick's law - diffusion equation. Solutions of the diffusion equation for specific cases. Influence of external forces on diffusion processes. Einstein - Smoluchowski equation. Stokes' law. Kinetics of photophysical and photochemical processes. Jablonski diagram. Quantum yields of photophysical processes. Quenching of the excited state of molecules by external factors. Fluorescence quenching. Stern - Volmer equation. Förster resonant energy transfer.

Week 7

Proteins. Functions and significance of proteins. Chemical structure and properties of amino acids. Peptide bond. Polypeptide chain. Protein structures. Relationship between individual structures. Ramachandra map. Protein solubility. Stability of protein structure. Protein denaturation. Thermal denaturation. Calorimetric and van‘t Hoff enthalpy of denaturation. Chemical denaturation. Molten - globular state of proteins. Protein folding. Levinthal paradox. Physiological consequences of incorrectly folded and aggregated proteins.

Week 8

Nucleic acids. Nucleic acid building blocks (nitrogenous bases, ribose, deoxyribose, phosphoric acid). Chemical structures of nucleotides. Primary and secondary structure of nucleic acids. Polynucleotide strand. Complementarity of bases in DNA. DNA conformations. Circular DNA. RNA structures. Functions of individual RNAs. Forces determining the structure and conformation of nucleic acids. DNA denaturation and renaturation.

Week 9

Biological membranes. Chemical composition of biological membranes. Lipids, cholesterol. Lipid representation in membranes. Membrane proteins. Micelles and liposomes. Structure of biological membranes. Liquid mosaic model. Phase transition in the membrane. Interactions between the lipid and protein part of the biological membrane. Transport of molecules across membranes. Membrane channels. Membrane transporters. Energetics of membrane transport. Nernst potential. Donnan's equilibrium.

Week 10

Biophysical bases of imaging examination methods. Basic principles of bio-imaging. Ultrasound diagnostic methods. Optical imaging methods. Luminescence microscopy. X-ray diagnostic technique. Computed tomography (CT). Principles of magnetic resonance. Magnetic resonance imaging.

Week 11

Biophysical bases of some treatment methods. Photodynamic therapy. Molecular mechanisms of photodynamic action. Biological response to photodynamic action. Photosensitizers. Singlet oxygen. Light sources in photodynamic therapy. Drug transport systems.

Week 12
Radiation and environmental biophysics. Radiobiology. Radiation protection. Effects of physicochemical stimuli on biological organisms (pressure, temperature, humidity). Influence of electromagnetic field on biological systems. Interaction of ionizing and non - ionizing radiation with biological systems.

Recommended literature:

1. R. Glaser. Biophysics (2nd Edition), Springer-Verlach Berlin, 2012.
2. M.B. Jackson. Molecular and Cellular Biophysics, Cambridge University Press, 2006.
3. M. Daune. Molecular biophysics (Structures in motion), Oxford University Press, 2004.
4. J. P. Allen. Biophysical Chemistry, Wiley-Blackwell, 2008.
5. J.A. Tuszynski. Molecelar and Cellular Biophysics, Chapman & Hall/CRC, 2008.
6. D.J. Dowsett, P.A. Kenny and R.E. Johnston. The Physics of Diagnostic Imaging, Hodder Arnold, 2006.
7. P. Nelson. Biological Physics.W.H. Freeman and Company, 2008.
8. G. S. Campbell and J. M. Norman. Introduction to Environmental Biophysics (2nd Edition). Springer Science, 1998.
9. R. Splinter (Ed.). Handbook of Physics in Medicine and Biology. CRC Press, Taylor & Francis Group, 2010.
10. R.K. Hoobbie and B.J. Roth. Intermediate Physics for Medicine and Biology (4th Edition), Springer Science, 2007.

Course language:
English language

Notes:

Course assessment
Total number of assessed students: 134

A	B	C	D	E	FX
20.15	28.36	25.37	15.67	10.45	0.0

Provides: prof. Mgr. Daniel Jancura, PhD.

Date of last modification: 17.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/VEK2/10	**Course name:** General Ecology

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 3., 5.

Course level: I.

Prerequisities:

Conditions for course completion:
active (100%) participation in lectures
preparation of the presentation to the given topic

Learning outcomes:
Fundamental parameters and relations in ecological science. Abiotic, biotic and anthropogenic factors in air, aquatic and terrestrial/soil environment. Autecology, Demecology and Synecology. Ecosystem and Nature Protection.

Brief outline of the course:
1. Basic ecological terms. 2. Characterisation of the basic ecological factors (light, temperature, water). 3. Air environment (composition of atmosphere, physical and chemical factors, air pollutants).4. Organisms and their adaptations in air environment. 5. Aquatic environment (water properties physical and chemical factors, gases in water, water pollutants, eutrophication and saprobity).6.Aquatic organisms and their adaptations. 7. Soil environment (physical and chemical properties, soil profile, humus layer, soil pollutants). 8.Soil organisms and their adaptations. 9. Characterization of Populations, structure and ppuatin dynamics. 10.Biocenoses and biotops. 11. Ecosystems. 12. Biomes and their characteristics, 13. Biospheric cycles.

Recommended literature:
Begon, M., Harper, J. L., Townsend, C. L.: Ecology: individuals, populations, and communities. Blackwell Sci. Publ., 1990

Course language:

Notes:

Course assessment
Total number of assessed students: 113

A	B	C	D	E	FX
10.62	23.89	34.51	22.12	8.85	0.0

Provides: RNDr. Natália Raschmanová, PhD., univerzitná docentka

Date of last modification: 16.03.2023

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ VF1a/12	**Course name:** General Physics I

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

Number of ECTS credits: 7

Recommended semester/trimester of the course: 1.

Course level: I.

Prerequisities:

Conditions for course completion:
Terms and conditions of assessment during the semester
-participation in classes in accordance with study regulations and teacher´s instructions
-active participation at seminars and exercises
-submitting all the assignments in accordance with teacher´s instruction
-tests during the semester
-project group work and its successful presentation and defence
Final assessment:
-final oral examination
Conditions for successful completion of the course:
-participation in lessons in accordance with the study regulations and teacher's instructions
-achieving the level higher than 50 % in assessment during the semester and in final assessment

Learning outcomes:
By the end of the course student masters basic knowledge connected with mechanics, molecular physics and thermodynamics. Student will be able to solve various problems connected with the course content and apply gained knowledge in different situations.

Brief outline of the course:
1. Basic knowledge of the calculus, vector algebra. Standards and units.
2. Mechanics of particle.
3. Gravitational field.
4. Work, power and energy.
5. Mechanics of system of particles.
6. Mechanics of rigid body.
7. Mechanics of elastic body.
8. Mechanics of fluids.
9. Basics of molecular physics. Structure and properties of gases.
10. Basics of thermodynamics.
11. Heat transfer. Thermal expansion.
12. Structure and properties of liquids
13. Changes of state.

Recommended literature:
CUMMINGS, Karen, LAWS, Priscilla, REDISH, Edward, COONEY, Patrick: Understanding Physics, John Wiley & Sons, 2004

Course language:
English

Notes:

Course assessment
Total number of assessed students: 373

A	B	C	D	E	FX
23.32	14.48	21.72	14.75	16.62	9.12

Provides: doc. RNDr. Zuzana Ješková, PhD., RNDr. Katarína Kozelková, PhD.

Date of last modification: 15.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/VF1b/24	**Course name:** General Physics II

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

Number of ECTS credits: 7

Recommended semester/trimester of the course: 3.

Course level: I.

Prerequisities:

Conditions for course completion:
To successfully complete the course (presence, if necessary distance), the student must demonstrate sufficient understanding of the basic concepts and laws of electromagnetism, so that it is possible to continue the study of general physics III, IV and the discipline of electromagnetic field theory. Knowledge of individual laws of electricity and magnetism and their generalization in the form of Maxwell's equations is required. Knowledge of these laws in nature and in practical use is required. Another requirement is adequate skills in solving the problems of electricity and magnetism.
Credit evaluation takes into account the scope of teaching (4 hours of lectures, 2 hours of numerical exercises, 4 credits), self-study (1 credit), evaluation (2 credits) and the fact that it is a basic subject that is part of the bachelor's state exam.The minimum limit for successful completion of the course is to obtain 50 points from the subsequent point evaluation, while it is necessary to obtain at least 50% of points from each part:
Numerical exercises maximum number of 20 points (usually 2 written tests of 10 points each, the student must obtain at least 5 points from each test)
Oral exam with a maximum of 80 points (answer to three questions, each of which must reach a level of at least 50%).
Rating scale
A 100-91
B 90-81
C 80-71
D 70-61
E 60-50
Fx 49-0

Learning outcomes:
After completing lectures and exercises, the student will have sufficient knowledge of the basics of electricity and magnetism and will be able to solve numerical problems of electromagnetism. He will also gain adequate knowledge about electromagnetic phenomena in nature and the use of electromagnetic phenomena in technical applications.

Brief outline of the course:

1. Week: Electrostatic field in vacuum. Culomb's law. Electric field. Electric dipole. Flux of electric field. Gauss' law.
2. Week: Work of forces in the electrostatic field. Potential. Relationship between electric fiel and electric potential. Potential and its measurement. Capacity of conductor and conductor system. Energy of electrostatic field.
3. Week: Stationary electric field and steady electric current. Ohm's law. Superconductivity. Equation of continuity of electric current. Electrical circuits with steady voltage. Kirchhoff's laws and their application. Work, power, energy and efficiency of the source of electromotive voltage.
4. Week: Electric current in electrolytes, semiconductors, gases and in vacuum. Thermoelectric phenomena and their use.
5. Week: Origin, properties and basic quantities of a stationary magnetic field in vacuum. Biot-Savart law and its application. Magnetic flux density.
6. Week: Interactions of a magnetic field with moving electrically charged particles and with electric currents. Ampere's law. Interaction between current conductors. Definition of ampere as current unit. Lorentz force.
7. Week: Quasi-stationary electric field. Capacitor charging and discharging process (R-C circuit). The phenomenon of electromagnetic induction. Faraday's law. Phenomenon of self-induction and mutual induction, inductance, mutual inductance. Potential of magnetic field.
8. Week: Transient in the R-L circuit. Energy of magnetic field. Energy conservation law. Magnetic dipole. Alternating currents and basic circuits of alternating electric current. RLC circuit
9. Week: Serial and parallel resonance. Multiphase currents. Rotating magnetic field. Formation of multiphase currents. Electric motor. Power of alternating electric current.
10. Week: Electrical phenomena in the material environment. Dielectric polarization, mechanisms. Electric field in dielectric. Interaction of electric charges stored in a dielectric. Gauss' law. Polarization vector and electrical induction vector and their mutual relationship. Linear and nonlinear dielectrics.
11. Week: Magnetic properties of substances. Elementary magnetic field of an atom. Magnetic state of substances. Magnetic polarization. Diamagnetism and paramagnetism. Arranged magnetic structure. Ferromagnets.
12. Week: Unsteady electromagnetic field. Maxwell's equations.

Recommended literature:
T. Matsushita: Electricity and Magnetism, Springer, 2017

Course language:
english

Notes:
Presence form represents a standart form for the course, if a need arises, the course is performed using MS Teams.

Course assessment
Total number of assessed students: 391

A	B	C	D	E	FX
34.78	14.58	16.37	12.28	9.72	12.28

Provides: prof. RNDr. Peter Kollár, DrSc., doc. RNDr. Adriana Zeleňáková, DrSc., doc. RNDr. Erik Čižmár, PhD.

Date of last modification: 21.02.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ VF1c/24	**Course name:** General Physics III

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

Number of ECTS credits: 7

Recommended semester/trimester of the course: 2.

Course level: I.

Prerequisities: ÚFV/VF1a/12

Conditions for course completion:
Written test (2x) from seminars during the semester.
Oral examination.

Learning outcomes:
The objective is to acquaint the students with the basis of oscilations, waves and optics.

Brief outline of the course:
Undamped oscilations, Mathematical, Physical and Torsional pendulum, Damped oscilations, Fourier transformation, Forced oscilations. Waves, their generation, waves equation.Interference. Huyghens principle. Reflection, difraction. Doppler effect. Waves speed in materials. Acoustics. Geometrical optics. Mirrors, lens. Fotometry.
Light as electromagnetic wave. Dispersion, absorption, interference, difraction, polarization. Photon's theory of light. Law of emision and absorption, Planck's law of radiation. Lasers.

Recommended literature:
1. A. Hlavička et al., Fyzika pro pedagogické fakulty, SPN, 1971
2. R.P. Feynman et al., Feynmanove prednášky z Fyziky I,II,III, ALFA, 1985
3. D. Halliday et al.,Fyzika-Vysokoškolská učebnice obecné fyziky, VUTIUM, 2010
4. J. Fuka, B. Havelka, Optika a atómová fyzika, SPN,1961
5. A. Štrba, Všeobecná Fyzika 3 – Optika, ALFA, 1979

Course language:
slovak

Notes:

Course assessment
Total number of assessed students: 41

A	B	C	D	E	FX
29.27	24.39	26.83	14.63	4.88	0.0

Provides: doc. RNDr. Ján Füzer, PhD., RNDr. Samuel Dobák, PhD.

Date of last modification: 21.02.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ VF1d/12	**Course name:** General Physics IV

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

Number of ECTS credits: 7

Recommended semester/trimester of the course: 4.

Course level: I.

Prerequisities: ÚFV/VF1c/10 or ÚFV/VF1c/12 or ÚFV/VF1c/22

Conditions for course completion:
- active participation in lectures and excersises
- submission of solved tasks
- 2x test
- an exam

Credit evaluation of the subject: direct teaching and consultations (2credits), self-study (1credit), practical activities- solved tasks (2redits), evaluation (2credits), a total of 7credits. Minimum limit for completion of the course is to obtain at least 51% of the total evaluation.

Learning outcomes:
Basic knowledge about the atomic structure and spectra and nuclei, and elementary particles. Basic experimental methods in nuclear physics and passage of nuclear radiation through media.

Brief outline of the course:
1.-6. week Atomic Physics - A.Kravčáková (P):
Corpuscular-wave dualism: De Broglie waves. Experimental confirmation of de Broglie's hypothesis. Uncertainty principle.
Atom structure: Atomic hypothesis. Rutherford's experiment. Bohr model of the atom.
Hydrogen radiation spectra. Combination principle. Quantum mechanical description of a hydrogen atom.
Electron shell: Spectra of hydrogen type atoms. Experimental verification of the existence of discrete levels of atoms (Franck-Hertz experiment). Angulat momentum of electron motion. Stern-Gerlach experiment. Quantum states of electrons. Atoms with more electrons. Alkali metal spectra. Total angular momentum of an atom. Magnetic momentum of an atom. An atom in an external magnetic and electric field. Zeeman's phenomenon. Selection rules. Pauli's principle. Periodic table of elements. X-ray spectra.
Molecules: Ion and covalent coupling, spectra of molecules.
7.-12. week Nuclear Physics - J.Vrláková (P):
Basic characteristics of atomic nuclei: Mass and electric charge. Radius of the atomic nucleus. Binding energy. Spin and magnetic momentum of the nucleus. Quadrupole momentum. Parity.
Nuclear forces and models of atomic nuclei: Properties of nuclear forces. Meson theory of nuclear forces. Models of atomic nuclei (droplet, layer and generalized model).

Radioactive radiation: Basic laws of radioactive decay. Law of decay. Alpha decay. Beta decay. Processes taking place in the nucleus during beta conversion. Neutrino existence hypothesis. Fermi's theory. Internal conversion. Gamma radiation.
Nuclear reactions: Basic terms and definitions. Classification of nuclear reactions. Conservation laws. Effective cross section. Mechanisms of nuclear reactions. Basic types of reactions. Breit-Wigner formula. Reactions with neutrons. Fission of atomic nuclei. Mechanism of fission. Nuclear reactor. Thermonuclear reactions.
Week 13 Subnuclear physics - A.Kravčáková (P):
Elementary particles: The concept of an elementary particle. Basic characteristics of particles. Conservation laws. Types of interactions. Antiparticles. Classification of elementary particles. Strange particles. Resonances. Quark model of hadrons.
Cosmic radiation: Primary and secondary components. Elementary particles and cosmology.
Week 14 Experimental methods - A.Kravčáková (P):
Passage of radiation through matter: The passage of heavy charged particles, electrons and gamma radiation through the matter.
Detectors: Basic characteristics of detectors. Volt-ampere characteristic. Gas detectors. Ionization chambers and Geiger-Müller computer. Scintillation, Cherenkov and semiconductor detectors. Track detectors.
Particle accelerators: Linear accelerator. Cyclic accelerators. Colliders.

Recommended literature:

1. Beiser A., Úvod do moderní fyziky, Praha, 1975.
2. Úlehla I., Suk M., Trka Z.: Atómy, jádra, částice, Praha, 1990.
3. Síleš E., Martinská G.: Všeobecná fyzika IV, skriptá PF UPJŠ, 2. vydanie, Košice, 1992.
4. Vrláková J., Kravčáková A., Vokál S.: Zbierka príkladov z atómovej a jadrovej fyziky, skriptá PF UPJŠ, Košice, 2016.
5. Hajko V. and team of authors, Physics in experiments, Bratislava, 1997.
6. Nosek D., Jádra a částice (Řešené příklady), Matfyzpress, MFF UK, Praha 2005,
7. Kravčáková A., Vokál S., Vrláková J., Všeobecná fyzika IV, 1.časť Atómová fyzika, skriptá PF UPJŠ, Košice, 2020.
8. Yang F., Hamilton J.H., Modern Atomic and Nuclear Physics, WSC Singapore, 2010.

Course language:
slovak and english

Notes:

Course assessment
Total number of assessed students: 115

A	B	C	D	E	FX
40.87	27.83	13.04	8.7	9.57	0.0

Provides: doc. RNDr. Adela Kravčáková, PhD., doc. RNDr. Janka Vrláková, PhD., RNDr. Zuzana Paulínyová, PhD.

Date of last modification: 16.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ DEJ1/99	**Course name:** History of Physics
Course type, scope and the method: **Course type:** Lecture **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 4., 6.	
Course level: I., II.	
Prerequisities:	
Conditions for course completion: Term project and its defense (60b), exam (40b). Credit evaluation of the subject: direct teaching and consultations (1credit), self-study, practical activities - project and evaluation (1credit). The minimum for completing the course is to obtain at least 51% of the total evaluation.	
Learning outcomes: Basic facts in the history of physics.	
Brief outline of the course: 1.-2. Evolution of knowledge before Galileo. 3.-4. Evolution of physics within the mechanical picture of the world. 5.-6. Evolution and limits of classical physics, phase of breakthrough in physics. 7.-8. Origin and evolution of the theory of relativity. Quantum physics and prospects of further evolution of physics and their application. 9.-10. Atomic and nuclear physics. 11.-12. Subnuclear physics. Contemporary state of physical research and its application in technology, natural sciences and philosophy. Position of physics in our society.	
Recommended literature: 1. R.Zajac, J.Chrapan: Dejiny fyziky, skriptá, MFF UK, Bratislava, 1982. 2. V.Malíšek: Co víte o dějinách fyziky, Horizont, Praha, 1986. 3. I.Kraus, Fyzika v kulturních dějinách Evropy, Starověk a středověk, Nakladatelství ČVUT, Praha, 2006. 4. A.I.Abramov: Istoria jadernoj fiziky, KomKniga, Moskva, 2006. 5. L.I.Ponomarev: Pod znakom kvanta, Fizmatlit, Moskva, 2006. 6. I.Kraus, Fyzika v kulturních dějinách Evropy, Od Leonarda ke Goethovi, Nakladatelství ČVUT, Praha, 2007. 7. I.Kraus, Fyzika od Thaléta k Newtonovi, Academia, Praha, 2007. 8. I.Štoll, Dějiny fyziky, Prometheus, Praha, 2009. 9. www-pages. 10.Brandt S., The harvest of a century, Discoveries of modern physics in 100 episodes, Oxford, 2009.	

Course language:
slovak and english

Notes:
The course is realized in the form of attendance, if necessary by distance learning in the environment of MS Teams or bbb.science.upjs.sk.

Course assessment
Total number of assessed students: 40

A	B	C	D	E	FX
85.0	7.5	7.5	0.0	0.0	0.0

Provides: doc. RNDr. Janka Vrláková, PhD.

Date of last modification: 19.11.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ UAS/13	**Course name:** Introduction to Astronomy

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 4.

Course level: I.

Prerequisities:

Conditions for course completion:
To successfully complete the course, the student must demonstrate a sufficient understanding of the basic concept from the field of astronomy and astrophysics. In addition to direct participation in teaching, independent student work is also required within the self-study of topics assigned by the teacher. In order to obtain an assessment and thus also credits, the student must meet the requirements of a continuous written test (with a weight of 30% of the total assessment) and pass an oral exam (with a weight of 70% of the total assessment).
Rating scale: A (90-100%), B (80-89%), C (70-79%), D (60-69%), E (50-59%), F (0-49%) .

Learning outcomes:
After completing the lectures and on the basis of the final evaluation, the student will demonstrate adequate mastery of the content standard of the course, which is defined by a brief syllabus of the course and recommended literature. Theoretical mastery of the content of the subject allows him to understand the subject of the study of astronomy and astrophysics, to orient himself in the study of the solar system, the origin and evolution of stars and galaxies. Based on the acquired knowledge, he / she is able to follow up on specialized courses in the further study of astrophysics

Brief outline of the course:
The time schedule of the course content is updated in the electronic bulletin board of the course.
1. Astronomy as a science
2. Our place in the Universe
3. Basic astronomical terminology
4. Coordinate systems
5. Time and calendar
6. Astronomical telescopes and instruments
7. Sun as a star
8. Planets in the Solar system
9. Asteroids, comets and meteors
10. Creation and evolution of the stars
11. Extrasolar planets
12. Evolution of the Galaxy and the Universe

Recommended literature:

Čeman, R., Pittich, E., 2002, Vesmír 1 - Slnečná sústava, MAPA Slovakia
Čeman, R., Pittich, E., 2003, Vesmír 2 - Hviezdy - Galaxie, MAPA Slovakia
Grygar, J., Horský, Z., Mayer, P., 1979, Vesmír, Mladá fronta
Kleczek, J., 2002, Velká encyklopedie vesmíru, Academia
Pittich, E., Kalmančok, D., 1981, Obloha na dlani, Obzor
Rothery, A. D., 2018, An Introduction to the Solar System, Cambridge University Press
Vanýsek, V.: 1980, Základy astronomie a astrofyziky, Academia Praha

Course language:

Notes:

Course assessment
Total number of assessed students: 67

A	B	C	D	E	FX
95.52	1.49	1.49	0.0	1.49	0.0

Provides: doc. Mgr. Štefan Parimucha, PhD.

Date of last modification: 21.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ZAAF/12	**Course name:** Introduction to Astrophysics
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 3 / 1 **Per study period:** 42 / 14 **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course: 6.	
Course level: I.	
Prerequisities:	
Conditions for course completion: To successfully complete the course, the student must demonstrate sufficient understanding of basic astronomical concepts, quantities and how to determine them. Knowledge of basic photometric quantities, magnitude, Pogson's relationship, spectral types and luminosity classes of stars, methods for determining the temperature, mass, radii, rotation and magnetic field of stars, basics of radiation of thermal and non-thermal origin and interstellar absorption is required. During the semester, the student must continuously master the content of the curriculum so that he can use the acquired knowledge in solving computational tasks during the exercises and pass written tests taken into account in the overall evaluation of the subject. The condition for obtaining credits is passing 2 written tests during exercises and an oral exam, which consists of three theoretical questions in the scope of the lectured subject matter. The credit evaluation of the course considers the following student workload: direct teaching (2 credits), self-study (1 credit) and assessment (2 credits). The minimum threshold for completing the course is to obtain at least 50% of the total score, using the following rating scale: A (90-100%), B (80-89%), C (70-79%), D (60- 69%), E (50-59%), Fx (0-49%).	
Learning outcomes: After completing lectures and exercises, the student will master the basic astrophysical concepts, quantities, and methods of their determination. It will also have sufficient physical knowledge and mathematical apparatus to enable independent solution of a wide range of basic astrophysical problems.	
Brief outline of the course: 1. Brightness of stars: radiative flux, intensity, radiation density and pressure. 2. Magnitude, Pogson formula, apparent and absolute magnitude, bolometric magnitude. 3. Colour of stars, colour indices, colour excess. Photometric systems. 4. Absorption of radiation in the Earth's atmosphere. Spectral window. 5. The spectra of stars: Temperature of stars, black body radiation, effective, radiative and colour temperatures. Spectra of atoms and molecules. 6. Spectral classifications. Luminosity classes. HR diagram, colour diagrams. 7. Boltzmann and Saha equations. Origin of non-thermal radiation.	

8. Basic properties of stars: Stellar distances and masses and methods of their determination, the mass-luminosity relation.
9. Stellar radii and the determination of the angular size of stars.
10. Stellar rotation. Magnetic field of stars. Zeeman and Stark effects.
11. Interstellar matter: Interstellar gas. The HI, H II regions, emission and planetary nebulae. Formation of interstellar molecules.
12. Interstellar dust, reflective nebulae. Formation of dust grains. Interstellar absorption and polarization.

Recommended literature:

1. Böhm-Vitense, E., Introduction to stellar astrophysics, Basic stellar observations and data, Cambridge University Press, Cambridge, 1997;
2. Carrol, B.W., Ostlie, D.A., An introduction to modern astrophysics, Addison-Westley Publ. Comp., New York, 1996;
3. Pasachoff, J.M., Filippenko, A., The Cosmos: Astronomy in the New Millennium, Cambridge University Press, 2013;
4. Vanýsek, V., Základy astronomie a astrofyziky, Academia, Praha, 1980;
5. Minnaert, M.G., Praktická astronómia, Obzor, Bratislava, 1979;

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 19

A	B	C	D	E	FX
63.16	26.32	5.26	5.26	0.0	0.0

Provides: doc. RNDr. Rudolf Gális, PhD.

Date of last modification: 14.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ UPF1/12	**Course name:** Introduction to Computational Physics

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 3.

Course level: I.

Prerequisities:

Conditions for course completion:
Elaboration of microreferat on given topics.
Exam and discussion of the implementation of the given project.

Learning outcomes:
The aim of the lecture is to provide students with the physical background of the computational processes in conventional computers, as well as to provide less conventional possibilities to implement computational processes using deeper knowledge of physical processes.

Brief outline of the course:
Physical processes utilised in contemporary computers. Computational processes / thermodynamics point of view. Physical limits of current computer technologies (Moore, Amdahl laws
. Computer modeling and physical reality. Computational complexity and paralelism. Distributed computing. Alternative methods of computation (analogue , optical processors, DNA computing, quantum computing).

Recommended literature:
Actual literature provided by lecturer.

Course language:

Notes:

Course assessment
Total number of assessed students: 51

A	B	C	D	E	FX
86.27	7.84	3.92	0.0	1.96	0.0

Provides: doc. RNDr. Jozef Uličný, CSc.

Date of last modification: 22.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ UVF/05	**Course name:** Introduction to General Physics
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: I.	
Prerequisities:	
Conditions for course completion: Terms and conditions of assessment during the semester -participation in classes in accordance with study regulations and teacher´s instructions -active participation at seminars and exercises -submitting all the assignments in accordance with teacher´s instruction -tests during the semester Final assessment: -based on assessment during the semester Conditions for successful completion of the course: -participation in lessons in accordance with the study regulations and teacher's instructions -achieving the level higher than 50 % in assessment during the semester and in final assessment	
Learning outcomes: By the end of the course student is able to solve problems connected with mechanics, molecular physics and thermodynamics. In solving problems student is able to apply digital tools for data collection, videomeasurement and computer modelling and data processing and their analysis.	
Brief outline of the course: The course is an auxiliary subject to the course General physics 1 - Mechanics, Molecular Physics and Thermodynamics aimed to development of conceptual understanding and problem solving connected with the following areas: 1. Kinematics and dynamics of motion along a line and two-dimensional motion of particle. Equation of motion. 2. Gravitational field. Projectile motion. 3. Work, power and energy. Law of energy conservation. 4. Rotational motion. Equation of rotational motion. 5. Law of momentum conservation and angular momentum conservation. 6. Deformation. Hook´s law. 7. Fluid mechanics. 8. Gases. Ideal gas laws. 9.Basics of thermodynamics. First law of thermodynamics. 10.Heat and heat exchange.	

11. Liquids. Surface tension.
12. Changes of state.

Recommended literature:
CUMMINGS, Karen, LAWS, Priscilla, REDISH, Edward, COONEY, Patrick: Understanding Physics, John Wiley & Sons, 2004

Course language:
English

Notes:

Course assessment
Total number of assessed students: 369

A	B	C	D	E	FX
36.86	20.87	24.39	13.28	4.34	0.27

Provides: doc. RNDr. Zuzana Ješková, PhD., RNDr. Katarína Kozelková, PhD.

Date of last modification: 15.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ UVF2/24	**Course name:** Introduction to General Physics II

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: I.

Prerequisities:

Conditions for course completion:
Terms and conditions of assessment during the semester
-participation in classes in accordance with study regulations and teacher´s instructions
-active participation at seminars and exercises
-submitting all the assignments in accordance with teacher´s instruction
-tests during the semester Final assessment:
-based on assessment during the semester
Conditions for successful completion of the course:
-participation in lessons in accordance with the study regulations and teacher's instructions
-achieving the level higher than 50 % in assessment during the semester and in final assessment

Learning outcomes:
By the end of the course student is able to solve problems and explain phemomena and experiments connected with selected areas of Electricity and Magnetism.

Brief outline of the course:
The course is an auxiliary subject to the course General physics 2 - Electricity and Magnetism aimed to development of conceptual understanding and problem solving connected with the following areas:
1. Electric field. Coulomb´s law.
2. Work, electric potential energy, electric potential.
3. Electric capacitance and capacitors.
4. Electric current. Ohm´s law, Kirchhoff´s laws.
5. Work and power. Energy and efficiency of sources of electromotive force
6. Magnetic field.
7. Interaction between magnetic field and electric charge.
8. Transient phenomena in RC circuit.
9. Electromagnetic induction.
10. Transient phenomena in RL circuit.
11. Alternating current circuits.
12. Resonance in series and paralel circuits.

Recommended literature:

Matsushita, Teruo. Electricity and Magnetism, Springer 2017
CUMMINGS, Karen, LAWS, Priscilla, REDISH, Edward, COONEY, Patrick: Understanding Physics, John Wiley & Sons, 2004

Course language:
English

Notes:

Course assessment
Total number of assessed students: 2

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

Provides: doc. RNDr. Zuzana Ješková, PhD.

Date of last modification: 21.02.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ZMF/17	**Course name:** Introduction to Mathematics for Physicists
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 1 / 2 **Per study period:** 14 / 28 **Course method:** present	
Number of ECTS credits: 3	
Recommended semester/trimester of the course: 1.	
Course level: I.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 319	

A	B	C	D	E	FX
38.24	20.69	19.12	10.34	8.78	2.82

Provides: RNDr. Tomáš Lučivjanský, PhD., univerzitný docent, doc. RNDr. Jozef Hanč, PhD.	
Date of last modification: 16.11.2021	
Approved: doc. RNDr. Jozef Strečka, PhD.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice
Faculty: Faculty of Science
Course ID: ÚFV/ UFMI/07 — **Course name:** Introduction to Microworld Physics
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 1 **Per study period:** 28 / 14 **Course method:** present
Number of ECTS credits: 4
Recommended semester/trimester of the course: 6.
Course level: I.
Prerequisities:
Conditions for course completion: 1. Active participation in lectures and excersises 2. Written semester task and its presentation, exam. Credit evaluation of the subject: direct teaching and consultations (1 credit), self-study (1 credit), practical activities - semester task (1 credit) and evaluation (1 credit). Total 4 credits. The minimum threshold for completing the course is to obtain at least 51% of the total evaluation, using the following rating scale: A (91-100%), B (81-90%), C (71-80%), D (61-70 %), E (51-60%), F (0-50%).
Learning outcomes: After completing the course, students will get a qualitative overview of the discoveries and advances in elementary particle physics (PEP) from its beginning to the present. They will become familiar with the latest theories of particle physics and their connections with cosmology. At the same time, they will acquire the ability to independently solve simple problems from the mentioned areas.
Brief outline of the course: 1. Atom and nucleus: Atoms as a composed particles, electron discovery, Thomsons model, natural radioactivity. 2. Discovery of the nucleus, Rutherfords model, Bohrs model of the atom, neutron discovery, the structure of the nucleus. 3. Interactions in nature: gravity, electromagnetic, weak and strong - strenght, range, intermediators. 4. Units in particle physics - length, mass a energy. 5. Latest knowledges about the structure of matter and forces: Nuclear particles - particle "ZOO". 6. Classification of particles, eightfold way, quark model 7. Standart model: strong interaction – quarks, gluons and colour charge. 8. Theory of elektroweak interactions. 9. New discoveries, Grand Unification. 10. Cosmology, particle physics and Big Bang. 11. Experimental methods in Particle Physics: basic principles of acceleration and detection of particles. 12. Experiments on LHC collider.
Recommended literature:

1. M.Veltman: Facts and Mysteries in Elementary Particle Physics, World Scientific Publishing, 2003.
2. F. Close: Particle Physics, A Very Short Introduction, Oxford, 2004.
3. F. Close: The cosmic onion, Quarks and the Nature of the Universe, Heinemann Educational Books, 1990.
4. R. Mackintosh, J. Al-Khalili, B. Jonson, T. Pena: Jádro, Cesta do srdce hmoty, Academia Praha, 2003.
5. S. Brandt: The Harvest of a Century, Oxford, 2009.

Course language:
slovak and english

Notes:

Course assessment
Total number of assessed students: 28

A	B	C	D	E	FX
85.71	10.71	3.57	0.0	0.0	0.0

Provides: doc. RNDr. Adela Kravčáková, PhD., Mgr. Lucia Anna Tarasovičová, Dr. rer. nat.

Date of last modification: 23.08.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ UFP/07	**Course name:** Introduction to Plasma Physics

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 5.

Course level: I.

Prerequisities:

Conditions for course completion:
Recherche work of current status in selected part of the issue.
Final examination.

Learning outcomes:
To acquaint with the basic physical processes in plasma.

Brief outline of the course:
Occurence of plasma in nature. Definition of plasma state. Temperature, Debye screening, plasma parameter.
Motion of single particles. Plasma as mixture of fluids. Waves in plasma. Diffusion and resistivity in weakly ionized and in totally ionized plasma. Hydromagnetic equilibrium and stability. Introduction to
kinetic theory. Nonlinear effects. Introduction to controlled thermonuclear reaction. Plasma formations in
space.

Recommended literature:
Chen, F.F., Introduction to Plasma Physics & Controlled Fusion: Volume 1 - Plasma Physics, January 1984 , Plenum Pub. Corp.

Course language:

Notes:

Course assessment
Total number of assessed students: 57

A	B	C	D	E	FX
89.47	10.53	0.0	0.0	0.0	0.0

Provides: RNDr. Pavol Bobík, PhD.

Date of last modification: 03.03.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ZPRF/11	**Course name:** Introduction to Programming for Physicists
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 1 / 2 **Per study period:** 14 / 28 **Course method:** present	
Number of ECTS credits: 4	
Recommended semester/trimester of the course: 2.	
Course level: I.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes: The aim of the lecture is to obtain the basic knowledge of numerical and graphical evaluation a presentation of scientific data and basic programming skills using a software packages used by experimental and theoretical physicists.	
Brief outline of the course: 1.-5. Basics of software package Origin. Overview of user interface, project creation. Evaluatiion of dataset in worksheet. Graphical evaluation of data – creation of 2- and 3-dimensional plots, plot inset, properties of plot, masking of data,selection end erasing of data from plot Linear and non-linear regression of data. Evaluation od peak data. Numerical analysis of data – interpolation, differentiation, numerical integration, normalization of dataset. Statistical data analysis. Signal processing – smoothing, filtering, Fourier transform analysis. 6.-12. Basics of programming language Matlab/Octave Overview of user interface, toolboxes. Matrix algebra in Malabe/Octave, work with characters and text, structures. Basic operators and fuctions. Script creation and structure, –loop, conditional commands, procedures and functions, global variables, vectorization of the algorithm, debugging Import and export of data. Data analysis – filtering, linear regression using a polynomial and defined function, interpolation, optimalization, finding a root of equation, Fourier transform analysis, numerical integration, differential equation solvers. Plotting of 2- and 3-dimensional datasets, plot properties. Creation of user interface in Matlab GUIDE.	
Recommended literature: User documentaton of OriginLab Origin; User documenation of Mathworks Matlab; F. Dušek, Matlab a Simulink - úvod do používaní, skriptá, Univerzita Pardubice, 2000; P. Karban, Výpočty a simulace v pr. Matlab Simulink, Computer Press 2007.	
Course language: Slovak, English	
Notes:	

Course assessment
Total number of assessed students: 82

A	B	C	D	E	FX
74.39	15.85	4.88	1.22	3.66	0.0

Provides: doc. RNDr. Erik Čižmár, PhD.

Date of last modification: 21.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: Dek. PF UPJŠ/USPV/13	**Course name:** Introduction to Study of Sciences
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week: Per study period:** 12s / 3d **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 1.	
Course level: I.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 2369	
abs	n
90.12	9.88
Provides: doc. RNDr. Marián Kireš, PhD.	
Date of last modification: 30.08.2022	
Approved: doc. RNDr. Jozef Strečka, PhD.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚMV/UDM/22	**Course name:** Introduction to mathematics
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 4 **Per study period:** 56 **Course method:** present	
Number of ECTS credits: 3	
Recommended semester/trimester of the course: 1.	
Course level: I.	
Prerequisities:	
Conditions for course completion: Two tests during the semester.	
Learning outcomes: Repetition of problematic sections of the secondary mathematics by interesting tasks. Explanation of basic terms, properties and proof methods used in various areas of mathematics.	
Brief outline of the course: Simplification of algebraic expressions. Real number, absolute value of real numbers; equations and inequalities. Irrational equations and inequalities. Concept of function. Linear and quadratic function; equations and inequalities. Exponencial and logarithmic function; equations and inequalities. Goniometric functions; equations and inequalities. Complex numbers.	
Recommended literature: 1. V. Medek - L. Mišík - T. Šalát: REPETITÓRIUM STREDOŠKOLSKEJ MATEMATIKY, Alfa Bratislava, 1976 2. S. Richtárová - D. Kyselová: MATEMATIKA (pomôcka pre maturantov a uchádzačov o štúdium na vysokých školách), Enigma Nitra, 1998 3. O. Hudec – Z. Kimáková – E. Švidroňová: PRÍKLADY Z MATEMATIKY (pre uchádzačov o štúdium na TU v Košiciach), EF TU Košice, 1999 4. F. Peller – V. Šáner – J. Eliáš – Ľ. Pinda: MATEMATIKA – Podklady na prijímacie testy pre uchádzačov o štúdium, Ekonóm Bratislava, 2000/2001 5. F. Vesajda – F. Talafous: ZBIERKA ÚLOH Z MATEMATIKY pre stredné všeobecnovzdelávacie školy a gymnáziá, SPN Bratislava, 1973 6. J. Lukášová – O. Odvárko – B. Riečan – J. Šedivý – J. Vyšín: ÚLOHY Z MATEMATIKY pre 4. ročník gymnázia, SPN Bratislava, 1976	
Course language: Slovak	
Notes:	

Course assessment
Total number of assessed students: 636

A	B	C	D	E	FX
24.06	19.97	17.77	15.88	9.59	12.74

Provides: RNDr. Igor Fabrici, Dr. rer. nat., Mgr. Daniela Kovalčíková, Mgr. Enikő Schnürerová

Date of last modification: 29.01.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ ZBP/04	**Course name:** Laboratory Training I

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: 6.

Course level: I.

Prerequisities:

Conditions for course completion:
(1) Test-paper (written exam during the semester - approximately in the 5th week of the semester - at the end of the theoretical-computational part of the course)
(2) Laboratory protocol (laboratory report)

Learning outcomes:
Completing the course student will get knowledge and first experiences of safe and efficient work in biophysical (chemical, optical spectroscopy) laboratory.

Brief outline of the course:
Week 1
Course schedule and requirements for successful completion of the course. Introduction to the fundamentals of laboratory work and safety, chemical and general safety. Introduction and definition, presentation of the laboratories at the Department of Biophysics and Center for Interdisciplinary Biosciences.
Week 2
Composition of substances and solutions: basic characteristics of solutions. Chemical formula and molecular weights, percentage composition from formulas, from empirical formula to molecular formula, mass and mass fraction, molar weight, molar volume, molarity, the concentration of a solution.
Week 3
Mixtures and solutions: solubility of substances, solution and its concentration, mass/volume concentration, the concentration of a solution in %, molar concentration, mole-mass relationships in chemical reactions, concentration units – ppm, ppb.
Week 4
Mixtures and solutions: diluting and mixing solutions.
Week 5
Written exam. Laboratory safety rules and guidelines.
Week 6
Proper and safe use of small laboratory equipment/instruments: automatic pipettes, centrifuge, laboratory dryer, Milli-Q ultrapure water system. Laboratory digester. Care and safe laboratory glassware/material use – handling, cleaning and storing.

Week 7
Preparation of solutions: Analytical balances and proper weighing practices; working safely with solvents, the storage and disposal of chemicals, solvents, stock solutions and chemical waste. What is Parafilm?
Week 8
Preparing buffer solutions. pH determination, acidity and alkalinity. Working principle of pH meter - calibration and working demonstration. Working with acids and bases.
Week 9
Introduction to spectroscopy. The light. Spectroscopic experiment. Spectroscopic techniques. Jablonski diagram. UV-Vis absorption spectrophotometry. Chromophore. Lambert-Beer's law. Absorption spectrum. Absorption spectrophotometer. Fluorescence spectroscopy. Fluorophore. Excitation and emission spectra. Characteristics of fluorescence spectra. Fluorescence quenching.
Week 10
Introduction to spectrophotometry: working with spectroscopic equipment - preparation of solutions of selected molecules at different pH and measurement of their UV-Vis absorption spectra.
Week 11
Introduction to spectrophotometry: working with spectroscopic equipment - measurement of fluorescence spectra of the selected molecules at different pH.
Week 12/13
Data collection, processing and analysis. Preparing a Practical/Scientific laboratory report. Evaluation of Laboratory reports.
Keeping the laboratory environment clean and safe.

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 10

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

Provides: RNDr. Zuzana Jurašeková, PhD.

Date of last modification: 21.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ MFY/12	**Course name:** Mathematical Physics

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

Number of ECTS credits: 6

Recommended semester/trimester of the course: 4.

Course level: I.

Prerequisities: ÚMV/FRPb/19

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 93

A	B	C	D	E	FX
22.58	17.2	13.98	11.83	31.18	3.23

Provides: RNDr. Tomáš Lučivjanský, PhD., univerzitný docent

Date of last modification: 16.11.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/ MAN3c/10	**Course name:** Mathematical analysis III for physicists

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

Number of ECTS credits: 8

Recommended semester/trimester of the course: 3.

Course level: I.

Prerequisities: ÚMV/FRPb/19

Conditions for course completion:
Ongoing evaluation takes the form of test during the semester. Overall evaluation is given by ongoing evaluation (60%), written and oral part of the exam (40%).

Learning outcomes:
The aim of this course is to familiarize students with the mathematical apparatus necessary for successful study of physics.

Brief outline of the course:
Norm and Banach spaces, vector-valued functions - curves, surfaces, vector fields, vector calculus, implicit function theorem, basic differential operators, potentials, regular transformations. Measure, Lebesgue integral, Fubini theorem and Stieltjes integral. Parametric integrations. Integration on manifolds - path, surface integrals and integral theorems - Green, Gauss and Stokes. Applications in physics.

Recommended literature:

Kopáček J. Matematická analýza nejen pro fyziky III. Matfyzpress, Praha, 2007.
Kopáček J. Příklady z matematiky nejen pro fyziky (III). Matfyzpress, Praha, 2006.
Eliaš, Horváth, Kajan: Zbierka úloh z vyššej matematiky IV, ALFA Bratislava, 1968.
B.P. Děmidovič: Sbírka úloh a cvičení z matematickej analýzy, Fragment, Brno, 2003.
Apostol, T. M. Calculus, 2nd ed., Vol . 1: One-Variable Calculus, with an Introduction to Linear Algebra. Waltham, MA: Blaisdell, 1967.
Apostol, T. M. Calculus, 2nd ed., Vol . 2: Multi-Variable Calculus and Linear Algebra, with Applications to Differential Equations and Probability. Waltham, MA: Blaisdell, 1969.
Schey H.M. Div, Grad, Curl, and All That: An Informal Text on Vector Calculus, 4th ed., 2005
Sharma K. Text Book of Vector Calculus, Discovery Publ. House, 2006

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 106

A	B	C	D	E	FX
20.75	14.15	21.7	24.53	13.21	5.66

Provides: doc. Mgr. Jozef Kiseľák, PhD., RNDr. Jana Borzová, PhD.

Date of last modification: 17.04.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/ MAN3d/10	**Course name:** Mathematical analysis IV for physicists

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: 6

Recommended semester/trimester of the course: 4.

Course level: I.

Prerequisities: ÚMV/MAN3c/10

Conditions for course completion:
Ongoing evaluation takes the form of test during the semester. Overall evaluation is given by ongoing evaluation (60%), written and oral part of the exam (40%).

Learning outcomes:
The aim of this course is to familiarize students with the mathematical apparatus necessary for successful study of physics.

Brief outline of the course:
Systems of differential equations - existence,uniqueness and stability of solutions, first integrals, approximate solutions. Hilbert spaces. Introduction to calculus of variations and operator theory. Fourier series. Fourier integral, Fourier and Laplace transform.

Recommended literature:
Kopáček J. Matematická analýza nejen pro fyziky IV. Matfyzpress, Praha, 2010.
Kopáček J. a kolektiv Příklady z matematiky nejen pro fyziky (IV). Matfyzpress, Praha, 2005.
Eliaš, Horváth, Kajan: Zbierka úloh z vyššej matematiky III, ALFA Bratislava, 1967.
Eliaš, Horváth, Kajan: Zbierka úloh z vyššej matematiky IV, ALFA Bratislava, 1968.
Greguš, Švec, Šeda: Obyčajné diferenciálne rovnice, ALFA SNTL Bratislava 1985.
Tenenbaum M., Pollard H. Ordinary Differential Equations, Dover Publications, New York 1985
Chicone C. Ordinary Differential Equations with Applications, Springer, 2nd. ed., 2006
Davis, H. F. Fourier Series and Orthogonal Functions, Dover Publications, 1989
Brown J., Churchil R. Fourier Series and Boundary Value Problems, McGraw-Hill , 5th ed. 2006

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 91

A	B	C	D	E	FX
20.88	9.89	18.68	28.57	20.88	1.1

Provides: doc. Mgr. Jozef Kiseľák, PhD., RNDr. Mária Slovinská
Date of last modification: 17.04.2022
Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚMV/ MST/19	**Course name:** Mathematical statistics
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 2 **Per study period:** 28 / 28 **Course method:** present	
Number of ECTS credits: 5	
Recommended semester/trimester of the course: 5.	
Course level: I.	
Prerequisities:	
Conditions for course completion: Total evaluation based on two written tests during the semester (2x40p) and the result of the written (30p) and oral part of the exam (30p). At least 50% must be obtained from each part. Final evaluation: ≥90% A; ≥80% B; ≥70% C; ≥60% D; ≥50% E; <50% FX.	
Learning outcomes: Student should obtain the knowledge about basic statistical methods and the ability to apply theoretical knowledge in practical problems solving.	
Brief outline of the course: 1. Random vectors (definition, distributions, characteristics, joint and marginal distributions). 2. Covariance, correlation and regression. 3. Random sample, sampling distributions and characteristics. 4. Some important statistics and their distributions. 5. Point estimators and their properties. 6. Maximum likelihood method. 7. Interval estimates, confidence interval construction (2 weeks). 8. Testing of statistical hypothesis (critical region, level of significance and power of test, methods for searching optimal critical regions). 9. Some important parametric tests (2 weeks). 10. Some important nonparametric tests (2 weeks).	
Recommended literature: 1. Skřivánková V.: Pravdepodobnosť v príkladoch, UPJŠ, Košice, 2006 (in Slovak) 2. Skřivánková V.-Hančová M.: Štatistika v príkladoch, UPJŠ, Košice, 2005 (in Slovak) 3. Casella, G., Berger, R., Statistical Inference, 2nd ed., Chapman and Hall/CRC, 2024 4. DeGroot, M. H., Schervish, M. J.: Probability and Statistics, 4th ed., Pearson, Boston, 2012 5. Anděl J.: Základy matematické statistiky, MatfyzPress, Praha, 2011 (in Czech)	
Course language: Slovak	
Notes:	

Course assessment
Total number of assessed students: 200

A	B	C	D	E	FX
25.5	21.0	16.5	18.5	10.5	8.0

Provides: doc. RNDr. Martina Hančová, PhD.

Date of last modification: 21.11.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ MTFM/20	**Course name:** Modern Trends in Physics
Course type, scope and the method: **Course type:** Lecture **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 4.	
Course level: I.	
Prerequisities:	
Conditions for course completion: To successfully complete the course (full-time, if necessary distance), the student must demonstrate a sufficient understanding of the basic concepts and laws of physics, which were focused on lectures, elaboration of semester work on specified topics and successful oral examination and written processing and presentation of one topic, which is in the content of the subject. Credit assessment takes into account the scope of teaching (2 hours of lectures and self-study 2 credits). Rating scale complied with 100-50 failed 49-0	
Learning outcomes: After completing the lectures and exercises, the student will have sufficient knowledge of those parts of physics that have been included in the content of lectures.	
Brief outline of the course: Week 1-3: Selected lectures in theoretical physics and astrophysics Week 4-6: Selected lectures in nuclear physics Weeks 7-9: Selected lectures in biophysics Week 10-12: Selected lectures on condensed matter physics Week 13.-14: Presentation of students' work and discussion.	
Recommended literature: The literature is specified at the beginning of the semester according to selected topics.	
Course language: english	
Notes: Presence form represents a standart form for the course, if a need arises, the course is performed using MS Teams.	

Course assessment
Total number of assessed students: 17

abs	n
100.0	0.0

Provides: prof. RNDr. Peter Kollár, DrSc.

Date of last modification: 22.11.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚBEV/ MOB2/10	**Course name:** Molecular Biology
Course type, scope and the method: **Course type:** Lecture **Recommended course-load (hours):** **Per week:** 3 **Per study period:** 42 **Course method:** present	
Number of ECTS credits: 3	
Recommended semester/trimester of the course: 4., 6.	
Course level: I., II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes: Familiarize students with the structure, properties and functions of information macromolecules and their work, focusing primarily on the molecular mechanisms of regulation of DNA replication, gene expression and cell cycle.	
Brief outline of the course: 1. Structure and properties of information biomacromolecules. 2. Chromatine molecular structure and dynamics and oragnization of chromosome. 3. Replication of chromosomal and extrachromosomal DNAs. 4. Mutations and DNA reapir. 5. Prokaryotic and eukaryotic genome. Human genome. 6. Mobile gene elements. 7. Transcription and postranscription processing of RNA. 8. Translation and posttraslational modification of proteins. Protein degradation. 9. Interaction of proteins with DNA. Regulation of gene expression in prokaryots. 10. Regulation of gene expression in eukaryots. 11. Cell signaling. 12. Cell cycle and cell cycle control.	
Recommended literature: E. Mišúrová:Molekulárna biológia. Učebné texty, PF UPJŠ Košice, 1999 E. Mišúrová, P. Solár: Molekulová biológia. Učebné texty, PF UPJŠ, 2007 S.Rosypal:Úvod do molekulární biologie. Grafex Blansko, Brno,1999 D.P. Clark: Molecular Biology, Elsevier Academic Press, London, 2005 D.P. Clark, N.Pazdernik, M. McGehee: Molecular Biology, 3rd Edition, Elsevier 2018	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 1

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

Provides: doc. RNDr. Peter Pristaš, CSc., univerzitný profesor, RNDr. Zuzana Jendželovská, PhD.

Date of last modification: 19.12.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ JZP1/03	**Course name:** Nuclear Radiation in Environment
Course type, scope and the method: **Course type:** Lecture **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 3	
Recommended semester/trimester of the course: 6.	
Course level: I.	
Prerequisities:	
Conditions for course completion: Term project and its presentation, tasks, written test, exam. Credit evaluation of the subject: direct teaching and consultations (1credit), self-study and practical activities -term project (1credit), evaluation (1credit). Minimum limit for completion of the course is to obtain at least 51% of the total evaluation.	
Learning outcomes: Getting acquainted with natural and artificial sources of ionizing radiation in the environment, with its effects on the living organism. Radiation protection. Overview of basic dosimetric quantities and radiation limits. Nuclear radiation methods in practice.	
Brief outline of the course: 1. Introduction. Sources of radiation. 2. Interaction of radiation with matter. 3. Dosimetry. 4. Biological effects of ionizing radiation and radiological protection. 5.-6. Natural sources of radiation. 7. Man-made sources of radionuclides. 8.-9. Application of radionuclides. 10.-11. Nuclear plants. Nuclear waste. 12.-13. Nuclear weapons. Reprocessing. Radiation and health.	
Recommended literature: 1. Cooper J.R, Randle K., Sokhi R.S.: Radioactive releases in the environment, J.Wiley &Sons, Ltd. 2003 2. R. L. Murray, Nuclear Energy, An Introduction to th Concepts, Systems, and Applications of Nuclear Processes, 6th edition,Elsevier, 2009 3. P.A.Tipler, R.A.Llewellyn: Modern Physics, 6th Edition,W.H.Freeman and Company, 2012 4. S.N.Ahmed, Physics&Engineering of Radiation Detection, Elsevier, 2015	
Course language: slovak	
Notes:	

Course assessment
Total number of assessed students: 54

A	B	C	D	E	FX
62.96	16.67	7.41	7.41	1.85	3.7

Provides: doc. RNDr. Janka Vrláková, PhD.

Date of last modification: 22.11.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ NUM/10	**Course name:** Numerical Methods
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 1 **Per study period:** 28 / 14 **Course method:** present	
Number of ECTS credits: 4	
Recommended semester/trimester of the course: 3.	
Course level: I.	
Prerequisities:	
Conditions for course completion: To successfully complete the course, the student must demonstrate a sufficient degree of understanding and ability to apply the basic numerical methods of mathematical analysis and algebra, which are necessary for subsequent courses in computational physics. The basis of evaluation is participation and activity in exercises and work on assignments. The condition for obtaining credits is passing 2 written tests at seminars and submitting 4 assignments (projects) electronically and with the attached computer program. The credit evaluation of the course takes into account the following student workload: direct teaching (2 credits) and individual work on projects (2 credits). The minimum threshold for completing the course is to obtain at least 50% of the total score, using the following rating scale: A (90-100%), B (80-89%), C (70-79%), D (60-69%), E (50-59%), F (0-49%).	
Learning outcomes: To acquaint students with the basic numerical methods of mathematical analysis and algebra needed for the next course of computational physics. The student will learn to approximate and interpolate functions, solve systems of linear and nonlinear equations, numerically derive and integrate or determine eigenvalues and eigenvectors of matrices.	
Brief outline of the course: 1. Computational solution of problems and errors of numerical solution. 2. Approximation of functions. 3. Interpolation of functions. 4. Approximation by trigonometric polynomials. Fast Fourier analysis. 5. Solution of nonlinear equations, convergence conditions and error estimation of the methods. 6. Numerical methods for solving nonlinear equations. 7. Solution of systems of linear equations - direct methods. 8. Solution of systems of linear equations - iterative methods. 9. Numerical integration (quadrature) of functions. 10. Numerical differentiation of functions. 11. Eigenvalues and eigenvectors of a matrix - partial problem. 12. The complete problem of eigenvalues.	
Recommended literature:	

Basic literature:
POZRIKIDIS, C.: Numerical Computation in Science and Engineering, Oxford University Press, 2008.
Other literature:
HAMMING, R.W.: Numerical Methods for Scientists and Engineers, Dover, 1973.
GARCIA, A.L.: Numerical Methods for Physics, Prentice-Hall, 1994.

Course language:

Notes:

Course assessment
Total number of assessed students: 191

A	B	C	D	E	FX
13.09	16.23	23.04	23.56	20.42	3.66

Provides: prof. RNDr. Milan Žukovič, PhD.

Date of last modification: 14.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ BSSF/15	**Course name:** Physics

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

Number of ECTS credits: 4

Recommended semester/trimester of the course:

Course level: I.

Prerequisities:

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 52

A	B	C	D	E	FX
55.77	15.38	13.46	15.38	0.0	0.0

Provides:

Date of last modification: 06.03.2025

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ ZFP1a/22	**Course name:** Physics Practical I

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

Number of ECTS credits: 3

Recommended semester/trimester of the course:

Course level: I.

Prerequisities:

Conditions for course completion:
Summary evaluation based on ongoing assessment:
1. Theoretical preparatory assignments (at least 50% of performance)
2. Group realization of experimental laboratory measurements, reporting their results in the protocol forms and their defense (at least 50% needed)
3. Active participation during group work in the classical or virtual laboratory (3 absences allowed) and during online learning (no absence, all individual theoretical assignments and laboratory protocols needed)

Learning outcomes:
Student should obtain and know to apply basic concepts and skills in
1. Designing and realizing classical and virtual physical experiments to improve or supplement new theoretical knowledge connected to introductory physics course: Mechanics &
Molecular Physics.
2. Processing, visualizing, analyzing, evaluating and scientific presenting experimental data according to Guide to the Expression of Uncertainty in Measurement (GUM) and using modern digital technology (computer probes and simulations, Jupyter notebooks, Google spreadsheets).

Brief outline of the course:
01.-02. Introduction, the concept of measurement error and uncertainty,
new SI units, the basic task of the experimenter
03.-04. Processing direct measurements, type A uncertainties, data visualization using digital technologies
05.- 06. Processing indirect measurements, type B uncertainties, uncertainty budget for the experiment, data analysis using digital technologies, temple and contents of laboratory protocols
07.-09. Laboratory tasks:
A. Measuring density of liquids and solids
B. Measuring spherical radius and area
C. Measuring moment of inertia
10. Defense of protocols
11.-13. Laboratory tasks:
D. Measuring dynamic fluid viscosity

E. Measuring state variables of thermal processes in air
F. Measuring thermal capacity of solids
14. Defense of protocols, final evaluation

Recommended literature:

1. RATCLIFFE, C.P. a RATCLIFFE, B., 2015. Doubt-Free Uncertainty In Measurement: An Introduction for Engineers and Students. London: Springer International Publishing. ISBN 978-3-319-12062-1.
2. DEGRO, J., JEŠKOVÁ, Z., ONDEROVÁ, Ľ. a KIREŠ, M., 2006. Základné fyzikálne praktikum I. Košice: Univerzita Pavla Jozefa Šafárika v Košiciach. ISBN 80-7097-649-7.
3. BUFFLER, A. ALLIE, S., LUBBEN F., CAMPBELL R., 2009. Introduction to Measurement in the Physics Laboratory: A probabilistic approach, University of York, York.
4. TAYLOR, J.R., 1997. Introduction To Error Analysis: The Study of Uncertainties in Physical Measurements. Sausalito CA: University Science Books. ISBN 978-0-935702-75-0.

Course language:
slovak

Notes:

Course assessment
Total number of assessed students: 37

A	B	C	D	E	FX
45.95	16.22	10.81	13.51	13.51	0.0

Provides: doc. RNDr. Jozef Hanč, PhD.

Date of last modification: 26.01.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ZFP1b/24	**Course name:** Physics Practical II

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 4.

Course level: I.

Prerequisities: ÚFV/VF1b/24

Conditions for course completion:
To successfully complete the course, the student must measure at least 11 experimental tasks, process and analyze the measured results and evaluate the experimental results in the form of a protocol.
The condition for the implementation of another experimental task is the submission of a protocol from the previous exercise.
The condition for the implementation of the practical task is sufficient theoretical training at home. If the student is not ready for the task in advance, the teacher can send him home and the student must replace the exercise at another time.
The credit evaluation of the course takes into account the following student workload:
1 credit: self-study of recommended literature and subsequent direct teaching
1 credits: realization of experimental exercise and subsequent defense of measuring procedure - it is obligatory to complete all practical tasks in the semester,
1 credit: elaboration and submission of protocols from measurements, which are evaluated.

Learning outcomes:
By completing the course, the student will get acquainted with selected physical experiments in the field of electricity and magnetism and supplement the theoretical knowledge acquired in the course General Physics in a practical way.
The result of education is:
a) Complementing and summarizing knowledge and experimental skills in the field of electricity and magnetism.
b) Gaining practical experience with recording, analysis and interpretation of experimental data from practical measurements.
c) Gaining experience with the presentation of experimental results in the form of a measurement protocol.

Brief outline of the course:
Students on practical exercises are working in pairs experimental tasks in the field of electrical, electromagnetic and magnetic properties of matters.
1. Electrical Resistivity
2. Self - and Mutual Inductance and Capacity

3. Serial and Parallel Resonance
4. Thermal Dependence of Selected Electrical Phenomena in Solids
5. The Characteristics of Semiconductor Diod
6. The Characteristics of Semiconductor Bipolar Transistor
7. Magnetic Hysteresis
8. Hall Constant Measurements
9. Measurements of Horizontal Component of Earth Magnetic Field
10. Measuring characteristics of switching components
11. Measuring the properties of optoelectronic components
12. Electric current in liquids and electrolysis

Recommended literature:

1. Tumanski S, Handbook of magnetic measurements, CRC press, 2011.
2. Fiorillo F, Characterization and Measurement of Magnetic Materials, Elsevier, 2004.

Course language:

english

Notes:

Teaching is carried out in person. If necessary, part of the teaching can be realized remotely using the MS Teams or BBB tool. At the beginning of the semester, the teacher sets the conditions for completing and mastering the course.

Course assessment

Total number of assessed students: 1

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

Provides: doc. RNDr. Adriana Zeleňáková, DrSc., doc. RNDr. Ján Füzer, PhD.

Date of last modification: 21.02.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ ZFP1c/24	**Course name:** Physics Practical III

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

Number of ECTS credits: 3

Recommended semester/trimester of the course: 3.

Course level: I.

Prerequisities: ÚFV/VF1c/24

Conditions for course completion:
Measurements of experimental tasks, their evaluation in the form of a written report, which must be defended. As a part of evaluation there is is also a good theoretical preparation for the measurement of the task.

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

Brief outline of the course:
Oscilations. Pendulum. Composition and decomposition of oscillations. Resonance. The speed of sound. Refractive index. Lense's focal length. Interference. Diffraction. Diffraction and reflection of waves. Polarization. The speed of light. Quantum optics.

Recommended literature:
Degro,J., Ješková, Z., Onderová,Ľ., Kireš,M.: Základné fyzikálne praktikum I, PF UPJŠ Košice, 2006
P. Kollár a kol. Základné fyzikálne praktikum II, PF UPJŠ Košice, 2006
J. Brož Základy fysikálních měření, SPN Praha, 1981.

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 1

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

Provides: doc. RNDr. Marián Kireš, PhD., doc. RNDr. Ján Füzer, PhD.

Date of last modification: 21.02.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ ZFP1d/14	**Course name:** Physics Practical IV
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 3 **Per study period:** 42 **Course method:** present	
Number of ECTS credits: 3	
Recommended semester/trimester of the course: 5.	
Course level: I.	
Prerequisities:	
Conditions for course completion: - a check of the theoretical preparation for measuring the given task - tests for tasks no. 2 (2x), 4,5,6,8, tests from the theoretical part - basic characteristics of radiation and detectors, each test with a minimum success rate of 51%, - measurement of tasks, elaboration and submission of protocols of measured tasks - the overall evaluation is the sum of the evaluations of the individual tasks	
Learning outcomes: The student will acquire knowledge and practical skills about the registration of various types of ionizing radiation and verify the knowledge acquired in the subject General Physics IV - Atomic and Nuclear Physics.	
Brief outline of the course: 1. Introduction to measurements. 2. Dosimetry measurements. 3. Statistic distribution of measured quantities. 4. Measurement time scale selection. 5. Absorption of beta rays. 6. Backward scattering of beta rays. 7. Scintillation gamma spectrometer. 8. Emulsion detector. 9. Franck Hertz experiment. 10. Beta - spectroscopy. 11. Energy dependence of the gamma-absorption coefficient. 12. MEDIPIX. 13. Interaction of photons with matter.	
Recommended literature: 1. J.Vrláková, S.Vokál: Základné fyzikálne praktikum III, skriptá PF UPJŠ, Košice, 2012, dostupné na http://www.upjs.sk/public/media/5596/Zakladne-fyzikalne-praktikum-III.pdf	

Course language:
slovak

Notes:

Course assessment
Total number of assessed students: 125

A	B	C	D	E	FX
81.6	8.8	4.8	2.4	0.8	1.6

Provides: doc. RNDr. Janka Vrláková, PhD., doc. RNDr. Adela Kravčáková, PhD., RNDr. Dominika Švecová, RNDr. Zuzana Paulínyová, PhD.

Date of last modification: 23.08.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ FMT/21	**Course name:** Physics of Materials

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 3 / 0 **Per study period:** 42 / 0
Course method: present

Number of ECTS credits: 4

Recommended semester/trimester of the course: 6.

Course level: I.

Prerequisities:

Conditions for course completion:
For successful completing of the subject student show adequate knowledge's from area of physics of materials and properties of steels and selected nonferrous metals. To achieve final evaluation, student has to pass through separate 2 tests. Credits evaluation takes into account taking part at the lectures and -2 credits, study of recommended literature and study for written exams - 1 credit. Minimal value to obtain evaluation for other graduates (non CMP) is reach 50% of each evaluation test. Graduate scale is: A (90-100%), B (80-89%), C (70-79%), D (60-69%), E (50-59%), F (0-49%)

Learning outcomes:
The course gives basic information about Physics of Metals. Main topics are: diffusion in metals, classification of surfaces, models of grain boundary, segregation kinetics, dislocations, plastic deformation.

Brief outline of the course:
Imperfections in crystal lattice. Diffusion in metals: 1st and 2nd Fick's laws, diffusion coefficient, solution of Ficks' laws for different marginal conditions, Kirkendall effect, diffusion-controlled growth of precipitates, up-hill diffusion, diffusion in dilute and alloy systems. Experimental methods of diffusion coefficient determination. Classification of surfaces, models of grain boundary. Grain boundary segregation in solids: equilibrium segregation (McLean's and Guttmann's models), site competition effect, non-equilibrium segregation, segregation kinetics. Dislocations: classification, properties, movement and dislocation reactions. Dilocation structure in bcc, fcc and hcp lattice. Elastic deformation. Elastic stretching. Plastic deformation. Mechanism of strain hardening. Mechanical properties and behaviour. Creep, Stress, Rupture and Stress Corrosion.

Recommended literature:

1.Heumann: Diffusion in Metallen, Springer-Verlag, Berlin 1992 (in German).
2. W. Cahn and P. Haasen: Physical Metallurgy, Elsevier Science Publishers, Amsterdam 1996.Shewmon: Diffusion in solids, TMS, Warrendale 1989.
3. D.R. Askeland, P. Phulé, The Science and Engineering of Materials, Thomson, 2003.
4.Donald R. Askeland, Pradeep P. Fulay, Wendelin. Wright, The Science and Engineering of Materials, Cengage Learning 2011, sixth edition, www.cengage.com/engineering ISBN 13:978-0-495-29602-7.

Course language:
english

Notes:
Lectures can be done at presence form or online form using MS Teams. Education form is updated at the begining of the subject. All ppt presentations are accesible in LMS UPJŠ.

Course assessment
Total number of assessed students: 2

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

Provides: prof. RNDr. Pavol Sovák, CSc., doc. RNDr. Adriana Zeleňáková, DrSc.

Date of last modification: 29.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚMV/ TPP/19	**Course name:** Probability 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: 5

Recommended semester/trimester of the course: 4.

Course level: I.

Prerequisities: ÚMV/MAN1c/22 or ÚMV/MAN2c/22 or ÚMV/FRPa/19

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

Learning outcomes:
To obtain knowledge of the axiomatic theory of probability, random variables and their characteristics, special types of distributions and their applications.

Brief outline of the course:
Probability space, definitions and properties of probability.
Conditional probability and independence.
Random variables, their distribution function and characteristics.
Mean, variance and skewness.
Discrete and absolutely continuous distributions.
Quantile and characteristic functions, their properties. Relation between characteristic function and moments. Median and mode.
Transformation of random variables.
Special types of distributions with applications (binomial, Poisson, geometric, uniform, exponential, normal, chi-square, Student, Fisher).
Central limit theorem.

Recommended literature:

1. Skřivánková V.: Pravdepodobnosť v príkladoch, UPJŠ, Košice, 2006 (in Slovak)
2. DeGroot, M. H., Schervish, M. J.: Probability and Statistics, 4th ed., Pearson, Boston, 2012
3. Evans, M. J., Rosenthal, J. S.: Probability and Statistics: The Science of Uncertainty, 2nd Ed., W. H. Freeman, 2009
4. Riečan et al.: Pravdepodobnosť a matematická štatistika, Alfa, Bratislava, 1984 (in Slovak)
5. Potocký a kol.: Zbierka úloh z pravdepodobnosti a matematickej štatistiky, Alfa, Bratislava, 1991

Course language:
Slovak

Notes:

Course assessment
Total number of assessed students: 395

A	B	C	D	E	FX
14.43	14.43	17.22	21.27	26.08	6.58

Provides: doc. RNDr. Daniel Klein, PhD., RNDr. Andrej Gajdoš, PhD.

Date of last modification: 27.01.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚINF/ PAZ1a/15	**Course name:** Programming, algorithms, and complexity
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 3 / 4 **Per study period:** 42 / 56 **Course method:** present	
Number of ECTS credits: 8	
Recommended semester/trimester of the course: 3., 5.	
Course level: I.	
Prerequisities:	
Conditions for course completion: Graded activities during semester: assignments, small exams, midterm, final project. Final examination: practical finalterm focused on a complex task. Rules to pass the subject: Pass the minimal limit of points for category of homeworks (assignments, final project) and tests (small exams, midterm). Get at least 42% from the finalterm and pass the defined limit of total points for all graded activities.	
Learning outcomes: Get an ability to implement basic Java programs and obtain essential knowledge related to object-oriented programming.	
Brief outline of the course: 1. Introduction to Java and JPAZ2 framework, first Eclipse project, interactive communication with objects using turtle graphics, repeating code in loops, notion of class, object, and method. 2. For-loops, local variables, variable types, arithmetic expressions, random numbers, random walk, conditions. 3. While-loop, returning a value from a method, reference and reference variables, debugging. 4. Primitive and reference types, chars, String objects (including basic algorithms), mouse events, instance variables. 5. Array of primitive values and array of references, simple array algorithms. 6. Advanced array algorithms, two-dimensional array. 7. Exceptions and exception handling, files and directories, writing to text files. 8. Reading from text files. 9. Creating classes, encapsulation, getters and setters, constructors and their hierarchy, method overloading. 10. Inheritance and polymorphism. 11. Java Collections Framework, ArrayList class, wrapper classes for primitive types and autoboxing, interfaces List, Set, Map and their implementations, methods equals and hashCode. 12. Access modifiers, abstract classes and methods, creating and implementing interfaces, sorting, static methods and variables. 13. Creating and throwing exceptions, checked and runtime exceptions, JavaDoc, Maven.	
Recommended literature:	

1. ECKEL, Bruce. Thinking in Java. Fourth edition. Upper Saddle River, NJ: Prentice Hall, c[2006]. ISBN 978-01-318-7248-6.
2. PECINOVSKÝ, Rudolf. OOP: naučte se myslet a programovat objektově. Brno: Computer Press, 2010. ISBN 978-80-251-2126-9.
3. SIERRA, Kathy a Bert BATES. Head first Java. Vyd. 2. Sebastopol: O´Reilly, 2005. ISBN 978-05-960-0920-5.

Course language:
Slovak language, english language is required only to read Java API documentation.

Notes:

Course assessment
Total number of assessed students: 961

A	B	C	D	E	FX
16.86	8.64	12.28	18.73	13.94	29.55

Provides: RNDr. Juraj Šebej, PhD., RNDr. Miroslav Opiela, PhD., RNDr. Viktor Pristaš, RNDr. Richard Staňa, Mgr. Viktor Olejár, Mgr. Dominika Kotlárová, doc. RNDr. Ľubomír Šnajder, PhD.

Date of last modification: 04.01.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ KVM I/11	**Course name:** Quantum Mechanics
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 4 / 2 **Per study period:** 56 / 28 **Course method:** present	
Number of ECTS credits: 8	
Recommended semester/trimester of the course: 5.	
Course level: I.	
Prerequisities:	
Conditions for course completion: To successfully complete the course, the student must demonstrate sufficient understanding of the basic terms, concepts and applications of quantum physics. Knowledge of basic concepts of quantum physics is required at the level of their mathematical definition, as well as their physical content and specific applications. During the semester, the student must continuously master the content of the curriculum so that he can actively and creatively use the acquired knowledge in solving specific computational tasks during the exercises and pass continuous written tests taken into account in the overall evaluation of the subject. The condition for obtaining credits is passing 2 continuous written tests in exercises and an oral exam, which consists of one more demanding calculation task and theoretical questions. The credit evaluation of the course takes into account the following student workload: direct teaching (3 credits), self-study (2 credits), individual consultations (1 credit) and assessment (2 credits). The minimum threshold for completing the course is to obtain at least 50% of the total score, using the following rating scale: A (90-100%), B (80-89%), C (70-79%), D (60- 69%), E (50-59%), F (0-49%).	
Learning outcomes: After completing lectures and exercises, the student will have sufficient physical skills, knowledge and mathematical apparatus enabling independent solution of a wide range traditional and current scientific problems in quantum physics. At the same time, he will gain an overview of the applications of quantum physics in various areas of physics - nuclear physics, condensed matter physics, statistical physics, quantum information theory, etc.	
Brief outline of the course: 1. Subject matter, experimental and theoretical foundations of quantum mechanics (QM). 2. Wave formulation of QM. Postulate about wave function, superposition principle and postulate about operators. 3. Eigenvalues and eigenfunctions of operators. Measurement of quantities and reduction of wave function. 4. Time-independent and time-dependent Schrödinger equation. Ehrenfest equations and integrals of motion. Continuity equation. 5. Matrix formulation of QM, Dirac symbolics, calculation of mean values and density matrix. 6. Current immeasurability of physical quantities, Heisenberg uncertainty relations.	

7. Solution of the Schrödinger equation for a particle in an infinitely deep potential well and a particle in a finite potential well. Bound and scattering states.
8. Passage of a particle through a potential barrier: tunneling and barrier reflection.
9. Solution of Schrödinger equation for linear harmonic oscillator.
10. Particle motion in the central potential field, angular part of the Schrödinger equation.
11. Particle motion in the central potential field, radial part of the Schrödinger equation. Hydrogen atom.
12. Electron spin, Pauli matrix. Principle of indistinguishability of identical particles, fermions and bosons. Pauli's exclusion principle.
13. Paradoxes and modern problems of QM. Quantum entanglement, nonlocality, computing, cryptography and teleportation.

Recommended literature:

1. Ľ. Tóth, M. Tóthová, Kvantová a štatistická fyzika I, Rektorát Univerzity P. J. Šafárika, 1982. (in Slovak language)
2. Ľ. Skála, Úvod do kvantovej mechaniky, Academia, Praha, 2005. (in Czech language)
3. J. Pišút, L. Gomolčák, Úvod do kvantovej mechaniky, Bratislava 1983. (in Slovak language)
4. W. Greiner, Quantum Mechanics, 4th edition, Springer, Berlin, 2000.
5. A. C. Philips, Introduction to Quantum Mechanics, Wiley, Weinheim, 2003.
6. D. J. Griffiths, Introduction to Quantum Mechanics, Prentice Hall, New Jersey, 1995.
7. G. Auletta, M. Fortunato, G. Parisi, Quantum Mechanics, Cambridge University Press, Cambridge, 2009.

Course language:

Notes:

Course assessment

Total number of assessed students: 119

A	B	C	D	E	FX
22.69	21.01	17.65	11.76	21.01	5.88

Provides: doc. RNDr. Jozef Strečka, PhD.

Date of last modification: 19.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ KVM II/08	**Course name:** Quantum Mechanics II.

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

Number of ECTS credits: 6

Recommended semester/trimester of the course: 6.

Course level: I.

Prerequisities: ÚFV/KVM/08 or ÚFV/KVM I/11

Conditions for course completion:
To successfully complete the course, the student must demonstrate sufficient understanding of the basics terms, concepts and applications of quantum physics. Knowledge of basic concepts is required from quantum physics at the level of their mathematical definition as well as their physical content and concrete applications. During the semester, the student must continuously master the content of the curriculum in order to gain the acquired knowledge in order to actively and creatively use them in solving specific tasks during the exercises and complete the continuous written test taken into account in the overall evaluation of the subject. The condition for obtaining credits is passing 1 continuous written test in exercises and an oral exam, which consists of one more complex computational task and theoretical questions. The credit evaluation of the course takes into account the following student workload: direct teaching (2 credits), self-study (2 credits), individual consultations (1 credit) and assessment (1 credit). Minimum threshold for passing
the subject is to obtain at least 50% of the total score, while it is used the following rating scale: A (90-100%), B (80-89%), C (70-79%), D (60-69%), E (50-59%), F (0-49%).

Learning outcomes:
After completing lectures and exercises, the student will have sufficient physical skills, knowledge and mathematical apparatus enabling independent solution of a wide range traditional and current scientific problems in quantum physics using approximate methods. At the same time, he will gain an overview of the applications of quantum physics in various fields of physics such as atomic and nuclear physics, condensed matter physics, statistical physics, quantum theory of magnetism, etc.

Brief outline of the course:
1. Stationary perturbation theory for non-degenerate quantum-mechanical systems with discrete energy spectrum.
2. Stationary perturbation theory for degenerate quantum-mechanical systems with discrete energy spectrum. Zeeman and Stark effects.
3. Stationary perturbation theory for two-level quantum-mechanical systems with two closely-spaced energy levels: crossing and selfavoided crossing of energy levels.
4. Ritz's variational method. Bound state of a quantum-mechanical system with attractive potential.
5. Applications of Ritz's variation method in finding the ground state of quantum spin models.

6. Nonstationary perturbation theory for non-degenerate quantum-mechanical systems with discrete energy spectrum. A special case of constant, adiabatic and short-rapid perturbation.
7. Nonstationary perturbation theory for quantum-mechanical systems with discrete-continuous energy spectrum. Harmonic perturbation and Fermi's golden rule.
8. Quantum-mechanical solution of the time-indepedent Schrődinger equation for the helium atom using stationary perturbation theory. Orthohelium and parahelium.
9. Quantum-mechanical solution of the time-indepedent Schrődinger equation for a hydrogen molecule using stationary perturbation theory. Heitler-London theory of valence bonds.
10. Quantum-mechanical solution of the time-indepedent Schrődinger equation for a hydrogen molecule using the Ritz variational method. LCAO method.
11. Hartree and Hartree-Fock method for multielectron atoms.

Recommended literature:

1. V. Ilkovič, Kvantová teória II, Scriptum UPJŠ, Košice, 1989. (in Slovak)
2. J. Pišút, L. Gomolčák, Úvod do kvantovej mechaniky, Bratislava 1983. (in Slovak)
3. W. Greiner, Quantum Mechanics, 4th edition, Springer, Berlin, 2000.
4. D. J. Griffiths, Introduction to Quantum Mechanics, Prentice Hall, New Jersey, 1995.
5. G. Auletta, M. Fortunato, G. Parisi, Quantum Mechanics, Cambridge University Press, Cambridge, 2009.

Course language:
EN - english

Notes:

Course assessment
Total number of assessed students: 132

A	B	C	D	E	FX
28.79	15.15	17.42	15.15	18.94	4.55

Provides: doc. RNDr. Jozef Strečka, PhD.

Date of last modification: 19.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ SEA1/04	**Course name:** Seminar from Nuclear Physics
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 1 **Per study period:** 14 **Course method:** present	
Number of ECTS credits: 1	
Recommended semester/trimester of the course: 6.	
Course level: I.	
Prerequisities:	
Conditions for course completion: - active participation in seminars - presentation and written work on a given topic	
Learning outcomes: To bring the topical problems, methodics and tools of high energy physics to the students.	
Brief outline of the course: Department seminar - selected topical problems of the nuclear and subnuclear physics.	
Recommended literature:	
Course language: Slovak and English	
Notes:	
Course assessment Total number of assessed students: 18	

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

Provides: doc. RNDr. Janka Vrláková, PhD.	
Date of last modification: 22.11.2021	
Approved: doc. RNDr. Jozef Strečka, PhD.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ TRS/03 | **Course name:** Special Theory of Relativity

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 5.

Course level: I., II.

Prerequisities: ÚFV/TEP1/03

Conditions for course completion:

Learning outcomes:

Brief outline of the course:

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 187

A	B	C	D	E	FX
49.73	20.86	15.51	8.02	5.88	0.0

Provides: RNDr. Tomáš Lučivjanský, PhD., univerzitný docent

Date of last modification: 06.03.2025

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/ TVa/11	**Course name:** Sports Activities I.
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 1.	
Course level: I., II., P	
Prerequisities:	
Conditions for course completion: Min. 80% of active participation in classes.	
Learning outcomes: Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.	
Brief outline of the course: Brief outline of the course: The Institute of physical education and sport at the Pavol Jozef Šafárik University offers 20 sports activities aerobics; aikido, basketball, badminton, body-balance, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, fitness, indoor football, SM system, step aerobics, table tennis, chess, volleyball, tabata, cycling. Additionally, the Institute of physical education and sport at the Pavol Jozef Šafárik University offers winter courses (ski course, survival) and summer courses (aerobics by the sea, rafting on the Tisza River) with an attractive programme, sports competitions with national and international participation.	
Recommended literature: BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571 BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252. JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308. KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027. KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345. LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902. SNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.	

STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 15781

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
85.74	0.06	0.0	0.0	0.0	0.04	9.0	5.15

Provides: Mgr. Patrik Berta, Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Tomková, PhD., Mgr. Marcel Čurgali, Mgr. Alena Buková, PhD., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD.

Date of last modification: 07.02.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/ TVb/11	**Course name:** Sports Activities II.
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 2.	
Course level: I., II., P	
Prerequisities:	
Conditions for course completion: active participation in classes - min. 80%.	
Learning outcomes: Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.	
Brief outline of the course: Brief outline of the course: The Institute of physical education and sport at the Pavol Jozef Šafárik University offers 20 sports activities aerobics; aikido, basketball, badminton, body-balance, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, fitness, indoor football, SM system, step aerobics, table tennis, chess, volleyball, tabata, cycling. Additionally, the Institute of physical education and sport at the Pavol Jozef Šafárik University offers winter courses (ski course, survival) and summer courses (aerobics by the sea, rafting on the Tisza River) with an attractive programme, sports competitions with national and international participation.	
Recommended literature: BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571 BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252. JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308. KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027. KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345. LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902. SNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.	

STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 13802

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
83.85	0.49	0.01	0.0	0.0	0.04	11.17	4.43

Provides: Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Marcel Čurgali, Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Tomková, PhD., Mgr. Alena Buková, PhD., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD.

Date of last modification: 07.02.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

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

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

Number of ECTS credits: 2

Recommended semester/trimester of the course: 3.

Course level: I., II.

Prerequisities:

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

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

Brief outline of the course:
Brief outline of the course:
The Institute of physical education and sport at the Pavol Jozef Šafárik University offers 20 sports activities aerobics; aikido, basketball, badminton, body-balance, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, fitness, indoor football, SM system, step aerobics, table tennis, chess, volleyball, tabata, cycling.
Additionally, the Institute of physical education and sport at the Pavol Jozef Šafárik University offers winter courses (ski course, survival) and summer courses (aerobics by the sea, rafting on the Tisza River) with an attractive programme, sports competitions with national and international participation.

Recommended literature:

BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571
BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252.
JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308.
KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027.
KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345.
LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902.
SNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.

STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 9334

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
87.96	0.06	0.01	0.0	0.0	0.02	4.92	7.03

Provides: Mgr. Marcel Čurgali, Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Tomková, PhD., Mgr. Alena Buková, PhD., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD.

Date of last modification: 07.02.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/ TVd/11	**Course name:** Sports Activities IV.
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course: 4.	
Course level: I., II.	
Prerequisities:	
Conditions for course completion: min. 80% of active participation in classes	
Learning outcomes: Sports activities in all their forms prepare university students for their professional and personal life. They have a great impact on physical fitness and performance. Specialization in sports activities enables students to strengthen their relationship towards the selected sport in which they also improve.	
Brief outline of the course: Brief outline of the course: The Institute of physical education and sport at the Pavol Jozef Šafárik University offers 20 sports activities aerobics; aikido, basketball, badminton, body-balance, body form, bouldering, floorball, yoga, power yoga, pilates, swimming, fitness, indoor football, SM system, step aerobics, table tennis, chess, volleyball, tabata, cycling. Additionally, the Institute of physical education and sport at the Pavol Jozef Šafárik University offers winter courses (ski course, survival) and summer courses (aerobics by the sea, rafting on the Tisza River) with an attractive programme, sports competitions with national and international participation.	
Recommended literature: BENCE, M. et al. 2005. Plávanie. Banská Bystrica: FHV UMB. 198s. ISBN 80-8083-140-8. [online] Dostupné na: https://www.ff.umb.sk/app/cmsFile.php?disposition=a&ID=571 BUZKOVÁ, K. 2006. Fitness jóga, harmonické cvičení těla I duše. Praha: Grada. ISBN 8024715252. JARKOVSKÁ, H, JARKOVSKÁ, M. 2005. Posilování s vlastním tělem 417 krát jinak. Praha: Grada. ISBN 9788024757308. KAČÁNI, L. 2002. Futbal:Tréning hrou. Bratislava: Peter Mačura – PEEM. 278s. ISBN 8089197027. KRESTA, J. 2009. Futsal.Praha: Grada Publishing, a.s. 112s. ISBN 9788024725345. LAWRENCE, G. 2019. Power jóga nejen pro sportovce. Brno: CPress. ISBN 9788026427902. SNER, Wolfgang. 2004. Posilování ve fitness. České Budějovice: Kopp. ISBN 8072322141.	

STACKEOVÁ, D. 2014. Fitness programy z pohledu kinantropologie. Praha: Galén. ISBN 9788074921155.
VOMÁČKO, S. BOŠTÍKOVÁ, S. 2003. Lezení na umělých stěnách. Praha: Grada. 129s. ISBN 8024721743.

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 5846

abs	abs-A	abs-B	abs-C	abs-D	abs-E	n	neabs
82.54	0.27	0.03	0.0	0.0	0.0	8.24	8.91

Provides: Mgr. Marcel Čurgali, Mgr. Agata Dorota Horbacz, PhD., Mgr. Dávid Kaško, PhD., Mgr. Patrik Berta, Mgr. Ladislav Kručanica, PhD., Mgr. Richard Melichar, Mgr. Petra Tomková, PhD., Mgr. Alena Buková, PhD., univerzitná docentka, doc. PaedDr. Ivan Uher, MPH, PhD., prof. RNDr. Stanislav Vokál, DrSc., Mgr. Zuzana Küchelová, PhD., Mgr. Ferdinand Salonna, PhD.

Date of last modification: 07.02.2024

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ MSU/07	**Course name:** Statistical Methods of Data Analysis

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

Number of ECTS credits: 4

Recommended semester/trimester of the course: 5.

Course level: I.

Prerequisities:

Conditions for course completion:
1. Active participation in lectures and excersises
2. 2x test
3. Passing the oral exam
Detailed conditions are updated annually on the electronic bulletin board of the course in AiS2 or within the repository for digital support materials (LMS UPJŠ, MS Teams UPJŠ, etc.)
The teacher justifies the justified non - participation of the student (incapacity for work, family reasons, etc.) a maximum of two lectures during the semester without the need for replacement.
In the event of a longer-term justified absence (for example due to incapacity for work), it shall determine the student an alternative form of mastering the missed study matter.
Credit evaluation of the course takes into account the following student workload: direct teaching and individual consultations (2 credits), self-study (1 credit), evaluation (1 credits). The minimum threshold for completing the course is to obtain at least 51% of the total score, using the following rating scale: A (91-100%), B (81-90%), C (71-80%), D (61- 70%), E (51-60%), F (0-50%).

Learning outcomes:
General introduction to theory of probability, random processes and mathematical statistics.

Brief outline of the course:
1. Random phenomena, random quantities and variables.
2. Interpretations and concept of probability, different definitions of probability.
3. Distribution functions and probability density.
4. Discrete and continuous random variables. Moments of distributions. Covariance and correlation.
5. Distributions: binomial, Poisson, normal, negative binomial, geometric, multinomial.
6. Distributions: uniform, exponential, multivariate, Gaussian, Cauchy distributions. Central limit theorem.
7. Distrbutions: chi-squared, Student and Fisher. Quantiles.
8. Characteristic function.
9. Chebyshev inequality. Chebyshev theorem. Bernoulli theorem.
10. Law of large numbers. The estimates of parameters of theoretical distributions from measured data. The maximum likelihood method. The weighted mean.
11. Statistical and systematic measurement errors. Estimation of errors. Propagation of errors.

12. Hypotheses testing. Null and alternative hypotheses. The least squares method. Linear and non-linear regression. Quality of regression, significance level.

Recommended literature:

1) L. Lyons, Statistics for Nuclear and Particle Physics, CUP, 1989.
2) L. Lyons, A Practical Guide to Data Analysis for Physical Science Students, CUP, 1991.
3) J.R. Taylor, An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, University Science Books, 1997.

Course language:

Notes:

Course assessment
Total number of assessed students: 115

A	B	C	D	E	FX
23.48	13.04	13.04	10.43	40.0	0.0

Provides: doc. RNDr. Adela Kravčáková, PhD., RNDr. Zuzana Paulínyová, PhD.

Date of last modification: 16.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/ SEV/10	**Course name:** Structure and Evolution of the Universe
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: 4.	
Course level: I., II.	
Prerequisities:	

Conditions for course completion:

To successfully complete the course, the student must demonstrate sufficient understanding of the basic knowledge of the structure and evolution of the universe. Knowledge of the basic properties of stars and methods of their determination, the structure, evolution and energy sources of stars, the structure of matter in the universe and its evolution is required. The condition for obtaining credits is passing a written or oral exam, preparation, and presentation of a semester essay. The credit evaluation of the course considers the following student workload: direct teaching (1 credit), self-study (2 credit) and assessment (1 credits). The minimum threshold for completing the course is to obtain at least 50% of the total score, using the following rating scale: A (90-100%), B (80-89%), C (70-79%), D (60- 69%), E (50-59%), Fx (0-49%).

Learning outcomes:

After completing the lectures, the student will master the basic knowledge about the properties of stars and methods of their determination, structure, evolution and energy sources of stars, the structure of matter in the universe and its evolution. It will also have sufficient physical knowledge and mathematical apparatus to enable independent solving of a wide range of tasks related to space research.

Brief outline of the course:

1. Basic properties of stars and methods of their determination: radiation flux, apparent and absolute magnitude, distances of stars, colors of stars.
2. Temperature of stars, black body radiation, spectra of atoms and molecules, non-thermal radiation.
3. Spectral classifications, luminosity classes, HR diagram, masses of stars.
4. Structure of stars: basic equations of stellar structure, transfer of energy by radiation and convection, production of energy in stars, fusion reactions.
5. Evolution of stars: interstellar matter and formation of stars and stellar systems, Jeans' criterion, protostars.
6. Evolution of stars: main sequence stars, giants, final stages of star evolution - white dwarfs, neutron stars and black holes.
7. Distribution of matter in the universe: Milky Way, its structure, dynamics, and evolution, types of galaxies, quasars, intergalactic matter, local group of galaxies.

8. Clusters and super-clusters of galaxies, large-scale structure of the universe, dark matter, and dark energy.
9. Evolution of the universe: historical development of views on the universe, Olberson's paradox, gravitational paradox, Cosmological principle.
10. Isotropicity and homogeneity of the universe, relic radiation, expansion of the universe. Steady state theory.
11. Relativistic cosmology: cosmological solutions of Einstein's equations, models of the universe and their properties, theory of the expanding universe, the Big Bang, the age of the universe.
12. Origin of the universe: the initial stages of the expansion of the universe, inflationary expansion and nucleogenesis, the formation of galaxies and galaxy clusters.

Recommended literature:

1. Carroll, B. W., Ostlie, D. A., An Introduction to Modern Astrophysics, Addison-Wesley Publishing Company, Reading, Massachusetts, 1996;
2. Contopoulos, D. Kotsakis, Cosmology, the structure and evolution of the Universe, Springer, 1984;
3. Pasachoff, J.M., Filippenko, A., The Cosmos: Astronomy in the New Millennium, Cambridge University Press, 2013;
4. Vanýsek, V., Základy astronomie a astrofyziky, Academia, Praha,1980;
5. Čeman, R., Pittich, E., Vesmír 1 - Slnečná sústava, MAPA Slovakia, Bratislava, 2002;
6. Čeman, R., Pittich, E., Vesmír 2 - Hviezdy - Galaxie, MAPA Slovakia, Bratislava, 2003;

Course language:
Slovak, English

Notes:

Course assessment
Total number of assessed students: 145

A	B	C	D	E	FX
37.24	27.59	13.79	11.72	9.66	0.0

Provides: doc. RNDr. Rudolf Gális, PhD.

Date of last modification: 20.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ SVL1/03	**Course name:** Structure and Properties of Solids

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 5.

Course level: I.

Prerequisities:

Conditions for course completion:
For successful completing of the subject student after taking exam shows adequate knowledge from area of structure and properties of solids, After completing the subject student is able to continue with the lectures from the specialized courses like Magnetism, Low Temperature Physics, Structural analysis, Supercondutors etc. Credits evaluation takes into account taking part at the lectures - 2 credits, study of recommended literature -1 credit, exam - 2 credits. Minimal value to obtain evaluation is reach 50% of each evaluation (test and exam) points. Point ratio exam/test is 70/30. Evaluation scale is: A (90-100%), B (80-89%), C (70-79%), D (60-69%), E (50-59%), F (0-49%)

Learning outcomes:
After completing the lectures and taking the written test, the student will have a deep knowledge which allows her/him to find relationships between structure and physical properties of selected solids. Student is also able to continue with the lectures from the specialized courses like Magnetism, Low Temperature Physics, Structural analysis, Supercondutors etc.metals and also will have the ability to enter into a systematic theoretical and experimental solution of the problems of condenset mater physics.

Brief outline of the course:
Time schedule of the subject contents is updated in electronic board in AiS2 sw. The subject content is focused in the following main topics: Periodic array of atoms. Fundamental type of lattices. Index systems for crystal planes. Simple crystal structure. Symetry and crystal structure. Point and space groups. Crystal binding and elastic constants. Wave diffraction and the reciprocal lattice. X.ray diffractometry. Brag´s law, Laue conditions, scatering of x-rays, Neutrons and neutron scattering, CW - diffractometer, Ewald´s sphere, Diffraction on powder samples, Structure factor, Ocupation factor, Atomic displacement factor. Thermal properties. Phonon heat capacity, thermal conductivity. Free electron Fermi gas. Energy bands. Semiconductor crystals. Superconductivity.

Recommended literature:

1. V. Valvoda: Základy krystalografie, SPN Praha, 1982
2. Z.T. Durski: Podstawy krystalografii strukturalnej i rentgenovskej, PWN, 1994
3. V. Kavečanský: Fyzika tuhých látok, Košice 1983
4. CH. Kittel: Úvod do fyziky Pevných látek, Academia, Praha 1985.
5. W. D. Callister: Materials Science and Engineering, John Willey aand Sons, New York, 1994.

6. Chetan Nayak, Solid State Physics, www.physics.ucla.edu/~nayak/solid_state.pdf
7. Bernard Ruph, X-ray Crystallography, http://www.ruppweb.org/Xray/101index.html

Course language:
English

Notes:
Lectures can be done at presence form or online using MS Teams. Education form is updated at the begining of the subject. All ppt presentations are accesible in LMS UPJŠ.

Course assessment
Total number of assessed students: 57

A	B	C	D	E	FX
36.84	24.56	21.05	10.53	5.26	1.75

Provides: prof. RNDr. Pavol Sovák, CSc., RNDr. Jozef Bednarčík, PhD., univerzitný docent

Date of last modification: 21.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚFV/SVK/13	**Course name:** Student Scientific Conference
Course type, scope and the method: **Course type:** **Recommended course-load (hours):** **Per week:** **Per study period:** **Course method:** present	
Number of ECTS credits: 4	
Recommended semester/trimester of the course:	
Course level: I., II.	
Prerequisities:	
Conditions for course completion:	
Learning outcomes:	
Brief outline of the course:	
Recommended literature:	
Course language:	
Notes:	
Course assessment Total number of assessed students: 26	

abs	n
100.0	0.0

Provides:	
Date of last modification: 30.11.2021	
Approved: doc. RNDr. Jozef Strečka, PhD.	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ DGS/21	**Course name:** Students` Digital Literacy

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: I.

Prerequisities:

Conditions for course completion:
Summary evaluation based on ongoing assessment:
1. Practical ongoing assignments and their defense (at least 50% needed)
3. Active participation during face-to-face contact learning in classical or virtual classroom (3 absences allowed) and during online learning (no absence, uploading all individual ongoing assignments)

Learning outcomes:
The student should obtain and know to apply basic knowledge and skills in working with current digital technologies (mobile phone, tablet, laptop, web technologies):
1. according to the current European framework for the Digital competence DigComp and ECDL
2. for better and more effective learning, work and active life in higher education, later lifelong learning and further career prospects.

Brief outline of the course:
01.-02. Basic digital skills, DigComp framework, ECDL
- modern web browser and its personalization
- security, privacy, responsible use of DT
03.-05. Search, collection and evaluation of digital content
- scanning, audio recording and speech resolution, optical resolution (OCR)
- digital notebooks (Google keep, Evernote, Onenote)
- evaluation of digital resources (Google forms and sections)
06.-08. Editing and creating digital content
- cloud and interactive documents
(text and spreadsheet editors - Google, Microsoft, Jupyter)
- work with pdf documents, e-books and videos
(Kami, Google books, Screencasting)
09. - 10. Organization, protection and sharing of digital content
- modern LMS and cloud storage
(Google Classroom, Microsoft team, Google Drive, Dropbox)
- time management (Google Calendar)
11.-13. Digital communication and cooperation

- collaborative interactive whiteboards (Jamboard, Whiteboard)
- online presentations and online meetings
(Google presentations, Powerpoint, Google meet, Microsoft teams)

Recommended literature:
1. Carretero Gomez, S., Vuorikari, R. and Punie, Y., DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use, Luxembourg, 2017, ISBN 978-92-79-68006-9, https://www.ecdl.sk/
2. Bruff, D. (2019). Intentional Tech: Principles to Guide the Use of Educational Technology in College Teaching (1st edition). Morgantown: West Virginia University Press.
3. Baker, Y. (2020). Microsoft Teams for Education. Amazon Digital Services.
4. Miller, H. (2021). Google Classroom + Google Apps: 2021 Edition. Brentford: Orion Edition Limited.

Course language:
slovak

Notes:

Course assessment
Total number of assessed students: 245

A	B	C	D	E	FX
76.33	5.31	2.86	0.0	14.69	0.82

Provides: doc. RNDr. Jozef Hanč, PhD.

Date of last modification: 26.01.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚTVŠ/ LKSp/13	**Course name:** Summer Course-Rafting of TISA River

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

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: I., II., P

Prerequisities:

Conditions for course completion:
Completion: passed
Condition for successful course completion:
- active participation in line with the study rule of procedure and course guidelines
- effective performance of all tasks: carrying a canoe, entering and exiting a canoe, righting a canoe, paddling

Learning outcomes:
Content standard:
The student demonstrates relevant knowledge and skills in the field, which content is defined in the course syllabus and recommended literature.
Performance standard:
Upon completion of the course students are able to meet the performance standard and:
- implement the acquired knowledge in different situations and practice,
- implement basic skills to manipulate a canoe on a waterway,
- determine the right spot for camping,
- prepare a suitable material and equipment for camping.

Brief outline of the course:
Brief outline of the course:
1. Assessment of difficulty of waterways
2. Safety rules for rafting
3. Setting up a crew
4. Practical skills training using an empty canoe
5. Canoe lifting and carrying
6. Putting the canoe in the water without a shore contact
7. Getting in the canoe
8. Exiting the canoe
9. Taking the canoe out of the water
10. Steering
a) The pry stroke (on fast waterways)
b) The draw stroke

11. Capsizing
12. Commands

Recommended literature:
1. JUNGER, J. et al. Turistika a športy v prírode. Prešov: FHPV PU v Prešove. 2002. ISBN 8080680973.
Internetové zdroje:
1. STEJSKAL, T. Vodná turistika. Prešov: PU v Prešove. 1999.
Dostupné na: https://ulozto.sk/tamhle/UkyxQ2lYF8qh/name/Nahrane-7-5-2021-v-14-46-39#!ZGDjBGR2AQtkAzVkAzLkLJWuLwWxZ2ukBRLjnGqSomICMmOyZN==

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 232

abs	n
36.64	63.36

Provides: Mgr. Dávid Kaško, PhD.

Date of last modification: 29.03.2022

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚTVŠ/KP/12	**Course name:** Survival Course
Course type, scope and the method: **Course type:** Practice **Recommended course-load (hours):** **Per week:** 2 **Per study period:** 28 **Course method:** present	
Number of ECTS credits: 2	
Recommended semester/trimester of the course:	
Course level: I., II., P	
Prerequisities:	
Conditions for course completion: Completion: passed Condition for successful course completion: - active participation in line with the study rule of procedure and course guidelines, - effective performance of all the tasks defined in the course syllabus	
Learning outcomes: Content standard: The student demonstrates relevant knowledge and skills in the field, which content is defined in the course syllabus and recommended literature. Performance standard: Upon completion of the course students are able to meet the performance standard and should: - acquire knowledge about safe stay and movement in natural environment, - obtain theoretical knowledge and practical skills to solve extraordinary and demanding situations connected with survival and minimization of damage to health, - be able to resist and face situations related to overcoming barriers and obstacles in natural environment, - be able implement the acquired knowledge as an instructor during summer sport camps for children and youth within recreational sport.	
Brief outline of the course: Brief outline of the course: 1. Principles of conduct and safety in the movement in unfamiliar natural environment 2. Preparation and guidance of a hike tour 3. Objective and subjective danger in the mountains 4. Principles of hygiene and prevention of damage to health in extreme conditions 5. Fire building 6. Movement in the unfamiliar terrain, orientation and navigation 7. Shelters 8. Food preparation and water filtering 9. Rappelling, Tyrolian traverse 10. Transport of an injured person, first aid	

Recommended literature:
1. JUNGER, J. et al. Turistika a športy v prírode. Prešov: Fakulta humanitných a prírodných vied PU v Prešove. 2002. 267s. ISBN 80-8068-097-3.
2. PAVLÍČEK, J. Člověk v drsné přírodě. 3. vyd. Praha: Práh. 2002. ISBN 8072520598.
3. WISEMAN, J. SAS: příručka jak přežít. Praha: Svojtka & Co. 2004. 566s. ISBN 8072372807.

Course language:
Slovak language

Notes:

Course assessment
Total number of assessed students: 461

abs	n
46.2	53.8

Provides: Mgr. Ladislav Kručanica, PhD.

Date of last modification: 16.05.2023

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ TME1/03	**Course name:** Theoretical Mechanics

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 3 / 2 **Per study period:** 42 / 28
Course method: present

Number of ECTS credits: 6

Recommended semester/trimester of the course: 3.

Course level: I.

Prerequisities: ÚFV/VF1a/12

Conditions for course completion:
To successfully complete the course, the student must demonstrate sufficient understanding of all basic concepts and applications of theoretical mechanics. Knowledge of basic concepts at the level of their mathematical definition is required, as well as their physical content and principled applications. The student must be able to actively master the content of the curriculum continuously during the semester, so that he can actively and creatively use the acquired knowledge in solving specific problems in exercises and independent homework. In addition to direct participation in teaching, the student is obliged to independently study professional topics assigned by the teacher and also to develop and present two home assignments. The condition for obtaining credits is, in addition to participation in teaching, also the successful completion of the 3rd written tests from exercises and lectures and 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.
Rating scale: A - 91% -100% points, B - 81% -90% points, C - 71% -80% points, D - 61% -70% points, E - 51% -60% points.

Learning outcomes:
The lecture on Theoretical Mechanics is the first lecture of an extensive university course in theoretical physics, where the student gets acquainted with fundamental theoretical concepts (e.g., generalized coordinates, velocities and momentum, phase space, Hamiltonian Lagrangian ...), which constitute the basis for understanding advanced theoretical methods of advanced courses such as quantum mechanics, statistical physics and quantum field theory. For this reason, attending this lecture is essential for all physics students. In addition to deep physical knowledge, students will also gain a practical experience in solving complex problems of mechanics of systems of mass points, continuum mechanics, hydrostatics and hydrodynamics.

Brief outline of the course:
1. Dynamics of a free system of mass points.
2. Motion of a constrained system of mass points. Constrains and their classification. The principle of virtual work and search for equilibrium positions.
3. D'Alembert's principle. Lagrange equations of the first kind. Generalized coordinates and generalized forces.

4. Lagrange equations of the second kind and generalized potential.
5. Basic properties of Lagrange equations. First integrals of equations of motion: Integral of energy and generalized momentum.
6. Integral principles. Variation of functions and integrals. Hamilton's principle.
7. Hamilton's function. Hamilton's canonical equations.
8. Mechanics of a perfectly rigid body. Position of a rigid body in space, independent coordinates. The speed of the points of a rigid body.
9. Center of gravity, linear and angular momentums of a rigid body. Tensor of inertia.
10. Kinetic energy of a rigid body. Euler angles and Euler kinematic equations. Euler's equations of motion of a perfectly rigid body.
11. Basic concepts of continuum mechanics. Vector and tensor of deformation. Stress vector and stress tensor. Equilibrium conditions and equations of motion of a continuum. Generalized Hooke's law. Waves in an elastic environment.
12. Mechanics of fluids. Conditions of a hydrostatic equilibrium. Continuity equation. Euler's equations of motion of an ideal fluid.

Recommended literature:

1. Meirovitch L.: Methods of Analytical dynamics, McGraw-Hill, New York, 1970.
2. Taylor T.T.: Mechanics: Classical and Quantum, Pergamon Press, Oxford, 1976.
3. Strelkov S.P.: Mechanics, Mir Publishers, Moscow, 1985.
4. Greiner W.: Classical Mechanics, Springer-Verlag, Berlin, 2010.
5. Goldstein H.: Classical Mechanics, Addison-Wesley, London, 1970.
6. Barger V., Olsson M.: Classical Mechanics: A Modern Perspective, McGraw-Hill, London, 1973.

Course language:
1. Slovak,
2. English

Notes:

Course assessment
Total number of assessed students: 205

A	B	C	D	E	FX
33.17	13.66	17.56	15.12	9.27	11.22

Provides: prof. RNDr. Michal Jaščur, CSc.

Date of last modification: 01.10.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ TEP1/03	**Course name:** Theory of the Electromagnetic Field

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

Number of ECTS credits: 5

Recommended semester/trimester of the course: 4.

Course level: I.

Prerequisities: ÚFV/VFM1b/15 or ÚFV/VF1b/03

Conditions for course completion:
To successfully complete the course, the student must demonstrate sufficient understanding of the basics terms, concepts and applications of electromagnetic field theory. Knowledge of basic concepts is required at the level of their mathematical definition, as well as their physical content and specific applications. During the semester, the student must continuously master the content of the curriculum so that he can actively and creatively use the acquired knowledge in solving specific tasks during the exercises and pass continuous written tests taken into account in the overall evaluation of the subject. The condition for obtaining credits is passing 2 continuous written tests in exercises and an oral exam, which consists of theoretical questions covering the entire scope of the course. The credit evaluation of the course takes into account the following student workload: direct teaching (2 credits), self-study (1 credit), individual consultations (1 credit) and assessment (1 credit). The minimum threshold for completing the course is to obtain at least 50% of the total score, using the following rating scale: A (90-100%), B (80-89%), C (70-79%), D (60- 69%), E (50-59%), F (0-49%).

Learning outcomes:
After completing lectures and exercises, the student will have sufficient physical skills, knowledge and mathematical apparatus enabling independent solution of a wide range scientific problems in electromagnetic field theory. The student also gets an overview of applications of electromagnetic field theory in various fields of physics such as electricity, magnetism, optics, etc.

Brief outline of the course:
1. Charge density and current density. Continuity equation. Definition of electromagnetic field.
2. System of Maxwell's equations in vacuum: differential formulation of Gauss' law of electrostatics, law of total current. The absence of magnetic monopoles and the law of electromagnetic induction.
3. Scalar and vector potential, gauge transformation. Wave equations for potentials. Energy conservation law in electromagnetic field theory: Poynting vector.
4. Conservation law of momentum of electromagnetic field: Maxwell's stress tensor.
5. Electrostatic field in vacuum and its potential. Potential of charges distributed in space and on surfaces. Boundary conditions on a charged area.

6. Multipole development of charge system potential. Electrostatic field energy. Electrostatic potential energy of a charge system and its multipole development in an external electric field.
7. Dielectric polarization. Vector of electrical induction, dielectric susceptibility and permittivity. Electrostatic field induced by a system of free charges in a dielectric, boundary conditions at the interface of two dielectrics.
8. Magnetic fields of stationary currents in vacuum; Biot-Savart law.
9. Stationary magnetic field of closed elementary current system, magnetic moment. Magnetization of magnets, magnets in the magnetic field of stationary currents.
10. Magnetic field strength, magnetic susceptibility and permeability. Magnetic field of a system of conductive currents in magnetics, boundary conditions at the interface of two magnets.
11. System of Maxwell's equations in the material environment and the conservation law of electromagnetic field energy. Quasi-stationary electromagnetic field.
12. Electromagnetic waves in homogeneous non-conductive medium, plane electromagnetic wave. Monochromatic plane wave and its polarization.
13. Refraction and reflection of a plane monochromatic wave at the interface of two media.

Recommended literature:
Kvasnica J.: Teorie elektromagnetického pole. Academia Praha, 1985.
Bobák A.: Teória elektromagnetického polľa, UPJŠ Košice, 2002.
Bobák A., Vargová E.: Zbierka riešených úloh z elektromagnetického poľa, UPJŠ Košice, 2001.
Greiner W.: Classical Electrodynamics, Springer-Verlag, New York, 1998.

Course language:
1. Slovak,
2. English

Notes:

Course assessment
Total number of assessed students: 349

A	B	C	D	E	FX
26.36	8.88	19.2	20.92	16.91	7.74

Provides: doc. RNDr. Jozef Strečka, PhD.

Date of last modification: 19.09.2021

Approved: doc. RNDr. Jozef Strečka, PhD.

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚFV/ TSF/17	**Course name:** Thermodynamics and Statistical physics

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 3 / 2 **Per study period:** 42 / 28
Course method: present

Number of ECTS credits: 5

Recommended semester/trimester of the course: 6.

Course level: I.

Prerequisities:

Conditions for course completion:
To successfully complete the course, the student must demonstrate sufficient understanding of all the basic concepts and applications of thermodynamics and classical statistical physics within the syllabus of the course. Knowledge of basic concepts of thermodynamics and classical statistical physics at the level of their mathematical definition, as well as their physical content and principled applications is required. The student must be able to actively master the content of the curriculum continuously during the semester, so that he can actively and creatively use the acquired knowledge in solving specific problems during exercises and for independent homework. In addition to direct participation in lectures, the student is obliged to study within the self-study professional topics assigned by the teacher and also to develop and present two homework assignments. The condition for obtaining credits is, in addition to participation in lectures, also the successful completion of three written tests from exercises and lectures and 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.
Rating scale: A - 91% -100% points, B - 81% -90% points, C - 71% -80% points, D - 61% -70% points, E - 51% -60% points.

Learning outcomes:
After completing lectures and exercises, the student will acquire fundamental knowledge and skills in thermodynamics and classical statistical physics, which are prerequisites for completing advanced courses in quantum statistical physics, computer physics and condensed matter theory at the master's courses. The graduate of this course masters sufficient physical knowledge and mathematical apparatus to independently solve a wide range of current scientific problems in various fields of classical physics. These are mainly practical applications to systems consisting of a huge number of interacting particles described by the equations of classical physics. The graduate is able to apply the acquired knowledge in the field of life sciences (e.g. the spread of dangerous infectious diseases), but also in the field of big data processing and in the social and political sciences (e.g. prediction of election results).

Brief outline of the course:
1. Historical introduction and basic concepts of thermodynamics. Macroscopic system and macroscopic parameters. Internal, external, extensive and intensive macroscopic parameters. State

of system, state parameters and status functions. Basic division of thermodynamic systems - isolated, closed and open systems. Homogeneous and heterogeneous systems, thermaly homogeneous system. State of thermodynamic equilibrium. The first postulate of thermodynamics, transitivity and the principle of spontaneous inviolability of the equilibrium state.
2. The second postulate of thermodynamics and thermodynamic temperature. Natural, reversible, irreversible and quasi-static processes in thermodynamics. Internal energy, work and heat in thermodynamics. Thermal and caloric equation of state. The first law of thermodynamics. Heat capacity, specific and latent heat. Isothermal, isochoric, isobaric, adiabatic and polytropic processes in thermodynamics and their description.
3. Pfaff differential form, integrating factor, complete differential and their use in thermodynamics. Basic formulations of the second law of thermodynamics. Caratheodory's principle and mathematical formulation of the second law of thermodynamics for quasi-static processes. Introduction of absolute temperature and entropy in thermodynamics.
4. Relationship between thermodynamic and absolute temperature. Entropy and Claussius equation for reversible processes. Thermodynamic potentials for quasi-static processes. Maxwell's relations. The third law of thermodynamics. Unattainability of absolute zero temperature.
5. Dependence of thermodynamic quantities on the mass of the number of particles. Euler's theorem for homogeneous functions and its application. Thermodynamic potentials for systems with variable particle number. Non-static processes and nonequilibrium states. Slow and fast non-static processes. Mathematical formulation of the second law of thermodynamics for non-static processes. Clausius inequality.
6. Thermodynamic potentials of nonequilibrium systems and equilibrium conditions. Maximum work done by the body in the external environment. Heterogeneous systems. Gibbs phase rule.
7. Phase space, configuration space and impulse space. Statistical ensemble and distribution function. Stationary ensemble. Canonical invariance of phase volume. Calculation of mean values of physical quantities in classical statistical physics.
8. Microcanonical, canonical and grand canonical ensembles in classical statistical physics. Canonical and grand canonical partition function, internal energy, entropy, free energy and grand canonical potential.
9. Equipartition and virial theorems. Calculation of ideal gas entropy in a microcanonical ensemble, Gibbs paradox.
10. The ideal gas in the canonical ensemble and the classical theory of paramagnetism. Classical theory of heat capacity - Dulong's-Petit's law.

Recommended literature:

1) J. Kvasnica, Termodynamika, SNTL, Praha (1965).
2) J. Kvasnica, Statistická fyzika, ACADEMIA, Praha (1983).
3) M. Varady, Statisticka fyzika, UJEP Ústi nad Labem, 2007.
4) M. Jaščur, M. Hnatič, Úvod do termodynamiky, Univerzita P.J. Šafárika, Košice (2013).

Course language:

Notes:

Course assessment
Total number of assessed students: 33

A	B	C	D	E	FX
42.42	18.18	33.33	3.03	3.03	0.0

Provides: prof. RNDr. Michal Jaščur, CSc.

Date of last modification: 06.11.2021

Approved: doc. RNDr. Jozef Strečka, PhD.