University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

List of information sheets for the doctoral study program molecular biology

Study and pedagogical-educational activities:

1. Doctoral student's own pedagogical activity I-VII
2. Supervision of the final bachelor's thesis
3. Elaboration of an opinion for the final work
4. Authorship or co-authorship in the creation of teaching materials
5. **Independent study of professional literature according to the recommendation of the supervisor I, II***
6. Supervising the work presented at the student scientific conference
7. Dissemination and application of the results of science and technology in practice

Compulsory subjects:

8. Dissertation state exam
9. Dissertation defence
10. **Methods of molecular biology**
11. **Professional English for doctoral students**

Compulsory optional subject:

12. **Genomics for doctoral students**
13. **Proteomics for doctoral students**
14. **Molecular biology for doctoral students**
15. Agricultural biotechnologies for doctoral students
16. **Functional analysis of proteins and modelling**
17. Reproductive biology of higher plants
18. **Selected chapters on the physiology and molecular biology of plant stress**

Creative activity:

19. **First-author publication in a scientific journal registered in the Web of Science databases and included in Q1 according to JCR IF**
20. **Publication in a scientific journal registered in the Web of Science databases and included in Q1 according to JCR IF**
21. **First-author publication in a scientific journal registered in the Web of Science databases and included in Q2 according to JCR IF**
22. **Publication in a scientific journal registered in the Web of Science databases and included in Q2 according to JCR IF**
23. **First-author publication in a scientific journal registered in the Web of Science databases and included in Q3 according to JCR IF**
24. **Publication in a scientific journal registered in the Web of Science databases and included in Q3 according to JCR IF**
25. **Publication in a scientific journal registered in the Web of Science databases and included in Q4 according to JCR IF**
26. **Publication in a scientific journal registered in the Web of Science or Scopus databases without inclusion in Q1-Q4 in JCR IF**
27. Other creative activity

***** the profile subjects are marked in bold

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

Study and pedagogical-educational activities

Doctoral student's own pedagogical activity I-VII
Supervision of the final bachelor's thesis
Elaboration of an opinion for the final work
Authorship or co-authorship in the creation of teaching materials
Independent study of professional literature according to the recommendation of the supervisor I, II*
Supervising the work presented at the student scientific conference
Dissemination and application of the results of science and technology in practice

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Doctoral student's own pedagogical activity I-VII

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Doctoral student's own pedagogical activity I-VII
Subject type (C, CO, O): Compulsory subject; usually 4 hours a week. The activity takes place in the form of attendance.	
Number of credits: 5 credits per semester	
Recommended semester/trimester of study: 1-7 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent work under the guidance of the subject guarantor.	
Educational outcomes: The student acquires: • pedagogical practice by conducting laboratory exercises under the supervision of the subject guarantor. • The pedagogical activity also gives the student the experience of performing in front of the audience, which provides the student with the self-confidence and certainty of performing in active participation (lectures) in scientific conferences.	
Brief content of the subject: Within the study and pedagogical-educational part, the doctoral student completes selected activities for which he/she obtains credits: 1. doctoral student's own pedagogical activity I 2. doctoral student's own pedagogical activity II 3. doctoral student's own pedagogical activity III 4. doctoral student's own pedagogical activity IV 5. doctoral student's own pedagogical activity V 6. doctoral student's own pedagogical activity VI 7. doctoral student's own pedagogical activity VII	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc.	
Date of last change: 30 March 2022	
Approved: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Supervision of the final bachelor's thesis
Supervising the work presented at the student scientific conference
Dissemination and application of the results of science and technology in practice

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Supervision of the final bachelor's thesis; Supervising the work presented at the student scientific conference; Dissemination and application of the results of science and technology in practice
Subject type (C, CO, O): optional subject	
Number of credits: 5	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent activity under the guidance of a PhD-supervisor – the consultant of the bachelor thesis.	
Educational outcomes: The doctoral student acquires: • pedagogical practice by leading and directing a bachelor's student aspiring for the bachelor title during the solution of his/her bachelor's thesis.	
Brief content of the subject: Within the study and pedagogical-educational part, the doctoral student completes selected activities for which he/she obtains credits for supervision of the final work of a bachelor student 1. Supervision of the final bachelor's thesis 2. Supervising the work presented at the student scientific conference 3. Dissemination and application of the results of science and technology in practice	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: PhD-supervisor	
Date of last change: 30 March 2022	
Approved: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Authorship or co-authorship in the creation of teaching materials

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Authorship or co-authorship in the creation of teaching materials
Subject type (C, CO, O): optional subject	
Number of credits: 5	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent activity under the guidance of the author of the published teaching material.	
Educational outcomes: The student gains • experience with the processing of the textbook, the selection of appropriate content and its processing in terms of both content and form.	
Brief content of the subject: Within the study and pedagogical-educational part, the doctoral student completes selected activities for which he/she obtains credits for authorship or co-authorship in the creation of teaching materials.	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: subject guarantor	
Date of last change: 30 March 2022	
Approved: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Elaboration of an opinion for the final work

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Elaboration of an opinion for the final work
Subject type (C, CO, O): optional subject	
Number of credits: 3	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent work under the guidance of the PhD-supervisor.	
Educational outcomes: The student gains: • experience with the evaluation of final theses on the basis of criteria for writing qualification final theses at UCM. • experience that can help and guide him/her in writing his/her own dissertation.	
Brief content of the subject: Within the study and pedagogical-educational part, the doctoral student completes selected activities for which he/she obtains credits for elaboration of an opinion for the final work.	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: PhD-supervisor	
Date of last change: 30 March 2022	
Approved: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Independent study of professional literature according to the recommendation of the supervisor I, II

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Independent study of professional literature according to the recommendation of the supervisor I, II
Subject type (C, CO, O): compulsory subject, profile subject	
Number of credits: 5	
Recommended semester/trimester of study: 1-4 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent work under the guidance of the PhD-supervisor.	
Educational outcomes: The student • acquires the ability to search for and process professional literature on the topic of the dissertation. • will be able to use the acquired and studied literary sources in the elaboration of the literature overview, the design of the experimental part of the work, in the evaluation of the results and in the discussion of the results within the experimental part of the work.	
Brief content of the subject: Within the study and pedagogical-educational part, the doctoral student completes selected activities for which he/she obtains credits for: (i) independent study of professional literature according to the recommendation of the supervisor I; and (ii) independent study of professional literature according to the recommendation of the supervisor II.	
Recommended literature: literary sources according to the assignment of the dissertation topic	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc.	
Date of last change: 30 March 2022	
Approved: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

Compulsory subjects:

Dissertation state exam
Dissertation defence
Methods of molecular biology
Professional English for doctoral students

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Dissertation state exam

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Dissertation state exam
Subject type (C, CO, O): compulsory subject of state exam	
Number of credits: 30	
Recommended semester/trimester of study: 4th semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: The student will prepare a written work for the dissertation exam. He/she will use literary sources that he/she studied and are related to the topic of the dissertation. The student will present the goals of the dissertation and defend them. The student takes an exam by answering questions related to the topic of the dissertation. The course of the dissertation examination is evaluated by the commission comprehensively by a statement "passed" or "failed" in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava.	
Educational outcomes: • The student has deep theoretical knowledge of subjects related to the topic of the dissertation. • He/she has a good overview of the current state of the issues addressed in the dissertation. • The student can perform a thorough literature research, understands professional texts in both Slovak and English languages. • He/she is able to apply the knowledge gained during the study. • The student can formulate the goals of the dissertation. • He/she can write the written work for dissertation exam.	
Brief content of the subject: Elaboration of literature research by collection of scientific texts. Written elaboration of an overview of the current state of the problem at home and abroad. Detailed formulation of dissertation goals. Choice of theoretical approach to solving the goals of the dissertation. Elaboration of a written work for the dissertation exam and its defense. Dissertation exam.	
Recommended literature: literary sources according to the assignment of the dissertation topic	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: state examination commission	
Date of last change: 30 March 2022	
Approved: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Dissertation defence

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Dissertation defence
Subject type (C, CO, O): compulsory subject of state exam	
Number of credits: 30	
Recommended semester/trimester of study: 8th semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Elaboration of dissertation work (the PhD-Thesis). The course of the defence of the dissertation is evaluated by the commission comprehensively by the statement "passed" or "failed" in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava.	
Educational outcomes: • The student has deep theoretical knowledge of subjects related to the topic of the dissertation and practical laboratory skills. • The student has an overview of the current state of the issues at home and abroad related to the topic of the dissertation. • He/she can independently solve current scientific issues. • He/she is able to critically analyze, evaluate and synthesize new concepts. • He/she can present and defend his/her own results as well as can think in a broader context. • The student can suggest practical use of results.	
Brief content of the subject: Defending theoretical and practical results. Scientific debate on the topic of the dissertation.	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: state examination commission	
Date of last change: 30 March 2022	
Approved: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Methods of molecular biology

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Methods in molecular biology
Type, scope, and method of educational activities: Compulsory subject. **Profile subject.** **Subject type (C, CO, O):** C **Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars **Study method:** on-site **Study form:** full-time study	
Number of credits: 10	
Recommended semester/trimester of study: 1-2 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: i) Participation in teaching in accordance with the UCM Study Regulations in Trnava; ii)Preparation and presentation (powerpoint) of a current topic in the field of molecular biology; iii)Active participation in seminars, asking questions about presentations, discussion (consideration in the overall evaluation of the course); iv)Written exam	
Educational outcomes: Upon successful completion of the course, the doctoral student • will improve and expand their knowledge in the methodological approaches • principles of contemporary molecular biology with the possibilities of their applications in several disciplines and in practice.	
Brief content of the subject: 1. Methods of preparation of recombinant DNA molecules, cloning into plasmid vectors, isolation and characterization of cloned genes, methods of searching for cloned genes, restriction analysis of recombinant plasmids 2. Polymerase chain reaction (PCR), reverse transcription (RT), preparation of cDNA using specific or random primers 3. Various modifications of (RT) -PCR and their use in diagnostics (nested PCR, cooperative PCR ...) 4. Real time PCR, comparison of different systems (Taqman, Sybr Green ...), quantification using qPCR, use and application in practice 5. Loop-mediated isothermal amplification (LAMP), principles of isothermal amplification, design of suitable primers, application of LAMP in molecular diagnostics of pathogens 6. Electrophoretic separation of nucleic acids, DNA visualization, restriction fragment length polymorphism (RFLP), short tandem repeats (microsatellites) 7. DNA microarray, microchipping, fluorescent labeling of DNA fragments, hybridization with microchip, microchip scanning, data analysis 8. DNA sequencing using Sanger dideoxy method, bioinformatics data processing, phylogenetic analysis 9. Work with public databases of sequence data, blast analysis, CDD search, sequence comparison 10. ELISA and its various modifications (double antibody sandwich, triple antibody sandwich, plate trapped antibody ...), immunoblot 11. Massive parallel sequencing (second and third generation sequencing), principles and use of different platforms, preparation of templates (siRNA, dsRNA, total RNA / DNA) and sequencing libraries	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

12. Bioinformatics processing of NGS sequence data using appropriate programs
13. Study of DNA-protein interactions (DNA-protein, protein-protein), two-hybrid systems

Recommended literature:

Clark, D.P., Nanette Pazdernik, N., McGehee, M. (2019). Molecular biology, 3er Edition. Elsevier, Academic Cell; ISBN: 978-01-281-3289-0
Pastoráková, A., Petrovič, R. (2016): Molekulárne metódy aktuálne používané v klinickej genetike. LF UK Bratislava, ISBN 978-80-223-4231-5
Šmarda a kol. (2010): Metody molekulární biologie. Masarykova Universita VBrno, ISBN 978-80-210-3841-7

Language, knowledge of which is necessary to complete the subject: Slovak, English

Subject evaluation

Passed	Not passed
0.00	0.00

Notes: - student time load:

Teacher: lectures/consultations/seminars: Ing. Miroslav Glasa, DrSc.

Date of last change: 30 March 2022

Approved: Prof. RNDr. Juraj Krajčovič, CSc.

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
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SUBJECT INFORMATION SHEET

Professional English for doctoral students

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Professional English for doctoral students
Type, scope, and method of educational activities: Compulsory subject **Subject type (C, CO, O):** C **Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars **Study method:** on-site **Study form:** full-time study	
Number of credits: 10	
Recommended semester/trimester of study: 1-4 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	

Conditions for completing the subject:

Students are evaluated on the basis of the portfolio they create from the outputs during the semester and defend at the final colloquium. They develop, submit and defend:

- Extended abstract for a scientific conference at the proceedings of abstracts.
- Reaserch paper from the field of studies usually related to the topic of the dissertation project in the IMRAD international standard structure within the range of three to five pages. (It can be an already published article in co-authorship, partial information about the research in the diploma thesis given in the form of a scientific article, an extended article from the student research conference, etc.).
- Scientific poster in PDF format. It can be thematically identical to the scientific paper.
- Multimedia PowerPoint presentation or video-presentation (according to the methodological topic) in the range of 8-10 minutes (it can also be thematically identical to the paper and the poster). In the case of contact teaching, an oral presentation with PowerPoint support.
- Academic curriculum vitae in Europass and alternative format, and cover letter such as a simulated internship (grant, job, etc.) application.

Written outputs make a part of the final evaluation in the range - 60%, Oral presentation of a scientific topic with PowerPoint support - 40%.

Educational outcomes:

Upon successful completion of this course, students gain:

Knowledge:

- can define and distinguish genres of scientific communication (research paper, poster, presentation, research report, etc.),
- knows grammatical, syntactic, phraseological peculiarities of genres, lexicon of the scientific-research environment,
- know general and professional vocabulary, synonyms, homonyms, antonyms, neologisms, internationalisms, multiword terms, composites, etc., which they use in making own speeches,
- know the morphematic structure of the word and the principles of word formation in English and can apply them when translating from and into English,
- knows and are able to apply academic discourse and the specifics of academic English.

Skills:

- can handle different types of multilingual dictionaries and professional glossaries,

- acquire specific language means and speech skills necessary for the development of advanced communication competences and cultural and social habits in the preparation for an international scientific event,
- are able to work with professional literature sorces, manage work with digital media and can select relevant information sources,
- have skills in creating effective PowerPoint slides to support the presentation of research results,
- an and graphically and grammatically correctly develop a scientific poster, use several software applications for its creation,
- can interpret graphs, diagrams, schemes, tables, pictograms and symbols, and apply them in scientific texts,
- practically elaborate an academic CV and cover letter.

Professional competencies:

- can flexibly apply the acquired language and communication skills and competencies in the target professional environment,
- can effectively use specialized monoôingual and bilingual dictionaries in practice,
- can work with authentic English professional text,
- master the language portfolio of phraseologisms for communication in the target professional environment.

Transferable competencies:

- know the specifics of the multicultural international academic environment and intercultural differences,
- acquire strong communication competencies for the international academic and scientific environment,
- are able to present the results of reaserch work at home and abroad.
- can work with information and communication technologies, apply software solutions for the creation of academic texts and outputs,
- handle verbal and nonverbal academic discourse.

Brief content of the subject:

Lectures:

1. Introduction to the subject. Instruction on access to databases and study literature. Characteristics of the scientific field and study discipline, glossary of academic terms. English - the language of science.
2. Working with professional English text, reading comprehension, horizontal and vertical division of the text (skimming, scanning, reading for information), making notes from the heard content.
3. Work with professional English text, translation strategies. Characteristics of the monolingual and bilingual printed, electronic and online dictionaries. Principles of work with and effective use of dictionaries.
4. Academic writing. Abstract, types of abstracts, principles of abstract writing.
5. Academic writing. Research paper, structure of a research paper according to international standards (IMRAD).
6. Academic writing. Stylistic and morphological-syntactic characteristics of research paper writing (title, keywords, abstract, introduction, material and methods, discussion, conclusion). Citation standards.
7. Scientific poster and poster presentation. Principles of design, the most common styles and structure of a scientific poster.
8. Presentation - principles of effective scientific presentation. Structure and language of the presentation. Communication models, verbal and nonverbal communication, interaction with the audience.
9. Presentation - principles of creating effective PowerPoint slides. Technical, graphic, language and content principles of creating PPT images.

10. Graphical expression of research data - graphs, diagrams, schemes, tables. Reading information from graphs and tables. Their inclusion in the text of a scientific article and in a poster.
11. Academic CV and cover letter. Characteristics of genres and their specifics in the academic environment.
12. Written and oral communication in the academic environment. Communication via electronic media (e-mail, internet). Language specifics of writing an e-mail message. Email label. Communication in a multicultural academic environment, intercultural differences. Conference environment and conference etiquette.

Seminars:

1. Panel discussion and assignment of parameters to written and oral presentations (abstract, research paper and scientific poster, CV and cover letter, professional presentation with the support of PPT). Specifics of English academic terminology, differences between Slovak and English, academic degrees in English.
2. Practical application of reading comprehension skills and recording spoken / listened information.
3. Practical examples in the translation of a selected professional text. The most common mistakes when translating from and into English. Short text translation and translation analysis - group work.
4. Work with authentic materials from the academic and scientific environment (scientific proceedings, scientific journals), study and comparison of compliance with international standards. Practical exercises on the topic.
5. Practical demonstrations and exercises: Title writing, choice of keywords, the difference between abstract, introduction and summary. Writing active and passive sentence constructions. Analysis of linguistic errors in sentences in individual parts of a scientific article.
6. Demonstrations and work with software applications in designing a scientific poster, graphic design, work with templates. Stylistic and linguistic differences between the poster text and the research paper.
7. Panel discussion about presentations, practical language exercises for the development of the language of presentation (signposting language).
8. Practical application of theoretical principles in the creation of effective PPT images in the presentation of the research report.
9. Verbal interpretation of graphs - expressing development, trends, changes and proportions. Practical application of professional lexicon.
10. Online academic CV writing in Europass CV format.
11. Practical experience from the use of electronic communication media in academic communication. Samples of correct and incorrect communication etiquette. Discussion of multiculturalism and intercultural differences in the academic and conference environment.
12. Final colloquium, defense and evaluation of student portfolio.

Recommended literature:

ARMER, T. 2011. Cambridge English for Scientists. Cambridge University Press, 2011. ISBN: 9780521154093

BRISCOE, MARY H. 1996. Preparing Scientific Illustrations: A Guide to Better Posters, Presentations, and Publications. Springer-Verlag New York. ISBN: 978-0-387-94581-1

DAVIS, M.- KAARON, J.D. - DUNAGAN, M. 2012. Scientific Papers and Presentations. Academic Press; 3rd edition. ISBN: 0123847273. Dostupné na: https://www.sciencedirect.com/book/9780123847270/scientific-papers-and-presentations

MCCARTHY, M. - O'DELL, F. 2016. Academic Vocabulary in Use Edition with Answers. Cambridge University Press; 2nd edition, 2016. ISBN: 9781107591660

ŠTEPÁNEK, L., J. - DE HAFF a kol. 2011. Academic English - Akademická angličtina. Průvodce anglickým jazykem pro studenty, akademiky a vědce. Grada Publishing, a.s., 2011. ISBN: 9788024735771

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

WALLWORK, A. 2016. English for Presentations at International Conferences. Springer International Publishing, 2016. ISBN: 978-3-319-26328-1.
Language, knowledge of which is necessary to complete the subject: English
Subject evaluation

Passed	Not passed
0.00	0.00

Notes:
Teacher: lectures/consultations/seminars: Assoc. Prof. PaedDr. Juraj Miština, PhD./ Mgr. Gabriela Chmelíková, PhD.
Date of last change: 30 March 2022
Approved: Prof. RNDr. Juraj Krajčovič, CSc.

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

Compulsory optional subject:

Genomics for doctoral students
Proteomics for doctoral students
Molecular biology for doctoral students
Agricultural biotechnologies for doctoral students
Functional analysis of proteins and modelling
Reproductive biology of higher plants
Selected chapters on the physiology and molecular biology of plant stress

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Genomics for doctoral students

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Genomics for doctoral students
Type, scope, and method of educational activities: Compulsory optional subject, profile subject **Subject type (C, CO, O):** CO **Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars **Study method:** The educational activity is carried out by the presence method **Study form:** full-time study	
Number of credits: 10	
Recommended semester/trimester of study: semester 1-3	
Level of study: PhD.	
Prerequisite subjects: without prerequisites	
Conditions for completing the subject: Elaboration of work on a given topic in the field of genomics (40% points), presentation and discussion of the work (40% points), answering questions testing knowledge related to the genomics (20% points).	
Educational outcomes: The student will gain knowledges: - new knowledges in molecular biology, genetics, biochemistry and genomics, - about new trends and practices in molecular biology, genomics and medicine, - about new methods in the study and analysis of biological systems, - about the possibilities of the graduate's application in scientific or diagnostic practice and the solution of practical tasks.	
Brief content of the subject: 1. Methods of comparative and evolutionary genomics 2. Methods of functional genomics and transcriptomics 3. DNA microchip technologies and their use in practice 4. Analysis of genetic transformation, gene expression 5. Personalized genomic medicine 6. CRISPR-CAS9 technology and its use 7. Use of stem cells in biology and regenerative medicine 8. Technologies of massive parallel sequencing of genomes - 2nd generation of sequencing 9. Whole-molecule sequencing technologies - 3rd generation of sequencing 10. Technologies of whole-molecule massive parallel sequencing - 4th generation of sequencing 11. Genomic databases 12. Bioinformatics procedures in genomic technologies 13. Metagenomic and epigenomic approaches and their use	
Recommended literature: J. Radvánszky, T. Szemes: Úvod do biomedicínskych aplikácií vysokoparalelného sekvenovania. Bratislava, CVTI SR, 2021, ISBN 978-80-89965-89-2 Next Generation Sequencing: Advances, Apeditor. Rijeka (HR): InTech; 2016 Jan 14. Applications and Challenges [Internet]. Kulski JK Arthur M Lesk, A. M.: Introduction to Genomics. Oxford University Press, 2012 Pevsner, J.: Bioinformatics and Functional Genomics, Wiley-Blackwell, 2015 Review publications from research journals.	
Language, knowledge of which is necessary to complete the subject: English	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

Subject evaluation			
	Passed	Not passed	
	0.00	0.00	
Notes: student time load:			
Teacher: lectures/consultations/seminars: RNDr. Michal Konečný, PhD.			
Date of last change: 31. 3. 2022			
Approved: prof. RNDr. Juraj Krajčovič, CSc.			

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Proteomics for doctoral students

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Proteomics for doktoral students
Type, scope, and method of educational activities: Compulsory optional subject, profile subject **Subject type (C, CO, O):** CO **Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars **Study method:** The educational activity is carried out by the presence method **Study form:** full-time study	
Number of credits: 10	
Recommended semester/trimester of study: semester 1-3	
Level of study: PhD.	
Prerequisite subjects: without prerequisites	
Conditions for completing the subject: The student prepares and presents (powerpoint) current topics selected from the field of the latest knowledge in proteomics assigned by the subject guarantor. The student actively participates in seminars, asks questions about presentations, requires discussion. Also answering questions of knowledge testing related to proteomics. Written, resp. oral examination. Elaboration of the work during the semester on the assigned topic represents 40% of the evaluation, presentation and discussion of the work represents 40% of the evaluation, answering the questions testing the knowledge represents 20% of the evaluation.	
Educational outcomes: Student after successful completion of the course: • will understand the methods of proteomics as a separate scientific discipline in the solution of systems biology and will be able to use its tools in related fields. • will be able to inform about the issues and possibilities of proteomic analysis and the use of the knowledge it provides. • has the necessary basic knowledge of advances in molecular biology, medical proteomics, pharmaceutical proteomics, plant proteomics, environmental proteomics and other related fields. • will be able to take a comprehensive approach to solving the problem and systematically use new knowledge • acquires the competence to apply new knowledge and procedures in proteomic analysis in research.	
Brief content of the subject: 1. Proteomic analysis as a tool of molecular biology 2. Protein-protein interactions as part of most cellular processes, including cell signaling, protein synthesis and metabolic processes 3. Progress in monitoring the effect of stress on plants - abiotic stress 4. Progress in monitoring the impact of stress on plants - biotic stress 5. Current trends in plant proteomics 6. Current trends in medical proteomics 7. Current trends in environmental proteomics 8. Current trends in biomedical research 9. Current trends in new methodologies 10. Current trends in mass spectrometry 11. Current trends in bionformatics 12. Defense of elaborated semester projects on related topics.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

Recommended literature:
Review and scientific publications from research journals.

Language, knowledge of which is necessary to complete the subject: English

Subject evaluation

	Passed	Not passed	
	0.00	0.00	

Notes: - student time load:

Teacher: lectures/consultations/seminars: Assoc. Prof. Ľubica Uváčková, PhD.

Date of last change: 31. 3. 2022

Approved: prof. RNDr. Juraj Krajčovič, CSc.

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Molecular biology for doctoral students

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Molecular Biology for doctoral students
Type, scope, and method of educational activities: Compulsory optional subject. Profile subject **Subject type (C, CO, O):** CO **Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminar per week **Study method:** on-site in combination with e-learning, consultations and discussions	
Number of credits: 10	
Recommended semester/trimester of study: 2nd semester	
Level of study: doctoral	
Prerequisite subjects: without prerequisite subjects	
Conditions for completing the subject: i. Participation in teaching in accordance with the UCM Study Regulations in Trnava; ii. Preparation and presentation (powerpoint) of a current topic in the field of molecular biology; iii. Active participation in seminars, asking questions about presentations, discussion (consideration in the overall evaluation of the course); iv. Written exam (4 questions).	
Educational outcomes: Upon successful completion of the course, the student will • gain current knowledge about the current state and perspectives of research in the field of molecular biology; • acquire an overview of the latest methods and trends in research and practical application of molecular biology in various fields of biology, medicine, pharmacy, agriculture, food and molecular biotechnology.	
Brief content of the subject: 1. Comparison of the content, structure and evolution of the organization of genetic information in viruses, bacteria, archaeons, in the nucleus of eukaryotes, in mitochondria and chloroplasts; genes encoding proteins *versus* repetitive sequences; 2. The origin and evolution of cells in the light of the latest knowledge of molecular biology; arguments for fundamental revisions in molecular systematics and phylogenetics, new hypotheses and methods of their testing; 3. Advances in the molecular biology of organelles and views on their origin and evolution; protein traficing and import of proteins into organelles – methods and mechanisms, mitochondria and chloroplasts without their own genomes; 4. Inheritance of mitochondria and chloroplasts in the light of the latest knowledge of molecular genetics; experiments and hypotheses; question of organelle genome multicopy, homoplasmy *versus* heteroplasmy; possibilities and perspectives of practical application of knowledge of molecular genetics; 5. Horizontal gene transfer, common features and mechanisms *versus* specifics in prokaryotes and eukaryotes. The issue of minimal genomes, strategies for their study and preparation; evolutionary conclusions and assessment of the practical use of constructs; The phenomenon of mixotrophy – origin and evolution from the point of view of molecular biology, advantages and disadvantages; algal genetic diversity and its biotechnological potential;	

6. Regulation of gene expression, older and new ideas, experiments and hypotheses; RNA interference – methods and mechanisms; transformation of algae – a range of methods, including the use of agrobacteria; advantages of chloroplast transformation over the nucleus;
7. Genetic code – origin and evolution from the point of view of the latest knowledge of molecular biology; RNA editing; genetically rencoded organisms;
8. Ways and methods of genetic information modification, history, present, perspectives, advantages and disadvantages, risks, bioethical aspects. CRISPR/Cas. Epigenetics – current scientific opinions and experiments; molecular biology techniques applied in forensic sciences. Molecular medicine; molecular principles of gene therapy;
9. Molecular genetic markers for the identification and study of organism variability; microsatellites, VNTRs, mitochondrial and plastid genes and genomes as phylogenetic markers;
10. Ancient DNA – molecular-biological analysis of historical biological material, principles, methods, history, limits and perspectives, examples (museum exhibits, fossils, mummies, molecular analysis of ancient *Homo sapiens* ancestors, with an emphasis on Neanderthals and Denisovans, why did Neanderthals become extinct?
11. History of Europe human settlement and its diversification; paleogenomics; a molecular study of evolution of the ancestors of today's Europeans, a "Glacier" man Ötzi; analysis of cemeteries from Central Europe;
12. Conservative cloning – new techniques aimed at reviving extinct species;
13. Synthetic biology – organisms, cells, organelles, ecosystems; cell fusion and transformation; experimental evolution; how multicellularity has evolved; *Quorum sensing*.

Recommended literature:

Clark, D.P., Nanette Pazdernik, N., McGehee, M. (2019). Molecular biology, 3er Edition. Academic Cell; Print as well as eText;
Morange, M. (2020). The black box of biology: a history of the molecular revolution. Harvard University Press;
Karp, G., Iwasa, J., Marshall W., (2020) Karp's Cell and Molecular Biology: Concepts and Experiments, Edition: 9th Edition. Wiley; Print as well as eText;
Genetic Engineering & Biotechnology News, New York, USA; https://www.genengnews.com

Language, knowledge of which is necessary to complete the subject: English

Notes:

Subject evaluation:

Passed	Failed
0.00	0.00

Teacher: prof. RNDr. Juraj Krajčovič, CSc.

Date of last change: 28.02.2022

Approved: prof. RNDr. Juraj Krajčovič, CSc.

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Agricultural biotechnologies for doctoral students

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Agricultural Biotechnology for doktoral Students
Type, scope, and method of educational activities: Compulsory optional subject. **Subject type (C, CO, O):** CO **Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminar per week **Study method:** on-site	
Number of credits: 10	
Recommended semester/trimester of study: semester 1.-3.	
Level of study: doctoral	
Prerequisite subjects: without prerequisitties	
Conditions for completing the subject: Active participation in lectures and successful completion of the oral exam. Before the end of the semester, the student will present in the form of a review on a selected topic in the field of the latest knowledge and applications of agricultural biotechnology. The presentation will be a condition for successful completion of the course and will form half of the final evaluation of the course. The second half of the evaluation will be an oral exam.	
Educational outcomes: By completing the subject, the student will gain • knowledge and insight into the importance and applications of agricultural biotechnology applied to soil, plants and livestock, • knowledge and insight into the range of possible applications of biotechnology in living organisms that form the basis of agricultural production (microorganisms, plants, animals), in particular the methods and importance of improving economic parameters and properties of plants and animals used in agriculture for the production of food and feed, but also for the production of non-food outputs from agriculture (raw materials for industry, products for pharmacy and medicine, renewable energy sources, environmental benefits). The student will • acquire the prerequisites for practical skills and the ability to work in the laboratory and in practice in general, working with the components of biotechnology (substrates, organisms, technologies) and in particular in agricultural biotechnology, • acquire basic competences for the application of theoretical knowledge in practical activities in his/her further scientific career (in biotechnology, biology) or for solving various problems in practice (agricultural and food biotechnology, use of the final production of agricultural biotechnology), • be able to design and implement biotechnological experiments and put them into practice, • be able to communicate with the professional public and to express himself/herself on the theoretical and practical aspects of agricultural biotechnology.	
Brief content of the subject: 1. Genetic variability of agriculturally used plants and animals and the potential to exploit the genetic variability of other organisms. 2. Methods of improvement (breeding) of plants and animals used in agriculture. 3. Principles and use of genome and gene mapping. 4. Use of genetic maps in molecular breeding. 5. Selection by molecular markers (MAS).	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

6. Methods of modifying plant and animal genomes by foreign DNA transfer.
SUBJECT INFORMATION SHEET OF THE UCM
7. Importance and practical use of genetically modified plants and animals in improving their economic parameters and properties.
8. Genetically modified plants and animals with lower negative impacts on the environment.
9. Genetically modified plants and animals used as "cell factories" for the production of biologically active substances.
10. Genetically modified plants intended for the production of renewable, energetically used biomass.
11. Agricultural plants producing values in in vitro culture systems.
12. Rules for the use of genetically modified plants and animals, foods containing genetically modified organisms, social and religious aspects of their perception.

Recommended literature:

Encyclopedia of biotechnology in agriculture and food / Editors, Dennis R. Heldman, Matthew B. Wheeler, Dallas G. Hoover. CRC Press Taylor & Francis Group, Boca Raton, USA, 2011, ISBN 978-0-8493-5027-6.
Adrian Slater, Nigel W. Scott, Mark R. Fowler: Plant Biotechnology: The Genetic Manipulation of Plants, Oxford University Press, USA; 2 edition (June 2, 2008), ISBN-10: 0199282617.
Arie Altman, Paul Michael Hasegawa (Eds.): Plant Biotechnology and Agriculture: Prospects for the 21st Century. Academic Press; 1 edition (November 22, 2011), ISBN-10: 0123814669.
Aluízio Borém, Roberto Fritsche-Neto (Eds.): Biotechnology and Plant Breeding: Applications and Approaches for Developing Improved Cultivars. Academic Press; 1 edition (March 15, 2014), ISBN-10: 0124186726.New and Future Developments in Microbial Biotechnology and Bioengineering: Crop Improvement Through Microbial Biotechnology / Editors, Ram Prasad, Sarvajeet S. Gill, Narendra Tuteja, Elsevier, Amsterdam, The Netherlands, 2018, ISBN 978-0-444-63987-5.
Review papers in scientific journals.

Language, knowledge of which is necessary to complete the subject: English

Notes:

Subject evaluation:

Passed	Failed
0.00	0.00

Teacher: Prof. RNDr. Ján Kraic, PhD.

Date of last change: 28.02.2022

Approved: Prof. RNDr. Juraj Krajčovič, PhD.

University of Ss. Cyril and Methodius in Trnava
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917 01 Trnava

SUBJECT INFORMATION SHEET

Functional analysis of proteins and modelling

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Functional analysis of proteins and modelling
Type, scope, and method of educational activities: Compulsory optional subject, profile subject **Subject type (C, CO, O):** **Recommended scope of teaching (in hours):** One hour of lecture and one hour of seminar per week. **Study method:** Lectures and seminars **Study form:** Presence attendance; physically (online also possible).	
Number of credits: 10	
Recommended semester/trimester of study: 3rd semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Elaboration of practical tasks during the semester according to the assignment. Successful completion of 2 tests during the semester; obtaining more than 50% of the points being considered mandatory. The definitive evaluation of the course is performed by an oral exam.	
Educational outcomes: Upon successful completion of the course - the PhD-student will thoroughly understand the principles of formation of protein molecules. - To do this, it is necessary to accomplish a detailed knowledge of the structure of real (i.e. biochemically characterized) proteins and be able to apply them to hypothetical proteins obtained from sequence and structural databases (GenBank, UniProt and PDB), e.g., in predicting their structure and function (eventually the specificity for enzymes) - as well as in their structural comparison.	
Brief content of the subject: 1. Sequence databases – nucleotide (GenBank, ENA, DDBJ) and amino acid (UniProt) databases. 2. Structure of proteins – primary, secondary, tertiary and quaternary structure. 3. Motifs and domains of proteins, supersecondary structure and modular proteins. 4. Divergent and covergent evolution of proteins. 5. Database of tertiary structures of proteins (Protein Data Bank; PDB). 6. Comparison of proteins sequences and calculations of evolutionary trees (CLUSTAL programmes). 7. Comparison of sequences of proteins (Hydrophobic Cluster Analysis method; HCA). 8. Internet tool BLAST (nucleotide and protein BLAST; specialized BLAST – approaches and algorithms). 9. Browsing sequenced genomes, *in silico* analyses of hypothetical proteins with focus on functionally characterized homologues and mutant proteins. 10. Predictions of secondary structure of proteins – stereochemial and statistical approaches, training neural networks (PHd method). 11. Modelling of tertiary structure of proteins – homologous proteins and templates (SwissModel, Phyre server). 12. Predictions of tertiary structure of proteins – AlphaFold and AlphaFold Protein Structure Database.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

(13) Comparison of tertiary structures of proteins (structural overlaps, rmsd value; MultiProt server).
Recommended literature: Selected articles from scientific literature to given topics.
Language, knowledge of which is necessary to complete the subject: English
Subject evaluation
Notes: - student time load:
Teacher: lectures/consultations/seminars: Prof. Ing. Štefan Janeček, DrSc. language of lectures: English
Date of last change: 14 March 2022
Approved: Prof. RNDr. Juraj Krajčovič, CSc.

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Reproductive biology of higher plants

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Reproductive biology of higher plants
Type, scope, and method of educational activities: Compulsory optional subject. **Subject type (C, CO, O):** CO **Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminar per week **Study method:** on-site	
Number of credits: 10	
Recommended semester/trimester of study: 1.-4. semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Elaboration of practical tasks during the semester according to the assignment. Successful completion of 2 tests during the semester; obtaining more than 50% of the points being considered mandatory. The definitive evaluation of the course is performed by an oral exam.	
Educational outcomes: - The student prepares and presents (powerpoint) current topics selected from the field of the latest knowledge given by the subject guarantor. - The student actively participates in seminars, asks questions about presentations, requires discussion. Also answering questions examining knowledge related to the subject. - Written, resp. oral examination. - Elaboration of the work during the semester on the assigned topic represents 40% of the evaluation, presentation and discussion of the work represents 40% of the evaluation, answering the questions testing the knowledge represents 20% of the evaluation	
Brief content of the subject: 1. Introduction to the reproductive biology of higher plants. 2. Embryo development. Sporophyte and gametophyte. Flower structure and properties. 3. Male gametophyte. Microsporogenesis. Pollen grain development. 4. Female gametophyte. Megasporogenesis. 5. Polination and fertilisation. Incompatibility. Male sterility. 6. Endosperm. Endosperm types. Regulation of endosperm development. 7. Defense of the semester project elaborated during the semester. 8. Embryo. Development. Zygote. Stages of embryo development of dicotyledonous plants. Suspender. Stages of embryo development of monocotyledonous plants. 9. Regulation of embryo development. In vitro embryo culture. 10. Somatic embryogenesis. 11. Seeds. Morphology. 12. Androgenesis and gynogenesis. 13. Defense of semester projects during the semester.	
Recommended literature: Selected articles from scientific literature to given topics.	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes: - student time load:	
Teacher: lectures/consultations/seminars: Assoc. Prof. Ľubica Uváčková, PhD.	
Date of last change: 31. March 2022	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

Approved: Prof. RNDr. Juraj Krajčovič, CSc.

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Selected chapters on the physiology and molecular biology of plant stress

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Selected chapters on the physiology and molecular biology of plant stress
Type, scope, and method of educational activities: Compulsory optional subject. Profile subject. **Subject type (C, CO, O):** CO **Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminar per week **Study method:** on-site	
Number of credits: 10	
Recommended semester/trimester of study: 1.-4. semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Assessment of the subject student after passing the oral exam with a single point gain of 100 points.	
Educational outcomes: Upon successful completion of the course, the student will gain: - an overview of the latest knowledge on selected physiological effects of environmental factors on plant vitality and physiology; - an overview of the state-of-the-art knowledge on selected molecular changes and responses of plants under stress conditions; - an overview of selected modern methods for the detection of physiological and molecular changes in plants during growth under stressful environmental conditions - skills for integrating knowledge in different scientific fields - skills for selecting methods for implementing research ideas	
Brief content of the subject: 1.-4. Advanced lectures focusing on selected physiological processes in plants and their changes in the context of environmental stress. The selection of lecture topics is based on the topic of the PhD student's dissertation and draws on relevant, specific scientific publications from the last 5 years. 5.-8. Advanced lectures focusing on selected molecular defense mechanisms in plants in the context of environmental stress. The selection of lecture topics is based on the PhD student's dissertation topic and draws on relevant, specific scientific publications from the last 5 years. 9.-12. Advanced lectures focusing on selected methods for the analysis of physiological and molecular changes in plants in the context of environmental stress. The selection of lecture topics is based on the topic of the PhD student's dissertation and draws on relevant, specific scientific publications from the last 5 years.	
Recommended literature: Selected articles from scientific literature to given topics.	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes: - student time load:	
Teacher: lectures/consultations/seminars: Assoc. Prof. Ildikó Matušíková, PhD.	
Date of last change: 31. March 2022	
Approved: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

Creative activity:

First-author publication in a scientific journal registered in the Web of Science databases and included in Q1 according to JCR IF
Publication in a scientific journal registered in the Web of Science databases and included in Q1 according to JCR IF
First-author publication in a scientific journal registered in the Web of Science databases and included in Q2 according to JCR IF
Publication in a scientific journal registered in the Web of Science databases and included in Q2 according to JCR IF
First-author publication in a scientific journal registered in the Web of Science databases and included in Q3 according to JCR IF
Publication in a scientific journal registered in the Web of Science databases and included in Q3 according to JCR IF
Publication in a scientific journal registered in the Web of Science databases and included in Q4 according to JCR IF
Publication in a scientific journal registered in the Web of Science or Scopus databases without inclusion in Q1-Q4 in JCR IF
Other creative activity

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

First-author publication in a scientific journal registered in the Web of Science databases and included in Q1 according to JCR IF

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** First-author publication in a scientific journal registered in the Web of Science databases and included in Q1 according to JCR IF
Subject type (C, CO, O): optional subject, profile subject	
Number of credits: 55	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent scientific activity under the guidance of the PhD-supervisor. The student will be integrated into the research team of the training workplace within the solution of a domestic or foreign project and during the semester he/she plans and performs introductory experiments. Based on the achievement of publishable results, the student will receive an evaluation in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava. In the scientific part, the student is obliged to publish at least one experimental output in a scientific journal registered in the Web of Science databases and included in the Q1 quartile in JCF IF. In these published outputs, registered in the Web of Science and Scopus databases, the doctoral student possesses a reasonable author's share according to the habits of the relevant study program, which is evidenced by a statement from the records of publication activity from the UCM University Library On-line Catalogue or from the Central Register of Publishing Activity Records, and is the first author of the publication.	
Educational outcomes: - The student has knowledge and overview of basic scientific methods, knows the problems and trends in the development of science in the field of dissertation. - He/she is able to define specific problems and methods of their solution, and is ready to solve them. - The student will gain the competence to decide on the form and method of presenting the results of the work in the form of scientific publications. - He/she will be able to assess the quality of his/her results and correctly identify suitable and sufficiently high-quality scientific journals for their publication. - The student will be competent to participate in the scientific team of the training or other workplace, or in the team applying the results of research in practice, not only by experimental manual work in the laboratory, but also by correct presentation of experimental results and their discussion with the scientific community.	
Brief content of the subject: Within the scientific part, the student completes selected activities for which he/she obtains credits: publication in a scientific journal registered in the Web of Science databases, included in Q1 in JCF IF	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

Date of last change: 30 March 2022
Approved: Prof. RNDr. Juraj Krajčovič, CSc.

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Publication in a scientific journal registered in the Web of Science databases and included in Q1 according to JCR IF

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Publication in a scientific journal registered in the Web of Science databases and included in Q1 according to JCR IF
Subject type (C, CO, O): optional subject, profile subject	
Number of credits: 50	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent scientific activity under the guidance of the PhD-supervisor. The student will be integrated into the research team of the training workplace within the solution of a domestic or foreign project and during the semester he/she plans and performs introductory experiments. Based on the achievement of publishable results, the student will receive an evaluation in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava. In the scientific part, the student is obliged to publish at least one experimental output in a scientific journal registered in the Web of Science databases and included in the Q1 quartile in JCF IF. In these published outputs, registered in the Web of Science and Scopus databases, the doctoral student possesses a reasonable author's share according to the habits of the relevant study program, which is evidenced by a statement from the records of publication activity from the UCM University Library On-line Catalogue or from the Central Register of Publishing Activity Records.	
Educational outcomes: - The student has knowledge and overview of basic scientific methods, knows the problems and trends in the development of science in the field of dissertation. - He/she is able to define specific problems and methods of their solution, and is ready to solve them. - The student will gain the competence to decide on the form and method of presenting the results of the work in the form of scientific publications. - He/she will be able to assess the quality of his/her results and correctly identify suitable and sufficiently high-quality scientific journals for their publication. - The student will be competent to participate in the scientific team of the training or other workplace, or in the team applying the results of research in practice, not only by experimental manual work in the laboratory, but also by correct presentation of experimental results and their discussion with the scientific community.	
Brief content of the subject: Within the scientific part, the student completes selected activities for which he/she obtains credits: publication (each) in a scientific journal registered in the Web of Science databases, included in Q1 in JCF IF	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc.	

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Námestie Jozefa Herdu 2
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Date of last change: 30 March 2022
Approved: Prof. RNDr. Juraj Krajčovič, CSc.

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

First-author publication in a scientific journal registered in the Web of Science databases and included in Q2 according to JCR IF

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** First-author publication in a scientific journal registered in the Web of Science databases and included in Q2 according to JCR IF
Subject type (C, CO, O): optional subject, profile subject	
Number of credits: 45	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent scientific activity under the guidance of the PhD-supervisor. The student will be integrated into the research team of the training workplace within the solution of a domestic or foreign project and during the semester he/she plans and performs introductory experiments. Based on the achievement of publishable results, the student will receive an evaluation in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava. In the scientific part, the student is obliged to publish at least one experimental output in a scientific journal registered in the Web of Science databases and included in the Q2 quartile in JCF IF. In these published outputs, registered in the Web of Science and Scopus databases, the doctoral student possesses a reasonable author's share according to the habits of the relevant study program, which is evidenced by a statement from the records of publication activity from the UCM University Library On-line Catalogue or from the Central Register of Publishing Activity Records, and is the first author of the publication.	
Educational outcomes: - The student has knowledge and overview of basic scientific methods, knows the problems and trends in the development of science in the field of dissertation. - He/she is able to define specific problems and methods of their solution, and is ready to solve them. - The student will gain the competence to decide on the form and method of presenting the results of the work in the form of scientific publications. - He/she will be able to assess the quality of his/her results and correctly identify suitable and sufficiently high-quality scientific journals for their publication. - The student will be competent to participate in the scientific team of the training or other workplace, or in the team applying the results of research in practice, not only by experimental manual work in the laboratory, but also by correct presentation of experimental results and their discussion with the scientific community.	
Brief content of the subject: Within the scientific part, the student completes selected activities for which he/she obtains credits: publication in a scientific journal registered in the Web of Science databases, included in Q2 in JCF IF	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

Date of last change: 30 March 2022
Approved: Prof. RNDr. Juraj Krajčovič, CSc.

University of Ss. Cyril and Methodius in Trnava
Námestie Jozefa Herdu 2
917 01 Trnava

SUBJECT INFORMATION SHEET

Publication in a scientific journal registered in the Web of Science databases and included in Q2 according to JCR IF

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Publication in a scientific journal registered in the Web of Science databases and included in Q2 according to JCR IF
Subject type (C, CO, O): optional subject, profile subject	
Number of credits: 40	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent scientific activity under the guidance of the PhD-supervisor. The student will be integrated into the research team of the training workplace within the solution of a domestic or foreign project and during the semester he/she plans and performs introductory experiments. Based on the achievement of publishable results, the student will receive an evaluation in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava. In the scientific part, the student is obliged to publish at least one experimental output in a scientific journal registered in the Web of Science databases and included in the Q2 quartile in JCF IF. In these published outputs, registered in the Web of Science and Scopus databases, the doctoral student possesses a reasonable author's share according to the habits of the relevant study program, which is evidenced by a statement from the records of publication activity from the UCM University Library On-line Catalogue or from the Central Register of Publishing Activity Records.	
Educational outcomes: - The student has knowledge and overview of basic scientific methods, knows the problems and trends in the development of science in the field of dissertation. - He/she is able to define specific problems and methods of their solution, and is ready to solve them. - The student will gain the competence to decide on the form and method of presenting the results of the work in the form of scientific publications. - He/she will be able to assess the quality of his/her results and correctly identify suitable and sufficiently high-quality scientific journals for their publication. - The student will be competent to participate in the scientific team of the training or other workplace, or in the team applying the results of research in practice, not only by experimental manual work in the laboratory, but also by correct presentation of experimental results and their discussion with the scientific community.	
Brief content of the subject: Within the scientific part, the student completes selected activities for which he/she obtains credits: publication (each) in a scientific journal registered in the Web of Science databases, included in Q2 in JCF IF	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc.	

University of Ss. Cyril and Methodius in Trnava
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Date of last change: 30 March 2022
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917 01 Trnava

SUBJECT INFORMATION SHEET

First-author publication in a scientific journal registered in the Web of Science databases and included in Q3 according to JCR IF

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** First-author publication in a scientific journal registered in the Web of Science databases and included in Q3 according to JCR IF
Subject type (C, CO, O): optional subject, profile subject	
Number of credits: 30	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent scientific activity under the guidance of the PhD-supervisor. The student will be integrated into the research team of the training workplace within the solution of a domestic or foreign project and during the semester he/she plans and performs introductory experiments. Based on the achievement of publishable results, the student will receive an evaluation in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava. In the scientific part, the student is obliged to publish at least one experimental output in a scientific journal registered in the Web of Science databases and included in the Q3 quartile in JCF IF. In these published outputs, registered in the Web of Science and Scopus databases, the doctoral student possesses a reasonable author's share according to the habits of the relevant study program, which is evidenced by a statement from the records of publication activity from the UCM University Library On-line Catalogue or from the Central Register of Publishing Activity Records, and is the first author of the publication.	
Educational outcomes: - The student has knowledge and overview of basic scientific methods, knows the problems and trends in the development of science in the field of dissertation. - He/she is able to define specific problems and methods of their solution, and is ready to solve them. - The student will gain the competence to decide on the form and method of presenting the results of the work in the form of scientific publications. - He/she will be able to assess the quality of his/her results and correctly identify suitable and sufficiently high-quality scientific journals for their publication. - The student will be competent to participate in the scientific team of the training or other workplace, or in the team applying the results of research in practice, not only through laboratory work, but also through the correct presentation of experimental results.	
Brief content of the subject: Within the scientific part, the student completes selected activities for which he/she obtains credits: publication in a scientific journal registered in the Web of Science databases, included in Q3 in JCF IF	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc.	

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SUBJECT INFORMATION SHEET

Publication in a scientific journal registered in the Web of Science databases and included in Q3-Q4 according to JCR IF

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Publication in a scientific journal registered in the Web of Science databases and included in Q3 according to JCR IF
Subject type (C, CO, O): optional subject, profile subject	
Number of credits: 15-25	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent scientific activity under the guidance of the PhD-supervisor. The student will be integrated into the research team of the training workplace within the solution of a domestic or foreign project and during the semester he/she plans and performs introductory experiments. Based on the achievement of publishable results, the student will receive an evaluation in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava. In the scientific part, the student is obliged to publish at least one experimental output in a scientific journal registered in the Web of Science databases and included in the Q3 quartiles in JCF IF. In these published outputs, registered in the Web of Science and Scopus databases, the doctoral student possesses a reasonable author's share according to the habits of the relevant study program, which is evidenced by a statement from the records of publication activity from the UCM University Library On-line Catalogue or from the Central Register of Publishing Activity Records.	
Educational outcomes: - The student has knowledge and overview of basic scientific methods, knows the problems and trends in the development of science in the field of dissertation. - He/she is able to define specific problems and methods of their solution, and is ready to solve them. - The student will gain the competence to decide on the form and method of presenting the results of the work in the form of scientific publications. - He/she will be able to assess the quality of his/her results and correctly identify suitable and sufficiently high-quality scientific journals for their publication. - The student will be competent to participate in the scientific team of the training or other workplace, or in the team applying the results of research in practice, not only through laboratory work, but also through the correct presentation of experimental results.	
Brief content of the subject: Within the scientific part, the student completes selected activities for which he/she obtains credits: publication (each) in a scientific journal registered in the Web of Science databases, included in Q3-Q4 in JCF IF	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc.	

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SUBJECT INFORMATION SHEET

Publication in a scientific journal registered in the Web of Science databases and included in Q3-Q4 according to JCR IF

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Publication in a scientific journal registered in the Web of Science databases and included in Q4 according to JCR IF
Subject type (C, CO, O): optional subject, profile subject	
Number of credits: 15-25	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent scientific activity under the guidance of the PhD-supervisor. The student will be integrated into the research team of the training workplace within the solution of a domestic or foreign project and during the semester he/she plans and performs introductory experiments. Based on the achievement of publishable results, the student will receive an evaluation in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava. In the scientific part, the student is obliged to publish at least one experimental output in a scientific journal registered in the Web of Science databases and included in the Q4 quartiles in JCF IF. In these published outputs, registered in the Web of Science and Scopus databases, the doctoral student possesses a reasonable author's share according to the habits of the relevant study program, which is evidenced by a statement from the records of publication activity from the UCM University Library On-line Catalogue or from the Central Register of Publishing Activity Records.	
Educational outcomes: - The student has knowledge and overview of basic scientific methods, knows the problems and trends in the development of science in the field of dissertation. - He/she is able to define specific problems and methods of their solution, and is ready to solve them. - The student will gain the competence to decide on the form and method of presenting the results of the work in the form of scientific publications. - He/she will be able to assess the quality of his/her results and correctly identify suitable and sufficiently high-quality scientific journals for their publication. - The student will be competent to participate in the scientific team of the training or other workplace, or in the team applying the results of research in practice, not only through laboratory work, but also through the correct presentation of experimental results.	
Brief content of the subject: Within the scientific part, the student completes selected activities for which he/she obtains credits: publication (each) in a scientific journal registered in the Web of Science databases, included in Q3-Q4 in JCF IF	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc.	

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SUBJECT INFORMATION SHEET

Publication in a scientific journal registered in the Web of Science or Scopus databases without inclusion in Q1-Q4 in JCR IF

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Publication in a scientific journal registered in the Web of Science or Scopus databases without inclusion in Q1-Q4 in JCR IF
Subject type (C, CO, O): optional subject, profile subject	
Number of credits: 10	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	
Conditions for completing the subject: Independent scientific activity under the guidance of the PhD-supervisor. The student will be integrated into the research team of the training workplace within the solution of a domestic or foreign project and during the semester he/she plans and performs introductory experiments. Based on the achievement of publishable results, the student will receive an evaluation in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava. In the scientific part, the student is obliged to publish at least one experimental output in a scientific journal registered in the Web of Science or Scopus databases without inclusion in quartiles Q1-Q4 in JCF IF. In these published outputs, registered in the Web of Science and Scopus databases, the doctoral student possesses a reasonable author's share according to the habits of the relevant study program, which is evidenced by a statement from the records of publication activity from the UCM University Library On-line Catalogue or from the Central Register of Publishing Activity Records.	
Educational outcomes: - The student has knowledge and overview of basic scientific methods, knows the problems and trends in the development of science in the field of dissertation. - He/she is able to define specific problems and methods of their solution, and is ready to solve them. - The student will gain the competence to decide on the form and method of presenting the results of the work in the form of scientific publications. - He/she will be able to assess the quality of his/her results and correctly identify suitable and sufficiently high-quality scientific journals for their publication. - The student will be competent to participate in the scientific team of the training or other workplace, or in the team applying the results of research in practice, not only through laboratory work, but also through the correct presentation of experimental results.	
Brief content of the subject: Within the scientific part, the student completes selected activities for which he/she obtains credits: publication (each) in a scientific journal registered in the Web of Science or Scopus databases without inclusion in Q1-Q4 in JCF IF	
Recommended literature:	
Language, knowledge of which is necessary to complete the subject: English	
Subject evaluation	
Notes:	
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc,	

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SUBJECT INFORMATION SHEET

Other creative activity

University: University of Ss. Cyril and Methodius in Trnava	
Faculty/institute: Faculty of Natural Sciences	
Subject code:	**Subject name:** Other creative activity
Subject type (C, CO, O): optional subject	
Number of credits: 5 or 10	
Recommended semester/trimester of study: 1-8 semester	
Level of study: 3rd degree	
Prerequisite subjects: none	

Conditions for completing the subject:
Independent scientific activity under the guidance of the PhD-supervisor. The student will be integrated into the research team of the training workplace within the solution of a domestic or foreign project and during the semester he/she plans and performs introductory experiments. During this part of the work he/she can get credits for mastering a new experimental methodology. He/she can also receive credits for obtaining an internal grant. In cooperation with other members of the team, the student will present preliminary results that can be used in further scientific work at a professional seminar of the workplace and at a national or international conference. In this section, it is also possible to obtain credits for citation of his/her scientific publication. Based on the achievement of publishable results, the student will receive an evaluation in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava.

Educational outcomes:

- The student has knowledge and overview of basic scientific methods, knows the problems and trends in the development of science in the field of dissertation.
- He/she is able to define specific problems and methods of their solution, and is ready to solve them.
- The student will gain the competence to decide on the form and method of presenting the results of the work in the form of scientific publications.
- He/she will be able to assess the quality of his/her results and correctly identify suitable and sufficiently high-quality scientific journals for their publication.
- The student will be competent to participate in the scientific team of the training or other workplace, or in the team applying the results of research in practice, not only through laboratory work, but also through the correct presentation of experimental results.

Brief content of the subject:
Within the scientific part, the student completes selected activities for which he/she obtains credits:

(i) publication in journals not registered in Web of Science or Scopus
(ii) publication in a peer-reviewed proceedings
(iii) active participation in an international scientific event (declared by a published contribution in the proceedings)
(iv) active participation in a domestic scientific event (declared by a published contribution in the proceedings)
(v) member of the research team in a foreign scientific project, registered at UCM
(vi) member of the research team on a domestic project (e.g., APVV, VEGA, KEGA, OPVaI), registered at UCM
(vii) citation to the publication output registered in the Web of Science or Scopus databases (excluding the autocitations; the affiliation has to be with the FNS UCM)
(viii) obtaining an internal grant

(ix) acquisition of a new experimental methodology I (x) acquisition of a new experimental methodology II (xi) presentation at the seminar
Recommended literature:
Language, knowledge of which is necessary to complete the subject: English
Subject evaluation
Notes:
Teacher: lectures/consultations/seminars: Prof. RNDr. Juraj Krajčovič, CSc,
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