CONTENT

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ PMB/22	**Course name:** Advanced microscopic methods in biology

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

Number of ECTS credits: 6

Recommended semester/trimester of the course:

Course level: III.

Prerequisities:

Conditions for course completion:
Active presence at the exercises.

Learning outcomes:
Students will be able to design and realize experiment using imaging methods in the field of biomedical research.

Brief outline of the course:
1. design of biological experiment, legislative and ethic aspects of biological experiments
2. formulation of scientific hypothesis and strategy of suitable experimental method to reach the aims of experiment
3. selection of appropriate experimental animal to reach the aims of experiment
4. selection of appropriate method for isolation and processing of biological material (tissue isolation, fixation, freezing, processing and sectioning of biological sample)
5. immunolabelling of cells and tissues for light, fluorescent and electron microscopy
6. design and preparation of probes for in situ hybridization
7. methods for visualization of cells and tissues using epifluorescent microscopy
8. methods of visualization of cells and tissues using transmission electron microscopy
9. methods of visualization of cells and tissues using scanning electron microscopy
10. application of transgenic animals in experimental research
11. processing of images using software ImageJ, generation of image output
12. quantification and statistical analysis

Recommended literature:

Course language:

Notes:
If necessary, subject may be realized in distant form of study.

Course assessment
Total number of assessed students: 0

N	P
0.0	0.0

Provides: RNDr. Anna Alexovič Matiašová, PhD., doc. RNDr. Juraj Ševc, PhD., RNDr. Ján Košuth, PhD.

Date of last modification: 23.06.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ ACM/12	**Course name:** Analytical Cytometry

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

Number of ECTS credits: 4

Recommended semester/trimester of the course:

Course level: II., III.

Prerequisities:

Conditions for course completion:

Learning outcomes:
The goal of the course is to teach the students fundamental theoretical and practical aspects of analytical cytometry. The course covers multiple areas of methods in microscopy with special focus on flurescence and its application in confocal microscopy, morphometric measurements and their applications in cytology, determination of vital parameters and live cell imaging, basic methods for sample preparation etc.

Brief outline of the course:
1.) Fundamentals of fluorescent methods, principles of fluorescence. 2.) Principles of confocal microscopy 3.) Principles of flow cytometry. 4.) Cell sorting. 5.) Analyses on living cells – principles, hardware requirements. 6.) Methods for vital parameters. 7.) Analyses, imaging methods with regard to lipids, cytoskeleton dynamics or cell division. 8.) Fluorescent dyes and their applications in analytical cytometry. 9.) Staining of nucleic acids, lipids, proteins, cytosceleton stainings, visualization of cell organelles. 10.) Vital stainings. 11.) Membrane transport. 12.) Reactive oxygen and nitrogen species (ROS, NOS). 13.) Mitochodrial membrane potential, pH etc.

Recommended literature:
1. R.D. Goldman a kol.: Live Cell Imaging – A Laboratory Manual, Cold Spring Harbour Laboratory Press, 2010
2. J.B. Pawley a kol.: Handbook of Biological Confocal Microscopy, Springer, 2006
3. D. Anselmetti a kol.: Single Cell Analysis, Wiley-Blackwell, 2009
4. A. Hibbs a kol.: Confocal Microscopy for Biologists, Kluwer Academic/Plenum Publishers, 2004

Course language:

Notes:

Course assessment
Total number of assessed students: 36

A	B	C	D	E	FX	N	P
2.78	0.0	0.0	0.0	0.0	0.0	0.0	97.22

Provides: doc. RNDr. Rastislav Jendželovský, PhD.

Date of last modification: 08.09.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚBEV/ AFCM/22	**Course name:** Application of flow cytometry in research

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

Number of ECTS credits: 4

Recommended semester/trimester of the course:

Course level: III.

Prerequisities:

Conditions for course completion:
100% participation. Test from lectures and practicals.

Learning outcomes:
To get acquainted of students with practical aspects of flow cytometry. The course covers the theoretical foundations and practical use of selected methods in the field of scientific research.

Brief outline of the course:
1.) Fluorophores used in cell cycle analysis. 2.) Double staining methods as extensions to cell cycle analysis. 3.) Phosphatidylserine translocation and viability. 4.) Expression and activity of Bcl-2 family members, mitochondrial membrane potential. 5.) Cytochrome c, caspase activity, cleavage of cytokeratin 18. 6.) Fluorophores used in detection of reactive oxygen species. 7.) Methods of evaluation of heterogeneity and resistance of cancer cells: analysis of ABC transporters activity (side population). 8.) Activity of aldehyddehydrogenase. 9.) Immunophenotypisation of heterogeneous populations using CD markers. 10.) Sorting of cell populations using FACS to monitor selected features of cells (single cell cloning, migration). 11.) Flow cytometry in plant cytogenetics: 1. DNA content / genome size determination, applications in evolution, ecology and reproduction biology.
12.) Flow cytometry in plant cytogenetics: 2. Polyploidy at the cellular, tissue and organism level.
13.) Flow cytometry in plant cytogenetics: 3. Flow karyotyping, sizing of chromosomes as initial step towards chromosome sorting and genome sequencing.

Recommended literature:
1. H.M. Shapiro, Practical Flow cytometry, WILEY-LISS, 2003. (ISBN:0-471-41125-6)
2. A.L. Givan, Flow Cytomtery: First principles, WILEY-LISS, 2001, (ISBN 0-471-22394-8)

Course language:
slovak, english

Notes:

Course assessment
Total number of assessed students: 0

N	P
0.0	0.0

Provides: doc. RNDr. Rastislav Jendželovský, PhD., RNDr. Jana Vargová, PhD., Mgr. Vladislav Kolarčik, PhD.

Date of last modification: 08.09.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ AMK/15	**Course name:** Applied Microbiology

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:

Course level: II., III.

Prerequisities:

Conditions for course completion:
Attendance of practicals (at least 90%), final examination

Learning outcomes:
The students will acquire in-depth knowledge on the important role of microoganisms in different fields like food (production of beer, wine, milk products, probiotics), chemical and pharmaceutical industry (production of vitamins, hormones, amino acids, enzymes, comodity chemicals), vaccines and their production, wastewater treatment, as well as microbial bioremediation, biofuels and biomining.

Brief outline of the course:
Application of bacteria in industrial processes, biochemicals production. Application of recombinant DNA techniques in industry. Lactic acid bacteria and its application in food industry. Microbiology in food quality control. Application of microorganisms in environment protection – wastewater treatment, bioremediation, biofuels, microbiology of biogas plants.

Recommended literature:

Course language:

Notes:

Course assessment
Total number of assessed students: 28

A	B	C	D	E	FX	N	P
35.71	28.57	17.86	7.14	0.0	0.0	0.0	10.71

Provides: doc. RNDr. Peter Pristaš, CSc., RNDr. Lenka Maliničová, PhD., RNDr. Jana Kisková, PhD.

Date of last modification: 23.06.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/CK1/03	**Course name:** Cytogenetics and Karyology

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

Number of ECTS credits: 4

Recommended semester/trimester of the course:

Course level: II., III.

Prerequisities:

Conditions for course completion:
written tests, oral examination;
Practicals: The protocols and worksheets from the practical activities or distance learning are required. The e-learning course UBEV/Cytogenetika a karylógia is available in Moodle.

Learning outcomes:
To gain knowledge and experience on genetic processes at the cell level using the newest scientific findings of cytogenetics. To get acquainted in detail with the results and significance of human genome mapping (HUGO project).

Brief outline of the course:
Organisation of eukaryotic genome. Nuclear skeleton. Nucleolus, nucleolar skeleton. Chromatin structure and changes of chromatin. Levels of DNA organisation in cell nucleus. Chromosomes. Polythene chromosomes. Cell cycle. Genetic regulation of a cell cycle. Genetic regulation of cell differentiation. Apoptosis. Telomeres and function of telomerase. Molecular cytology. Basic characteristics of the Human genom project - what we can learn from it?

Recommended literature:
Snustad, P.D., Simmons, M.J.: Principles of Genetics. John Wiley and Sons, 5th edition 2009, 871 pp.
Periodicals
Internet sources

Course language:

Notes:

Course assessment
Total number of assessed students: 1512

A	B	C	D	E	FX	N	P
24.93	15.15	15.61	14.35	18.12	10.91	0.0	0.93

Provides: prof. RNDr. Eva Čellárová, DrSc., doc. RNDr. Katarína Bruňáková, PhD.

Date of last modification: 26.07.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ CTP1/01	**Course name:** Cytopathology

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:

Course level: II., III.

Prerequisities:

Conditions for course completion:
Oral examination

Learning outcomes:
To provide the students with a knowledge of basic biological principles of carcinogenesis.

Brief outline of the course:
Tumor development. Tumor growth and metastatic potential. Cell cycle regulation and pathogenesis of cancer. Apoptosis in tumor growth and metastasis. Oncogenes and cancer. Tumor suppressor genes. Metastasis suppressor genes. Angiogenesis in cancer. Cell surface glycoproteins and their receptors. Proteinases and their inhibitors in cancer invasion. Radio-, chemo- and immunotherapy.

Recommended literature:
Lauren Pecorino: Molecular Biology of Cancer, Mechanisms, Targets, and Therapeutics, Second Edition, Oxford University Press, 2008, ISBN 978-0-19-921148-7
Robert A. Meyers: Cancer, From Mechanisms to Therapeutic Approaches, Wiley-VCH Verlag GmbH & Co. KGaA, 2007, ISBN 978-3-527-31768-4
Robert G. McKinnell et al.: The Biological Basis of Cancers, Second Edition, Cambridge University Press, 2006, ISBN 13: 978-0-521-84458-1
Vincent T. DeVita, Jr, et al.: Cancer Principles & Practice of Oncology, 3rd Edition, Wolters Kluwer/Lippincott Williams & Wilkins, 2012, ISBN 13: 978-1-4511-1639-7
John D. Schuetz and Toshihisa Ishikawa: Adcances in Cancer Research ABC Transporters and Cancer, Elsevier/Academic Press 2015, ISBN 978-0-12-801251-2
Roberto Scatena et al.: Advances in Cancer Stem Cell Biology, Springer, 2012, ISBN 978-1-4614-0808-6, DOI 10.1007/978-1-4614-0809-3

Course language:

Notes:

Course assessment
Total number of assessed students: 355

A	B	C	D	E	FX	N	P
39.44	22.54	21.13	8.45	5.07	1.97	0.0	1.41

Provides: prof. RNDr. Peter Fedoročko, CSc.

Date of last modification: 02.02.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ EMK/15	**Course name:** Environmental Microbiology

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:

Course level: II., III.

Prerequisities:

Conditions for course completion:
Attendance of practicals (at least 90%), final oral examination

Learning outcomes:
To provide students data on participation of microorganisms in biosphere processes, characteristics of most frequently occuring microbial communities and interactions ofmicroorganisms with other organisms.

Brief outline of the course:
Evolution and biodiversity of microorganisms, microorganisms in environment, the influence of abiotic factors on microorganisms, biogeochemical cycles, interactions between microorganisms and other organisms

Recommended literature:
1. BERTRAND, Jean-Claude, et al. (ed.). Environmental microbiology: fundamentals and applications. Dordrecht: Springer, 2015.
2. MITCHELL, Ralph; GU, Ji-Dong (ed.). Environmental microbiology. John Wiley & Sons, 2010.
3. HUDECOVÁ, D.: Mikrobiológia 1. Bratislava: STU, 2002.
4. SCHMIDT, Tom. Topics in ecological and environmental microbiology. Elsevier, 2012.
5. SIGEE, David. Freshwater microbiology: biodiversity and dynamic interactions of microorganisms in the aquatic environment. John Wiley & Sons, 2005.
6. VAN ELSAS, Jan Dirk, et al. Modern soil microbiology. CRC press, 2006.

Course language:

Notes:

Course assessment
Total number of assessed students: 76

A	B	C	D	E	FX	N	P
56.58	21.05	1.32	0.0	2.63	0.0	0.0	18.42

Provides: doc. RNDr. Peter Pristaš, CSc., RNDr. Lenka Maliničová, PhD., RNDr. Mária Piknová, PhD.
Date of last modification: 23.06.2022
Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/FG/14	**Course name:** Functional Genomics

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:

Course level: II., III.

Prerequisities:

Conditions for course completion:
Full-time form of practical teaching: active participation in practicals, practical courses protocols, written exam. In case of distance learning: active participation in practicals (the online method) using the MOODLE course UBEV/FG/14 Funkčná genomika, practical courses protocols, written exam.

Learning outcomes:
Functional genomics attempts to answer questions about the function of DNA at the levels of genes, RNA transcripts, and proteins. A key characteristic of functional genomics studies is their genome-wide approach to these questions, generally involving high-throughput methods rather than a more traditional "gene-by-gene" approach. The outcome of this course will be understanding of the approaches and methods used in functional genomics and their application in research as well as in practice.

Brief outline of the course:
• Introduction to functional genomics, Biological databases and other resources for functional genome analysis, A real-case applications of the functional genomics
• Genome and functional genomics: sequenced model organisms, conceptual and methodological input of genome sequencing, structural vs. functional genome annotation
• Genome-wide reverse genetics: techniques to create collections of genome-wide mutants and their use in functional genomics
• Transcriptomics: methods to obtain transcriptome data, in silico processing of transcriptomic data, differential expression
• Proteomics: methods to obtain proteome data, quantitative vs. qualitative proteomics, data analysis, data mining
• Metabolomics: methods to obtain metabolomic data, quantitative vs. qualitative metabolomics, data analysis, data mining
* Interactomics - protein networks, methods in interactome and signalome studies, data analysis, practical use of the acquired knowledge on interactome and signalome

Recommended literature:
J. Pevsner: Bioinformatics and Functional Genomics, 3rd Edition, ISBN: 978-1-118-58178-0
Internet sources

Course language:
English

Notes:

Course assessment
Total number of assessed students: 146

A	B	C	D	E	FX	N	P
19.18	28.77	26.03	8.22	13.7	1.37	0.0	2.74

Provides: doc. RNDr. Katarína Bruňáková, PhD., RNDr. Linda Petijová, PhD., RNDr. Miroslava Bálintová, PhD., doc. MVDr. Mangesh Bhide, PhD.

Date of last modification: 26.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/GMd/12	**Course name:** Gene manipulations

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: 2.

Course level: III.

Prerequisities:

Conditions for course completion:
Independent elaboration of a poster on a topic related to the subject. Completion of exercises
Oral examination

Learning outcomes:
Obtaining knowledge about cloning and gene expression in various host systems, their use in biotechnological and biological research. Acquisition of knowledge about more complex and latest genetic methods and procedures and their use in solving specific biological problems.

Brief outline of the course:
Cloning and expression of genes in yeast and animal cells. In vitro amplification techniques for DNA and RNA molecules. In vitro mutagenesis. Biotechnology and genetic engineering. Preparation of biologically active substances and recombinant vaccines.

Recommended literature:
BROWN, Terence A. Gene cloning and DNA analysis: an introduction. Wiley-blackwell, 2020.
DALE, Jeremy W.; VON SCHANTZ, Malcolm; PLANT, Nicholas. From Genes to Genomes: Concepts and Applications of DNA Technology. John Wiley & Sons, 2011.
HOWE, Christopher. Gene cloning and manipulation. Cambridge University Press, 2007.

Course language:
English

Notes:

Course assessment
Total number of assessed students: 8

abs	n
100.0	0.0

Provides: doc. RNDr. Peter Pristaš, CSc., RNDr. Mariana Kolesárová, PhD., RNDr. Mária Piknová, PhD.

Date of last modification: 23.06.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: ÚBEV/ GER/22	**Course name:** Genetic and epigenetic regulation of gene expression
Course type, scope and the method: **Course type:** Lecture / Practice **Recommended course-load (hours):** **Per week:** 2 / 0 **Per study period:** 28 / 0 **Course method:** present	
Number of ECTS credits: 3	
Recommended semester/trimester of the course:	
Course level: III.	
Prerequisities:	
Conditions for course completion: Understanding of genetic and epigenetic regulation of gene expression based on recent findings and achievements.	
Learning outcomes: To understand basic differences between genetic and epigenetic regulation of gene expression, to apprehend the fundamentals of regulation in different organisms as revealed by genetic model systems, to become acquainted with future objectives and results of human genome and human epigenome analyses along with other projects as ENCODE or HMP.	
Brief outline of the course: Regulation systems in microorganisms: global regulation, regulation at the transcription level, signal transduction, regulation by ncRNA, feed-back regulation, posttranslational regulation. Eukaryotic regulation systems. Levels of genetic control. Pre-transcriptional and transcriptional levels. Histone modifications, chromatin remodeling. Cis-regulation elements and their interactions with regulation proteins. Project ENCODE (Encyclopedia of DNA elements). Posttranscriptional level. Alternative splicing. Stability and degradation of mRNA. Multipurpose role of ncRNA in posttranscriptional regulation. Epigenetic regulation. DNA methylation and methylome. Methods of analysis of the methylation status. The role of short and long ncRNAs in epigenetic regulation. Epigenetics and monoallelic gene expression. Epigenetic regulation of cancerogenesis. Epigenomic projects. Methods of genome analysis. "OMICS" approaches. CRISPR-Cas and genome editing.	
Recommended literature: Madigan, M. T.: Microorganisms. 16th edition. Pearson Education Lt. 2022, 1123 pp. Klug, W. S.: Concepts of Genetics. 12th edition. Pearson Education Lt. 2020, 862 pp.	
Course language:	
Notes:	

Course assessment
Total number of assessed students: 0

abs	n
0.0	0.0

Provides: doc. RNDr. Peter Pristaš, CSc., prof. RNDr. Eva Čellárová, DrSc., RNDr. Zuzana Jendželovská, PhD.

Date of last modification: 24.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ GMO/22	**Course name:** Genetically modified organisms

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

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: III.

Prerequisities:

Conditions for course completion:
Understanding of the fundamentals of genetic modification, its significance and practical use.

Learning outcomes:
Understanding of the fundamentals and basic principles and significance of genetic modification of organisms and their use in biotechnology.

Brief outline of the course:
Traditional and modern genetic modification. Genetic modification in research. Genetic modification as a tool for study of gene function. Practical aspects of genetically modified organisms. Microorganisms and production of human proteins (Humulin produced by E. coli as an example). Vaccines based on GMO (covid vaccines as an example). Genetic modification of plants (examples of GM tomato FlavrSavr - the first example of anti-sense RNA techniques, golden rice - modification of biosynthetic pathway of carotenoids, genetic modification of cpDNA aimed at production of vaccines and medicines for treatment of metabolic and genetic diseases). Genetically modified animals (goat milk containing human antitrombin as an example). Social and ethical aspects of GMO.

Recommended literature:
Klug, W. S.: Concepts of Genetics. 12th edition. Pearson Education Lt. 2020, 862 pp.
Scientific papers

Course language:

Notes:

Course assessment
Total number of assessed students: 0

abs	n
0.0	0.0

Provides: doc. RNDr. Katarína Bruňáková, PhD., prof. RNDr. Eva Čellárová, DrSc.

Date of last modification: 24.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ GC1/01	**Course name:** Human Genetics

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:

Course level: II., III.

Prerequisities:

Conditions for course completion:
Full-time form of experimental and practical teaching: active participation in practicals, written and oral exam. In case of distance learning: active participation in practicals (the online method) using the MOODLE course UBEV/Human Genetics, written exam.

Learning outcomes:
To provide students with a basics of human genetics, with the role of genetic factors in pathologic processes, with the inheritance, diagnostics and treatment of genetic disorders.

Brief outline of the course:
The genetic basics of physiological variability and pathological traits of individuals; human population genetics; immunological variability; the patterns of inheritance and pedigree problem solving; the basic methods used in human genetics - genealogy, linkage analysis and the gene mapping, cytogenetic analysis and karyotyping, the DNA diagnosis of pathological traits; the treatment of genetic disorders.

Recommended literature:
Friedman JM, Dill FJ, Hayden MR, McGillivray BC (1996): Genetics 2/e. Williams & Wilkins, Baltimore, Maryland, USA
Lewis R.: Human Genetics: Concepts and Applications, 9th Edition. McGraw-Hill, New York, 2010
Passarge E.: Genetics, 3rd Edition, Thieme, 2007

Course language:
slovak and english

Notes:

Course assessment
Total number of assessed students: 1414

A	B	C	D	E	FX	N	P
24.82	14.99	16.55	14.0	18.1	11.03	0.0	0.5

Provides: doc. RNDr. Katarína Bruňáková, PhD.

Date of last modification: 26.11.2021
Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ UFCM/10	**Course name:** Introduction to Flow Cytometry

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

Number of ECTS credits: 4

Recommended semester/trimester of the course:

Course level: II., III.

Prerequisities:

Conditions for course completion:

Learning outcomes:
The goal is to teach the students on II. stage some theoretical and practical aspects of flow cytometry. The course will cover theoretical bases of fluorescence, its detection, multiparametric analyses and practical applications in clinical diagnosis and scientific research.

Brief outline of the course:
1.) Conditions for completing the course, completing training in health and safety regulations. 2.) Fluorescence, types of fluorescent devices, flow cytometer. 3.) Principle of flow cytometry, data presentation, gating strategy. 4.) Particles size in flow cytometry, flow cytometry in cell biology, zoology and microbiology. 5.) Cell sorting. 6.) Cell cycle analysis. 7.) Detection of phosphatidylserine translocation and viability. 8.) Compensation, spectraviewer. 9.) Analysis of mitochondrial membrane potential and activation of caspases. 10.) Detection of stem cells. 11.) Immunophenotyping. 12.) Flow cytometry in botany. 13.) DNA content and genome size. Data evaluation strategies, FlowJo software.

Recommended literature:
1. H.M. Shapiro: Practical Flow Cytometry, WILEY-LISS, 2003. (ISBN:0-471-41125-6)
2. A.L. Givan: Flow Cytomtery: First principles, WILEY-LISS, 2001, (ISBN 0-471-22394-8)
3. J. Dolezel a kol.: Flow Cytometry with Plant Cells, Willey-VCH, 2007, (ISBN: 978-3-527-31487-4)

Course language:

Notes:

Course assessment
Total number of assessed students: 177

A	B	C	D	E	FX	N	P
65.54	5.08	5.65	2.26	1.69	0.0	0.0	19.77

Provides: doc. RNDr. Rastislav Jendželovský, PhD., RNDr. Jana Vargová, PhD., Mgr. Vladislav Kolarčik, PhD.

Date of last modification: 08.09.2021
Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/MOBM/09	**Course name:** Methods in Molecular Biology

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

Number of ECTS credits: 4

Recommended semester/trimester of the course:

Course level: III.

Prerequisities:

Conditions for course completion:

Learning outcomes:
Acquaint the students with modern methods in molecular biology and with their applications in research and to give them practical basics needed for practical work in molecular biology laboratory.

Brief outline of the course:
Basics of laboratory practice for work under sterile/aseptic conditions in cell culture lab, cell culturing of tumour cell lines, methods for isolation of nucleic acids from cells, determination of protein concentration in cell lysates, measurements of enzymatic concentrations. Polymerase chain reaction, Western blot, dot-blot, fluorescent microscopy, flowcytometric analyses of cellular processes (cell cycle, cell death, mitochondrial parameters, proteomic applications).

Recommended literature:
J. Reinders a A.Sickmann: Proteomics: Methods and Protocols (Methods in Molecular Biology), Humana Press, 2009
G. Ecker et al.: Transporters as Drug Carriers: Structure, Function, Substrates: 44 (Methods and Principles in Medicinal Chemistry), Wiley-VCH, 2009
J. Pawley: Handbook of Biological Confocal Microscopy, Springer, 2006

Course language:

Notes:

Course assessment
Total number of assessed students: 32

N	P
0.0	100.0

Provides: Mgr. Martin Panigaj, Ph.D.

Date of last modification: 03.05.2015

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ MOG/03	**Course name:** Model Organisms in Genetics

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:

Course level: II., III.

Prerequisities:

Conditions for course completion:
protocols,
preparation of a project: Model organism for my diploma thesis,
oral examination

Learning outcomes:
To provide the students with genetic models of prokaryotic and eukaryotic organisms used in genetic research.

Brief outline of the course:
Basic properties of model organisms used in genetics. Viral models in genetics (Tobacco mosaic virus, Lambda phage, PhiX174 phage, corona viruses). Prokaryotic model systems (Escherichia coli, Diplococcus pneumoniae, Agrobacterium tumefaciens and A. rhizogenes). Another prokaryotic models (Bacillus subtilis, Caulobacter crescentus, Mycoplasma genitalium, Synechocystis sp.), model systems of simple eukaryotic organisms (Saccharomyces cerevisiae, Neurospora crassa, Aspergillus nidulans, Dictiostelium discoideum). Animal model systems (Drosophila melanogaster, Caenorhabditis elegans, Danio rerio, Mus musculus). Another animal models (Xenopus laevis, Ambystoma mexicanum, Chrysemys picta, Anolis carolinensis, Fugu rubripes, Gallus gallus, Heterocephalus glaber). Plant model organisms (Pisum sativum, Arabidopsis thaliana, Nicotiana tabacum, Zea mays, Selaginella moellendorffii, Brachypodium distachyon, Lotus japonicus, Populus trichocarpa). Genetic databases. Model organisms and their importance in the study of fundamentals of human genetic disorders.

Recommended literature:
Snustad, P.D., Simmons, M.J.: Genetika. Nakladatelství Masarykovy univerzity, Brno, 2009, 871 pp., 2017, 864 pp.
Periodicals in the field of genetics,
Internet sources

Course language:

Notes:

Course assessment
Total number of assessed students: 1493

A	B	C	D	E	FX	N	P
24.45	15.41	15.67	13.93	18.55	11.05	0.0	0.94

Provides: prof. RNDr. Eva Čellárová, DrSc., RNDr. Martina Matoušková, PhD., RNDr. Miroslava Bálintová, PhD., RNDr. Jana Henzelyová, PhD.

Date of last modification: 26.07.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ MMOC/22	**Course name:** Molecular Mechanisms of Mammalian Ontogenesis

Course type, scope and the method:
Course type: Lecture / Practice
Recommended course-load (hours):
Per week: 2 / 0 **Per study period:** 28 / 0
Course method: present

Number of ECTS credits: 3

Recommended semester/trimester of the course:

Course level: III.

Prerequisities:

Conditions for course completion:
Participation in a lectures and passing an exam.

Learning outcomes:
Students will acquire basic knowledge about ontogenetic development in mammals and about developmental molecular and regulatory mechanisms taking part in gametogenesis, fertilization, early embryogenesis (morulation, blastulation, gastrulation) and organogenesis.

Brief outline of the course:
1. Gametogenesis in mammals. Molecular basis and regulation of spermatogenesis and oogenesis.
2. Fertilization and early embryogenesis. Blastulation. Regulation of early embryonic development and polarization of early embryo.
3. Gastrulation. Induction of primitive streak and germ layers. Determination of body axes.
4. Neurulation. Specification and development of nervous system.
5. Somitogenesis, myogenesis and body extension.
6. Organogenesis. Development of sensory organs and epidermis.
7. Organogenesis. Development of cardiovascular system.
8. Organogenesis. Development of urogenital system.
9. Organogenesis. Development of skeletal system and limbs.
10. Organogenesis. Development of digestive and respiratory system.
11. Regeneration, aging and senescence.
12. Developmental deffects and disorders. Genetic errors in development, teratogens, endocrine disruptors.
13. Cancer as a disease of development.

Recommended literature:
Scott F. Gilbert, Michael J.F. Barresi (2016): „Developmental Biology“ (11th edition; Sinauer Associates, Inc.)

Course language:
english

Notes:

Course assessment Total number of assessed students: 0	
N	P
0.0	0.0
Provides: doc. RNDr. Zuzana Daxnerová, CSc., RNDr. Zuzana Jendželovská, PhD.	
Date of last modification: 10.09.2021	
Approved:	

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/MCYT/22	**Course name:** Molecular cytology

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

Number of ECTS credits: 4

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

Course level: III.

Prerequisities:

Conditions for course completion:
100% participation. Test from lectures and practicals.

Learning outcomes:
To get acquainted of students with molecular level of key processes taking place in the eukaryotic cell.

Brief outline of the course:
1.) Methods applied in molecular cytology. 2.) Organisation at the level of supramolecular complexes, cell structures and cells. 3.) Composition, structure and organisation of biological membranes. 4.) Cell cycle. 5.) Cell division. 6.) Mechanisms of substance transfer across membranes. 7.) Transport of substances into cells. 8.) Metabolism of substances. 9.) Transport of substances from cells. 10.) ABC transport proteins. 11.) Exosomes. 12.) Antioxidant systems of cells. 13.) Stress proteins of cells. Signaling pathways involved in cell survival. Signaling pathways leading to programmed cell death.

Recommended literature:
Wilson J. and Hunt T. Molecular Biology of The Cell: a problems approach, fourth edition, Garland Science, 2002
Campbell N. a Reece J.: Biologie. Computer Press, 2006
Karp G.: Cell Biology, sixth edition, John Wiley and Sons, 2010

Course language:
slovak english

Notes:

Course assessment
Total number of assessed students: 0

N	P
0.0	0.0

Provides: doc. RNDr. Rastislav Jendželovský, PhD.

Date of last modification: 08.09.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: KPE/ PgVU/17	**Course name:** Pedagogy for University Teachers

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

Number of ECTS credits: 5

Recommended semester/trimester of the course:

Course level: III.

Prerequisities:

Conditions for course completion:
1. Development of a teaching diary—100%
2. Compulsory active participation and attendance in accordance with the Study Regulations.

Learning outcomes:
Students will be able to:
Apply didactic principles, methods, forms, and tools in the teaching of a specialised subject. Specify the educational procedures of a university teacher in subject teaching, pedagogical diagnostics, evaluation of learning outcomes, and self-reflection. Present rationalisation and streamlining possibilities in the teaching of specialised subjects. Apply educational competencies of university teachers taking into account the peculiarities of educating university students.

Brief outline of the course:
The personality of a university teacher. Teaching styles. Student in university education. Student learning styles. Possibilities of adapting teaching styles and student learning styles. University teacher–student interaction and communication in the teaching process. Pedagogical competencies of a university teacher. Didactic analysis of the curriculum; teaching materials and textbooks. Forms of university teaching. Methods of university teaching. Verification methods and student assessment. Creation of a didactic test. Designing university teaching process. University teacher self-reflection.

Recommended literature:
Čapek, R. (2015). Moderní didaktika. Lexikon výukových a hodnoticích metod. Praha, Grada Publishing, a.s.
Danek, J. (2014). Pedagogická komunikácia na vysokej škole. Trnava, Univerzita sv.Cyrila a Metoda v Trnave.
Dargová, J. (2001). Tvorivé kompetencie učiteľa. Prešov, Privat Press.
Dvořáček, J. (2014). Základy pedagogiky. Praha, Oeconomica.
Hupková, M., Petlák, E. (2004). Sebareflexia a kompetencie v práci učiteľa. Bratislava, IRIS.
Kyriacou, CH. (1996). Klíčové dovednosti učitele. Praha, Portál.
Mertin, V. a kol. (2012). Metody a postupy poznávaní žáka: pedagogická diagnostika. Praha, Wolters Kluwer.
Petty,G. (2013). Moderní vyučování. Praha, Portál.

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

Course language:
slovak

Notes:

Course assessment
Total number of assessed students: 47

abs	n	neabs
100.0	0.0	0.0

Provides: doc. PaedDr. Renáta Orosová, PhD.

Date of last modification: 07.09.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/FARM/09	**Course name:** Pharmacology

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

Number of ECTS credits: 8

Recommended semester/trimester of the course:

Course level: III.

Prerequisities:

Conditions for course completion:

Learning outcomes:
To provide students with a comprehensive introduction to the fundamental Pharmacology and uses of the major classes of drugs currently used in medical practice.

Brief outline of the course:
Basic pharmacology (pharmacokinetic and pharmacodynamic principles), factors influencing drug effects, routes of drug application.
Special pharmacology including drugs affecting the autonomic nervous system, myorelaxants and ganglioplegic drugs, drugs affecting CNS (drugs used to treat psychiatric disorders, antiepileptics, antiparkinson drugs, hypnotics).

Recommended literature:
Finkel et al.: Lippincott´s Illustrated reviews: Pharmacology 4th edition, Wolters Kluwer, 2009, pp. 564.

Course language:

Notes:

Course assessment
Total number of assessed students: 37

N	P
0.0	100.0

Provides: prof. MVDr. Ján Mojžiš, DrSc., MUDr. Iveta Radváková, PhD.

Date of last modification: 03.05.2015

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ BTR1/06	**Course name:** Plant Biotechnology

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

Number of ECTS credits: 6

Recommended semester/trimester of the course:

Course level: I., II., III.

Prerequisities:

Conditions for course completion:
Active participation at the practicals, protocols, oral examination

Learning outcomes:
To gain theoretical and practical knowledge on plant tissue culture in vitro.

Brief outline of the course:
Definition and history of plant biotechnology. Aseptic techniques, culture conditions. Micropropagation, types of plant explant cultures used in biotechnology. Somatic hybridization and embryogenesis, direct and indirect organogenesis. Somaclonal varation. Secondary metabolites production, bioreactors, biotransformation, immobilization and elicitation. Genetic transformation, direct and indirect methods of transformation. Types of vectors, promotors, selection markers and reporter genes used in plant transformation. Germplasm storage, gene banks. Cryopreservation and slow growth method. Genetically modified organisms - metabolic engineering, genetic engineering, plants resistant to biotic and abiotic stresses, molecular farming, the role of tissue and organ specific plant promoters, plastome engineering, plant-based edible vaccines. RNA silencing, the application of microRNAs in plant biotechnology.

Recommended literature:
Abdin M.Z., Kiran U., Kamaluddin M., Ali A. (eds.): Plant Biotechnology: Principles and Applications. 2017, Springer Nature Singapore Pte Ltd., Singapore
Chawla H.S.: Introduction to Plant Biotechnology. 2009, third edition, Science Publisher, Enfield, USA
Periodicals and Internet sources

Course language:

Notes:

Course assessment
Total number of assessed students: 174

A	B	C	D	E	FX	N	P
40.8	18.39	12.64	9.77	10.34	2.87	0.0	5.17

Provides: RNDr. Miroslava Bálintová, PhD., prof. RNDr. Eva Čellárová, DrSc., RNDr. Jana Henzelyová, PhD.
Date of last modification: 02.02.2021
Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ GEP/12	**Course name:** Population Genetics

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

Number of ECTS credits: 4

Recommended semester/trimester of the course:

Course level: II., III.

Prerequisities:

Conditions for course completion:
Full-time form of teaching: active participation in practicals, written and oral exam. In case of distance learning: active participation in practicals (the online method), practical courses protocols, written exam using the tests prepared in the MOODLE course UBEV/GEP/12 Genetika populácií.

Learning outcomes:
Acquire knowledge about genetic interactions in population. Describe the theoretical and historical ground of population genetics. Identify, characterize and compare fundamental mechanisms (mutation, selection, migration, genetic drift). Interactions leading to intra- and interpopulation variability in population structure. Genetic diversity analysis.

Brief outline of the course:
Factors affecting populations. Genetic variability in populations. Polymorphism, heterozygosity. Fundamental models in population genetics. Hardy-Weinberg theorem for 2, 3 and n alleles. Special cases of random mating (Bruce's genotype ratios, Sex-linked genes). Population genetics and mutations. Assortative mating, calculation and interpretation of inbreeding coefficient. Genetic drift, fixation/elimination of alleles in small populations. One-way, two-way migration. Natural selection in haploid and diploid populations. Populations of plants, animals and human. Darwin's evolution theory, molecular evolution.

Recommended literature:
HALLIBURTON. R. (2004): Introduction to Population Genetics. Pearson Prentice Hall.
HARTL, D. L. and CLARK, A. G. (2007): Principles of Population Genetics. 4th ed. Sinauer.
RELICHOVÁ, J. (2001): Genetika populací. Masarykova univerzita Brno.
Hedrick, P.W.: Genetics of Populations. Jones and Bartlett Publishers 2000.

Course language:

Notes:

Course assessment
Total number of assessed students: 1258

A	B	C	D	E	FX	N	P
19.55	14.86	15.02	16.53	21.14	12.16	0.0	0.72

Provides: RNDr. Linda Petijová, PhD., doc. RNDr. Katarína Bruňáková, PhD.

Date of last modification: 26.11.2021

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice	
Faculty: Faculty of Science	
Course ID: KPPaPZ/PsVU/17	**Course name:** Psychology for University Lecturers

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

Number of ECTS credits: 5

Recommended semester/trimester of the course:

Course level: III.

Prerequisities:

Conditions for course completion:
Case study, micro-output, its analysis
Current modifications of the course are listed in the electronic bulletin board of the course.

Learning outcomes:
After completing the course, students can:
and Understand, summarize and explain selected psychological knowledge from cognitive psychology, emotion and motivation psychology, personality psychology, developmental, social, educational psychology and health psychology.
b) apply the above psychological knowledge necessary for the professional, competent performance of university teaching practice of doctoral students
c) to create and implement the teaching of a professional topic with applied psychological knowledge
d) evaluate their performance and the performance of their classmates, provide feedback

Brief outline of the course:
The content of the course is based on selected psychological knowledge of cognitive psychology, psychology of emotions and motivation, personality psychology, developmental, social, educational psychology and health psychology. Teaching is realized by a combination of lectures with interactive, experiential methods, discussion, open communication with mutual respect, support of independence, activity and motivation of students. Syllabus: University teacher and his work in the teaching process with a focus on: teachers in relation to themselves (cognitive, personal, social and competencies in the use of methods), in relation to students and as part of the teacher-student relationship on the basis of selected areas of cognitive psychology, psychology of emotions and motivation, developmental psychology, social psychology, educational psychology and health psychology with application to the university environment

Recommended literature:
Alexitch, L. R. (2005). Applying social psychology to education. Social Psychology.–Ed.: Schneider F., Gruman J., Coutts L.–Sage Publications, Inc, 205-228.
Fry, H., Ketteridge, S., & Marshall, S. (2008). A handbook for teaching and learning in higher education: Enhancing academic practice. Routledge.
Mareš, J.: Pedagogická psychologie. Portál, 2013.

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

Course language:
slovak

Notes:

Course assessment
Total number of assessed students: 52

abs	n	neabs
100.0	0.0	0.0

Provides: PhDr. Anna Janovská, PhD.

Date of last modification: 24.06.2022

Approved:

COURSE INFORMATION LETTER

University: P. J. Šafárik University in Košice

Faculty: Faculty of Science

Course ID: ÚBEV/ MEVP/22	**Course name:** Research Methodology and Ethics

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

Number of ECTS credits: 2

Recommended semester/trimester of the course:

Course level: III.

Prerequisities:

Conditions for course completion:
To learn the fundamentals of scientific methodology and ethical principles.

Learning outcomes:
To learn the fundamentals of scientific methodology and ethical principles in scientific research..

Brief outline of the course:
Science and research. Definition of science. Fundamental features of science (empirical, objective, self-correcting based on newest proofs, progressive). Definition of research. Basic features of research (controllable, rigorous, systematic, verifiable, empirical, critical). Basic principles of research, induction and deduction. Scientific research. Classification (fundamental, strategic, applied). Scientific methodology: problem identification, formulation of hypothesis, experimental design, observation and experiment, data analysis, hypothese testing, theory formulation, pre-design of perspectives in the given area. Ethical aspects of scientific work (code of conduct, student code of conduct) and publishing (good practise of scientific publishing, considering of plagiarism). Ethical and legislative aspects of biological research (work with laboratory animals, work with GMO).

Recommended literature:
Laake P. et al.: Research Methodology in the Medical and Biological Sciences. eBook ISBN: 9780080552897, 2007

Course language:

Notes:

Course assessment
Total number of assessed students: 0

abs	n
0.0	0.0

Provides: doc. RNDr. Katarína Bruňáková, PhD., prof. RNDr. Eva Čellárová, DrSc., prof. RNDr. Peter Fedoročko, CSc., doc. RNDr. Monika Kassayová, CSc.

Date of last modification: 24.11.2021

Approved: