# List of information sheets for the doctoral study programme in biotechnology

**Study and pedagogical-educational activities:**

1. Own Pedagogical Activity of Doctoral Student I-VII
2. Supervision of the Final Bachelor's Thesis
3. Elaboration of an Opinion for the Final Work of the Bachelor's Study
4. Co-authorship (or Authorship) of Created and Published Teaching Material
5. **Independent Study of Literature according to the Recommendation of the Supervisor I, II**

**Compulsory subjects:**

6. **Advances in Biotechnology**
7. Dissertation Defence
8. Dissertation Exam
9. Professional English for PhD Students

**Compulsory optional subjects:**

10. Advances in Bioanalytical Chemistry
11. **Agricultural Biotechnology for PhD Students**
12. **Biosafety and Marketing of Biotechnology and its Products**
13. **Biotechnological Transformations of Biomass, Biofuels and Biorefineries**
14. **DNA Recombination and Genetic Transformation Technology**
15. **Industrial Biotechnology for PhD Students**
16. Medical and Pharmaceutical Biotechnologies for PhD Students
17. **Modern Methods for Studying the Structure, Properties and Activity of Compounds and Biomolecules**
18. New Tends, Procedures and Methods in the Study of Living Organisms
19. Preparation of Projects and Grants in the Field of Biotechnology

**Creative activity:**

20. **Publication in a Scientific Journal Registered in the Web of Science Databases Included in Q1 or Q2 in JCF IF (1st or 2nd quarter of the impact factor value in the Journal Citation Report)**
21. **Publication in a Scientific Journal Registered in the Web of Science Databases Included in Q1-Q4 in JCF IF (1st-4th quarter of the impact factor value in the Journal Citation Report)**
22. Other Creative activity

- profile subjects are highlighted in bold

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

# *Study and pedagogical-educational activities*

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

**SUBJECT INFORMATION SHEET**

<table>
<tr><td colspan="3">University: University of Ss. Cyril and Methodius in Trnava</td></tr>
<tr><td colspan="3">Faculty/institute: Faculty of Natural Sciences</td></tr>
<tr><td colspan="2">Subject code: KBT/dd312 – KBT/dd318</td><td>Subject name: Own Pedagogical Activity of Doctoral Student I-VII</td></tr>
<tr><td colspan="3">Type, scope, and method of educational activities: Compulsory subject.<br>Subject type (C, CO, O): C<br>Recommended scope of teaching (in hours): Generally 4 hours per week.<br>Study method:<br>Study form: full-time study</td></tr>
<tr><td colspan="3">Number of credits: 10</td></tr>
<tr><td colspan="3">Recommended semester/trimester of study: semester 1-4</td></tr>
<tr><td colspan="3">Level of study: doctoral</td></tr>
<tr><td colspan="3">Prerequisite subjects: without prerequisites</td></tr>
<tr><td colspan="3">Conditions for completing the subject:<br>Independent work under the direction of the course leader.</td></tr>
<tr><td colspan="3">Educational outcomes:<ul><li>The student will gain teaching experience by conducting laboratory exercises under the direction of the subject supervisor.</li><li>Thanks to this activity, the student will also practice speaking in front of an audience, which should give him/her confidence for his/her future scientific career, so that he/she can actively participate (in the form of lectures) in scientific conferences.</li></ul></td></tr>
<tr><td colspan="3">Brief content of the subject:<br>The student will complete selected activities for which he/she will receive credit:<ul><li>Own Pedagogical Activity of Doctoral Student I</li><li>Own Pedagogical Activity of Doctoral Student II</li><li>Own Pedagogical Activity of Doctoral Student III</li><li>Own Pedagogical Activity of Doctoral Student IV</li><li>Own Pedagogical Activity of Doctoral Student V</li><li>Own Pedagogical Activity of Doctoral Student VI</li><li>Own Pedagogical Activity of Doctoral Student VII</li></ul></td></tr>
<tr><td colspan="3">Recommended literature:</td></tr>
<tr><td colspan="3">Language, knowledge of which is necessary to complete the subject: English</td></tr>
<tr><td colspan="3">Subject evaluation</td></tr>
<tr><td rowspan="2"></td><td>Passed</td><td>Failed</td><td rowspan="2"></td></tr>
<tr><td>0.00</td><td>0.00</td></tr>
<tr><td colspan="3">Notes: - student time load:</td></tr>
<tr><td colspan="3">Teacher: dissertation supervisor, subject supervisor</td></tr>
<tr><td colspan="3">Date of last change: 31.3.2022</td></tr>
<tr><td colspan="3">Approved: prof. RNDr. Ján Kraic, PhD.</td></tr>
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# SUBJECT INFORMATION SHEET

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|---|---|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | | | |
| **Faculty/institute: Faculty of Natural Sciences** | | | |
| **Subject code: KBT/dd319** | **Subject name: Supervision of the Final Bachelor's Thesis** | | |
| **Type, scope, and method of educational activities: Optional subject.**<br>**Subject type (C, CO, O): O**<br>**Recommended scope of teaching (in hours):**<br>**Study method:**<br>**Study form: full-time study** | | | |
| **Number of credits:** 5 | | | |
| **Recommended semester/trimester of study:** semester 1-8 (semester 1-10 in external form) | | | |
| **Level of study:** doctoral | | | |
| **Prerequisite subjects:** without prerequisites | | | |
| **Conditions for completing the subject:**<br>Independent activity under the guidance of a supervisor - bachelor thesis consultant. | | | |
| **Educational outcomes:**<br>• The student will gain teaching experience in advising and mentoring a bachelor's degree candidate in the context of resolving a bachelor's thesis. | | | |
| **Brief content of the subject:ô**<br>The student will complete selected activity for which he/she will receive credit:<br>• Supervision of the Final Bachelor's Thesis | | | |
| **Recommended literature:** | | | |
| **Language, knowledge of which is necessary to complete the subject:** English | | | |
| **Subject evaluation** | | | |
| | Passed | Failed | |
| | 0.00 | 0.00 | |
| **Notes: - student time load:** | | | |
| **Teacher: dissertation supervisor** | | | |
| **Date of last change: 31.3.2022** | | | |
| **Approved: prof. RNDr. Ján Kraic, PhD.** | | | |

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<tr><td colspan="4">Faculty/institute: Faculty of Natural Sciences</td></tr>
<tr><td colspan="2">Subject code: KBT/dd320</td><td colspan="2">Subject name: Elaboration of an Opinion for the Final Work of the Bachelor's Study</td></tr>
<tr><td colspan="4">Type, scope, and method of educational activities: Optional subject.<br>Subject type (C, CO, O): O<br>Recommended scope of teaching (in hours):<br>Study method:<br>Study form: full-time study</td></tr>
<tr><td colspan="4">Number of credits: 3</td></tr>
<tr><td colspan="4">Recommended semester/trimester of study: semester 1-8 (semester 1-10 in external form)</td></tr>
<tr><td colspan="4">Level of study: doctoral</td></tr>
<tr><td colspan="4">Prerequisite subjects: without prerequisites</td></tr>
<tr><td colspan="4">Conditions for completing the subject:<br>Independent activity under the guidance of a supervisor.</td></tr>
<tr><td colspan="4">Educational outcomes:<br>• The student will gain experience in evaluating theses on the basis of the criteria binding for writing qualification theses at the University of Ss. Cyril and Methodius in Trnava, which will help him/her to become more aware of the individual aspects of his/her own dissertation.</td></tr>
<tr><td colspan="4">Brief content of the subject:<br>The student will complete selected activity for which he/she will receive credit:<br>• Elaboration of an Opinion for the Final Work of the Bachelor's Study</td></tr>
<tr><td colspan="4">Recommended literature:</td></tr>
<tr><td colspan="4">Language, knowledge of which is necessary to complete the subject: English</td></tr>
<tr><td colspan="4">Subject evaluation</td></tr>
<tr><td rowspan="2"></td><td>Passed</td><td>Failed</td><td rowspan="2"></td></tr>
<tr><td>0.00</td><td>0.00</td></tr>
<tr><td colspan="4">Notes: - student time load:</td></tr>
<tr><td colspan="4">Teacher: dissertation supervisor</td></tr>
<tr><td colspan="4">Date of last change: 31.3.2022</td></tr>
<tr><td colspan="4">Approved: prof. RNDr. Ján Kraic, PhD.</td></tr>
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<tr><td colspan="4">Faculty/institute: Faculty of Natural Sciences</td></tr>
<tr><td colspan="2">Subject code: KBT/dd321</td><td colspan="2">Subject name: Co-authorship (or Authorship) of Created and Published Teaching Material</td></tr>
<tr><td colspan="4">Type, scope, and method of educational activities: Optional subject.<br>Subject type (C, CO, O): O<br>Recommended scope of teaching (in hours):<br>Study method:<br>Study form: full-time study</td></tr>
<tr><td colspan="4">Number of credits: 5</td></tr>
<tr><td colspan="4">Recommended semester/trimester of study: semester 1-8 (semester 1-10 in external form)</td></tr>
<tr><td colspan="4">Level of study: doctoral</td></tr>
<tr><td colspan="4">Prerequisite subjects: without prerequisites</td></tr>
<tr><td colspan="4">Conditions for completing the subject:<br>Independent activity under the guidance of the author of the published teaching material.</td></tr>
<tr><td colspan="4">Educational outcomes:<br>• The student will gain experience in processing a teaching text, selecting appropriate content and presenting it in a comprehensible text.</td></tr>
<tr><td colspan="4">Brief content of the subject:<br>The student will complete selected activity for which he/she will receive credit:<br>• Co-authorship (or Authorship) of Created and Published Teaching Material</td></tr>
<tr><td colspan="4">Recommended literature:</td></tr>
<tr><td colspan="4">Language, knowledge of which is necessary to complete the subject: English</td></tr>
<tr><td colspan="4">Subject evaluation</td></tr>
<tr><td rowspan="2"></td><td>Passed</td><td>Failed</td><td rowspan="2"></td></tr>
<tr><td>0.00</td><td>0.00</td></tr>
<tr><td colspan="4">Notes: - student time load:</td></tr>
<tr><td colspan="4">Teacher: subject supervisor</td></tr>
<tr><td colspan="4">Date of last change: 31.3.2022</td></tr>
<tr><td colspan="4">Approved: prof. RNDr. Ján Kraic, PhD.</td></tr>
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<tr><td colspan="4">Faculty/institute: Faculty of Natural Sciences</td></tr>
<tr><td colspan="2">Subject code: KBT/dd322, KBT/dd323</td><td colspan="2">Subject name: Independent Study of Literature according to the Recommendation of the Supervisor I, II</td></tr>
<tr><td colspan="4">Type, scope, and method of educational activities: Compulsory subject. Profile subject.<br><br>Subject type (C, CO, O): C<br>Recommended scope of teaching (in hours):<br>Study method:<br>Study form: full-time study</td></tr>
<tr><td colspan="4">Number of credits: 5</td></tr>
<tr><td colspan="4">Recommended semester/trimester of study: semester 1-4 (semester 1-6 in external form)</td></tr>
<tr><td colspan="4">Level of study: doctoral</td></tr>
<tr><td colspan="4">Prerequisite subjects: without prerequisites</td></tr>
<tr><td colspan="4">Conditions for completing the subject:<br>Independent activity under the guidance of a dissertation supervisor.</td></tr>
<tr><td colspan="4">Educational outcomes:<ul><li>The student will acquire the ability to search and process scientific literature on the topic of the dissertation.</li><li>The student will be able to use the studied literature sources in designing expertiments and also in discussing results.</li></ul></td></tr>
<tr><td colspan="4">Brief content of the subject:<br>The student will complete selected activities for which he/she will receive credit:<ul><li>Independent Study of Literature according to the Recommendation of the Supervisor I</li><li>Independent Study of Literature according to the Recommendation of the Supervisor II</li></ul></td></tr>
<tr><td colspan="4">Recommended literature:</td></tr>
<tr><td colspan="4">Language, knowledge of which is necessary to complete the subject: English</td></tr>
<tr><td colspan="4">Subject evaluation</td></tr>
<tr><td rowspan="2"></td><td>Passed</td><td>Failed</td><td rowspan="2"></td></tr>
<tr><td>0.00</td><td>0.00</td></tr>
<tr><td colspan="4">Notes: - student time load:</td></tr>
<tr><td colspan="4">Teacher: prof. RNDr. Ján Kraic, PhD.</td></tr>
<tr><td colspan="4">Date of last change: 31.3.2022</td></tr>
<tr><td colspan="4">Approved: prof. RNDr. Ján Kraic, PhD.</td></tr>
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***Compulsory subjects (C)***

University of Ss. Cyril and Methodius in Trnava
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# SUBJECT INFORMATION SHEET

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd300** | **Subject name: Advances in Biotechnology** |
| **Type, scope, and method of educational activities:** Compulsory subject. **Profile subject.**<br>**Subject type (C, CO, O):** C<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 | |
| **Recommended semester/trimester of study:** semester 1-4 | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |

**Conditions for completing the subject:**

During the semester, each student will prepare and present 4 seminar reports/ppt presentations from papers recently published in international scientific journals on specific topics from the latest developments in biotechnology. Each presentation is evaluated up to 20 points. The student needs to reach 60 points to get a "passed" evaluation.

**Educational outcomes:**

- To inform and gain, in particular, a comprehensive view and knowledge of the issues and opportunities of biotechnology, based on an understanding of the current potential and the latest knowledge in the individual fields and disciplines on which biotechnology is based.
- The student will be able to understand biotechnology in a systematic and multidisciplinary way and to solve individual problems in the light of the latest knowledge of related disciplines.
- Upon graduation, the student will have the necessary background knowledge of advances in molecular biology, medicine, pharmacy, industry, plants, the environment, and other areas of biotechnology.
- The student will be able to comprehensively understand and approach problem solving and to effectively, systematically apply new knowledge gained in other specialized courses of study.
- The student will acquire the competence to apply new biotechnological procedures in such focused research and practice.

**Brief content of the subject:**

1. Contribution of modern methods of molecular biology to the development of biotechnology
2. Selected current trends in biochemistry and design methods
3. Study of the structure and properties of substances and their potential for biotechnology
4. Selected current trends in enzymology and their potential for the development of biotechnology
5. Advances in genetic manipulation and their importance for plant, animal and medicinal biotechnology
6. Applicability of bioanalytical methods / biosensors in biotechnologies (control of biotechnological processes, medical biotechnologies, environmental biotechnologies)
7. Selected examples of the latest biotechnology research in the world in the fields of medical, biotechnology
8. Selected examples of the latest biotechnology research in the world in the fields of pharmaceutical, biotechnology
9. Selected examples of the latest biotechnology research in the world in the fields of industrial biotechnology
10. Selected examples of the latest biotechnology research in the world in the fields of plant, environmental and other biotechnologies
11. Selected examples of a systems and multidisciplinary approach in biotechnology research
12. Defense of semester projects during the semester on topics related to biotechnology

**Recommended literature:**

- *KEEN, M. -- PONGRACZ, J. Medical Biotechnology. Edinburgh UK: Churrchill Livingstone Elsevier,*

*2009. 193 s. ISBN 978-0-08-045135-0.*

- *GROVES , M. Pharmaceutical Biotechnology. Boca Raton, Florida: CRC Press, Taylor &Francis Group, 2006. 411 s. ISBN 978-0-8493-1873-3.*
- *Future prospects for industrial biotechnology / Organisation for Economic Co-operation and Development. [1st ed.]. - Paris : OECD, 2011. 137 s. - ISBN 978-92-64-11956-7*
- *Biotechnology Progress. Accessible at: http://onlinelibrary.wiley.com/journal/10.1021/%28ISSN%291520-6033 ISSN: 8756-7938.*
- *Journal of Biotechnology Accessible at: http://www.sciencedirect.com/science/journal/01681656 ISSN: 0168-1656*
- *Bernard R. Glick, Jack J. Pasternak, Cheryl L. Patten. Molecular Biotechnology: Principles and Applications of Recombinant DNA. ASM Press; 4 Edition (December 1, 2009), 1000 pages. ISBN-10: 1555814980, ISBN-13: 978-1555814984*
- *Journal of Biotechnology (2020), Special Issue "Trends and Prospects in Medicinal and Pharma Biotechnologies in Europe" Editors: S. Miertuš, M. Ondrejovič and M. Dettenhofer*
- *Miertuš S., et al., Current State and Prospects of Biotechnology in Central and Eastern European Countries. Critical Reviews in Biotechnology, Part I: 39(1), 114-136 (2019), Part II: 137-155 (2019)*
- *Braccini, S. , Pecorini, G, Chiellini F. Bakos, D., Miertus, S., Frecer, V. : Adhesion of Fibroblast Cells on Thin Films Representing Surfaces of Polymeric Scaffolds of Human Urethra Rationalized by Molecular Models of Integrin Binding: Cell Adhesion on Polymeric Scaffolds for Regenerative Medicine, Jounal of Biotechnology, 2020, https://doi.org/10.1016/j.jbiotec.2020.11.001*
- *Zinoviev, F. Mueller Langer, Piyali Das, N. Bertero, P. Fornasiero, M. Kaltschmitt, G. Centi, S. Miertus: Next Generation Biofuels: Survey of emerging technologies and sustainability issues ChemSusChem.,3, (10) 1106–1133, (2010)*

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

**Subject evaluation**

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

**Notes: - student time load:**

**Teacher: Assoc. Prof. RNDr. Miroslav Ondrejovič, PhD.; Prof. Ing. Stanislav Miertuš, DrSc.**

**Date of last change: 31.3.2022**

**Approved: prof. RNDr. Ján Kraic, PhD.**

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917 01 Trnava

**SUBJECT INFORMATION SHEET**

| | |
|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd343** | **Subject name: Dissertation Defence** |
| **Type, scope, and method of educational activities:** Compulsory subject of the state examination<br>**Subject type (C, CO, O):** C<br>**Recommended scope of teaching (in hours):**<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 30 | |
| **Recommended semester/trimester of study:** semester 8 (semester 10 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>Elaboration of the dissertation. The course of the dissertation defence is evaluated by the committee comprehensively in terms of „passed“ or „failed“ in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava. | |
| **Educational outcomes:**<br>• The student has a deep theoretical knowledge of the subjects related to the topic of the dissertation and practical laboratory skills.<br>• He/she has an overview of the current state of the field at home and abroad, which is related to the topic of the dissertation.<br>• Can independently solve current scientific problems.<br>• Is able to critically analyse, evaluate and synthesise new concepts.<br>• He gained experience in presenting and defending his own results in a broader context. | |
| **Brief content of the subject:**<br>Defend theoretical and practical results.<br>Scientific discussion of the dissertation topic. | |
| **Recommended literature:** | |
| **Language, knowledge of which is necessary to complete the subject:** English | |
| **Subject evaluation** | |

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

| |
|---|
| **Notes: - student time load:** |
| **Teacher: State Examination Committee** |
| **Date of last change: 31.3.2022** |
| **Approved: prof. RNDr. Ján Kraic, PhD.** |

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**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd342** | **Subject name: Dissertation Exam** |
| **Type, scope, and method of educational activities:** Compulsory subject of the state examination<br>**Subject type (C, CO, O):** C<br>**Recommended scope of teaching (in hours):**<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits: 30** | |
| **Recommended semester/trimester of study:** semester 4 (semester 6 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>The student will prepare a thesis for the dissertation exam. The student will present the objectives of the dissertation and defend them. The student takes an exam - answers questions related to the dissertation topic. The course of the dissertation exam is evaluated by the committee by a comprehensive “passed” or “failed“ in accordance with the study regulations of the University of Ss. Cyril and Methodius in Trnava. | |
| **Educational outcomes:**<br>• The student has a deep theoretical knowledge of subjects related to the topic of the dissertation.<br>• He/she has a good overview of the current state of the issues addressed in the dissertation.<br>• The student is capable of thorough literature research, understands professional texts in English.<br>• The student is able to apply the knowledge acquired during his/her studies.<br>• The student is able to formulate the objectives of the dissertation.<br>• The student is able to prepare a written thesis for the dissertation examination. | |
| **Brief content of the subject:**<br>Literature research and preparation of an overview of the current state of the issue at home and abroad. Formulation of dissertation objectives. Choice of a theoretical approach to address the dissertation objectives. Preparation of a written thesis for the dissertation examination and its defence. Dissertation examination. | |
| **Recommended literature:** | |
| **Language, knowledge of which is necessary to complete the subject:** English | |
| **Subject evaluation** | |

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

| |
|---|
| **Notes: - student time load:** |
| **Teacher: State Examination Committee** |
| **Date of last change: 31.3.2022** |
| **Approved: prof. RNDr. Ján Kraic, PhD.** |

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| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd301** | **Subject name: Professional English for PhD Students** |
| **Type, scope, and method of educational activities:** Compulsory subject<br>**Subject type (C, CO, O):** C<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 in external form) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |

**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,
- can 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*

*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 | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

**Notes: - student time load:**

**Teacher: Assoc. Prof. PaedDr. Juraj Miština, PhD./ Mgr. Gabriela Chmelíková, PhD.**

**Date of last change: 31.3.2022**

**Approved: prof. RNDr. Ján Kraic, PhD.**

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

***Compulsory optional subjects (CO)***

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

# SUBJECT INFORMATION SHEET

| | |
|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd3xx; KBT/dde3xx** | **Subject name: Advances in Bioanalytical Chemistry** |
| **Type, scope, and method of educational activities:** compulsory optional subject<br>**Subject type (C, CO, O):** CO<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 in external form) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>During the semester, each student will prepare and present 4 seminar reports/ppt presentations from papers recently published in international scientific journals on specific topics from the latest developments in Bioanalytical Chemistry. Each presentation is evaluated up to 20 points. The student needs to reach 60 points to get a "passed" evaluation. | |
| **Educational outcomes:**<br>• The student will gain knowledge of modern methods for the analysis of biochemical and biological samples in various fields of practical application, as well as advanced methods using biomolecules and biosystems as testing tools.<br>• The student will gain knowledge of the theoretical principles of biosensors and other biochemical as well as biological methods, assays and detection systems and their applications in clinical biochemistry and medicine, food analysis, environmental monitoring, biotechnological process control and other areas.<br>• Upon completion of the study, the student will be able to assess the applicability of individual bioanalytical methods and gain competence to work in various fields of application. | |
| **Brief content of the subject:**<br>1. Principles of bioanalysis<br>2. Biological sample, sample preparation before analysis<br>3. Modern instrumental analytical methods in the analysis of biological samples<br>4. Bioaffinity chromatography, chiral separations<br>5. Modern methods of tissue imaging in medicine<br>6. Use of synchrotron radiation in the analysis of biomolecules and in biomedicine<br>7. Biochemical and biological methods of analysis (enzyme analysis, immunoassay and enzyme immunoassay)<br>8. Use of cells and higher biological systems as probes and detection systems<br>9. Biosensors, - principles, building components, methods of biosensor signal detection<br>10. Enzyme biosensors, immunosensors, DNA sensors, biosensors based on biological systems (bacteria, higher cell organisms, ..)<br>11. Nanobiosensors<br>12. Multidisciplinary approach to biosensor development<br>*13.* Current trends in biosensor applications in environmental analysis, in the food industry, in food quality control, in monitoring biotechnological processes, in clinical biochemistry and in medicine | |
| ***Recommended literature:***<br>• *S. Mikkelsen, E. Corton: Bioanalytical Chemistry, Willey, 2004*<br>• *Ajit Sadana Neeti Sadana: Biomarkers and Biosensors, Elsevier, 2014*<br>• *Ali Ensafi: Electrochemical Biosensors, Elsevier, 2019* | |

- *Legerská B., Chmelová D., Ondrejovič M. & Miertuš S.: The TLC-Bioautography as a Tool for Rapid Enzyme Inhibitors detection-A Review; Critical review in Analytical Chemistry (2020)DOI: 10.1080/10408347.2020.1797467*
- *Hľasová, Z., Košík, I., Ondrejovič, M., Miertuš, S., Katrlík, J. Methods and current trends in determination of neuraminidase activity and evaluation of neuraminidase inhibitors. Critical Reviews in Analytical Chemistry 49(4), 350-367 (2019)*
- *A. Pizzariello, M. Stredansky, S. Stredanska, S. Miertus: Ph-sensitive amperometric biosensor, US patent - US7041209 (2006)*
- *Biosensors and Bioelectronics (https://www.journals.elsevier.com/biosensors-and-bioelectronics)*
- *Biosensors (open access) - dostupné na : https://www.mdpi.com/journal/biosensors*


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

**Subject evaluation**

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

**Notes: - student time load:**

**Teacher: Prof. Ing. Stanislav Miertuš, DrSc.**

**Date of last change: 31.3.2022**

**Approved: prof. RNDr. Ján Kraic, PhD.**

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

**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd305** | **Subject name: Agricultural Biotechnology for PhD Students** |
| **Type, scope, and method of educational activities:** compulsory optional subject, **profile subject.**<br>**Subject type (C, CO, O):** CO<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 in external form) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>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:**<br>By completing the subject, the student will gain<br>• knowledge and insight into the importance and applications of agricultural biotechnology applied to soil, plants and livestock,<br>• 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).<br>The student will<br>• 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,<br>• 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),<br>• be able to design and implement biotechnological experiments and put them into practice,<br>• 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:**<br>1. Genetic variability of agriculturally used plants and animals and the potential to exploit the genetic variability of other organisms.<br>2. Methods of improvement (breeding) of plants and animals used in agriculture.<br>3. Principles and use of genome and gene mapping.<br>4. Use of genetic maps in molecular breeding.<br>5. Selection by molecular markers (MAS).<br>6. Methods of modifying plant and animal genomes by foreign DNA transfer. | |

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

**Subject evaluation**

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

**Notes: - student time load:**

**Teacher: Prof. RNDr. Ján Kraic, PhD.**

**Date of last change: 31.3.2022**

**Approved: prof. RNDr. Ján Kraic, PhD.**

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

**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd310** | **Subject name: Biosafety and Marketing of Biotechnology and its Products** |
| **Type, scope, and method of educational activities:** compulsory optional subject, **profile subject.**<br>**Subject type (C, CO, O):** CO<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 in external form) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>During the semester, the student processes 3 latest scientific articles related to the issue, which will be presented in the form of a ppt presentation and at the same time the student sufficiently answers the questions that will be asked. | |
| **Educational outcomes:**<br>• To teach the student to objectively and scientifically analyze the benefits and risks of biotechnological practices and products.<br>• To be able to clearly inform the consumer and the general public about these aspects.<br>• To be able to present clearly the current state of knowledge and possible effects in the fields of medicine, food and nutrition, industrial production and environmental protection, pointing out possible risks and ways of minimising them.<br>• Upon completion, the student is able to independently analyse and report on the benefits and risks associated with a particular area of biotechnology.<br>• The student will also be able to participate in the preparation and maintenance of biotechnology-related documentation. | |
| **Brief content of the subject:**<br>1. Introduction to the issue, summary of aspects related to the subject<br>2. New biotechnological approaches - genome editing, RNAi<br>3. Theory of system of analysis and risk management<br>4. Specific aspects of risk management in the field of biotechnology<br>5. Principles and forms of communication and popularization of objective scientific knowledge, benefits and risks of biotechnology for the general public<br>6. Analysis, management and communication of risks and expected benefits in the field of medical biotechnology, agricultural and food biotechnology and nutrition, industrial biotechnology, environmental biotechnology<br>7. Ethics and new biotechnologies<br>8. Principles of marketing goods and technologies<br>9. Specific requirements for the marketing of biotechnologically produced goods and biotechnological processes<br>10. Integrated marketing communication<br>11. Case studies<br>12. Processing of model presentations and documents | |
| **Recommended literature:**<br>*Chen C, Reniers G. Risk assessment of processes and products in industrial biotechnology. InSustainability and Life Cycle Assessment in Industrial Biotechnology 2018 (pp. 255-279). Springer, Cham.*<br>*Gupta V, Sengupta M, Prakash J, Tripathy BC. Basic and applied aspects of biotechnology. Singapore: Springer Singapore; 2017.*<br>*EFSA journal Online ISSN:1831-4732* | |

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*ISAAA Knowledge Centre*
*Lewandowski I. Bioeconomy: Shaping the transition to a sustainable, biobased economy. Springer Nature; 2018.*
*Munshi A, Sharma V. Safety and ethics in biotechnology and bioengineering: What to follow and what not to. InOmics Technologies and Bio-Engineering 2018 Jan 1 (pp. 577-590). Academic Press.*
*Eriksson, P., Rajamäki, H. Biotechnology marketing: Insider and outsider views. J Commer Biotechnol 16, 98–108 (2010). https://doi.org/10.1057/jcb.2009.16*
*Biologická bezpečnosť / Autori: Dezider Tóth et al. 1. vyd. Nitra : Slovenská poľnohospodárska univerzita v Nitre, 2007. 463 s. - ISBN 978-80-8069-846-1*
*Grosová S, Kutnohorská O. Marketing: Aplikace v chemii, potravinářství a farmacii. VSCHT Praha 2017, ISBN 978-80-7592-003-4*

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

**Subject evaluation**

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

**Notes: - student time load:**

**Teacher: Assoc. Prof. Ing. Jana Moravčíková, PhD.**

**Date of last change: 31.3.2022**

**Approved: prof. RNDr. Ján Kraic, PhD.**

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

**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd308** | **Subject name: Biotechnological Transformations of Biomass, Biofuels and Biorefineries** |
| **Type, scope, and method of educational activities:** compulsory optional subject, **profile subject.**<br>**Subject type (C, CO, O):** CO<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 in external form) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>Elaboration and presentation of work on the assigned topic, answering questions examining knowledge related to individual topics of the subject syllabus. | |
| **Educational outcomes:**<br>Student after completing the course:<br>• knows the basics of biochemical processes of transformation of renewable resources (biomass, waste from agricultural or food production, municipal waste).<br>• The student will gain an overview and knowledge of methods for the complex use of renewable resources with a focus on biorefineries, biotechnological processes for the production of energy, biofuels and a wide range of high value-added products (chemicals, polymers, etc.). Emphasis is placed on an overview of new processes using catalytic and biological systems and an overview of the wide range of products produced in this way.<br>• The student will be competent to work in workplaces specializing in biomass processing, conversion to biofuels, production of other products from primary biomass, and processing of waste biomass into products. | |
| **Brief content of the subject:**<br>1. Renewable resources (biomass, waste from agricultural or food production, municipal waste, etc.) vs. oil as a raw material for industrial production, perspectives, risks, principles of sustainability<br>2. Energy production, biofuel cells<br>3. Biofuels and bioproducts. Principles of biorefinery<br>4. Generations of biofuels (1st, 2nd, 3rd, 4th)<br>5. Sustainability of production processes, its assessment, principles of LCA method<br>6. Principles of chemical transformations, thermochemical processes of biomass transformation, hydrolysis, liquefaction, gasification, syn-gas production, processing of individual biomass components, catalytic processes of biofuel production and initial intermediates of industrial organic synthesis<br>7. Biochemical processes (enzymatic transformations, hydrolysis, fermentations, use of microbial systems), biotransformation of lignocellulosic materials<br>8. Bioprocesses for the production of biofuels (bioethanol, biomethane, DME, biodiesel, hydrogen) and chemicals<br>9. Biotransformation of alcohols, acids, carbohydrates, amino acids, esters and other low molecular weight substances, biotransformation of polymers<br>10. Catalytic transformations of biomass fractionation intermediates and by-products of biofuel production, production of high value-added products<br>11. Biosynthesis of surfactants, production of pheromones, herbicides, insecticides<br>12. Production of biodegradable plastics from biomass as feedstock<br>13. Examples of industrial applications | |
| **Recommended literature:**<br>*P. Fornasiero and M. Graziani: Renewable Energy and Renewable Resources, Taylor Francis Ed. 2011*<br>*Haibo Xie: The Role of Green Chemistry in Biomass Processing and Conversion,SAGE, 2013* | |
| **Language, knowledge of which is necessary to complete the subject:** English | |

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917 01 Trnava

| **Subject evaluation** | | | |
|---|---|---|---|
| | Passed | Failed | |
| | 0.00 | 0.00 | |
| **Notes: - student time load:** | | | |
| **Teacher: Assoc. Prof. RNDr. Miroslav Ondrejovič, PhD.** | | | |
| **Date of last change: 31.3.2022** | | | |
| **Approved: prof. RNDr. Ján Kraic, PhD.** | | | |

University of Ss. Cyril and Methodius in Trnava
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**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd307** | **Subject name: DNA Recombination and Genetic Transformation Technology** |
| **Type, scope, and method of educational activities:** compulsory optional subject, p**rofile subject.**<br>**Subject type (C, CO, O):** CO<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 in external form) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>Completion of the course is conditioned by the elaboration of a current clear presentation on the assigned topic relevant to the content of the course and also the topic of the student's dissertation. The degree of relevance, timeliness of the presented results and the ability to draw a personal opinion and conclusions on the studied issues will be evaluated. | |
| **Educational outcomes:**<br>By completing the course, the student will gain experience and competence to design experimental work, classify and summarize the knowledge of biotechnological research in the field of recombinant DNA and genetic transformation.<br>Within the European Qualifications Framework, students acquire the following skills and abilities by completing the course:<br>• follow instructions and plan their own procedure in experimental work, namely - basic laboratory skills for working in a biotechnology laboratory, working with DNA, RNA, protein, recombinant molecules, enzymes<br>• students gain the ability to analyze data and present this data as a basis for important decisions in their further experimental practice<br>• the graduate is able to routinely use laboratory tools and correctly masters the principles of laboratory practice<br>• can use information databases and work with them within the relevant tasks<br>• knows how to design and carry out an experiment<br>• can correctly evaluate the achieved results and discuss them with relevant practice, resp. scientific databases<br>• can draw conclusions and correct procedures with respect to the assigned topic<br>• the graduate is competitive within peers with respect to the international space<br>• the graduate is ready to participate in the work process in the field of molecular - biological research at a professional level. | |
| **Brief content of the subject:**<br>1. The course will acquaint students with the strategy, design and preparation of genetically modified organisms.<br>2.Students will be introduced to working with Genbank and Uniprot databases, as a basic step for the selection and isolation of suitable genes,<br>3.Choice of the necessary gene modification<br>4. Selection of a suitable transformation vector according to the type of host organism<br>5. Gene cloning, selection of a suitable recipient organism<br>6.Selection of transformants<br>7. Proof of transgenes at the genomic, transcriptomic, proteomic and metabolomic levels<br>8. Methods of heterologous expression<br>9.Preparation of a transgenic plant and a strategy for selecting a suitable transgene and recipient plant | |

10. Used methods of transgenosis in monocotyledonous and dicotyledonous plants
11. Examples of transgenic plants as producers of secondary metabolites
12. Real use of transgenic organisms in practice
13. Brief insight into legislation relevant to genetic modification

**Recommended literature:**

*Genetically Engineered Cereals for the Production of Polyunsaturated Fatty Acids / Milan Čertík ... [et al.]. In: Food Lipids : chemistry, nutrition, and biotechnology / Casimir C. Akoh. - Boca Raton : Taylor & Francis, 2017. – ISBN 9781498744850. - s. 997-1010.[Spoluautori: Tatiana Klempová - Daniel Mihálik - Katarína Ondreičková - Marcela Gubišová - Ján Kraic]*

*Biochemistry, Ninth Edition/|Lubert Stryer; Jeremy Berg; John Tymoczko; Gregory Gatto - ISBN 9781319234362 – 2019.*

*Engineering Principles in Biotechnology, /Wei-Shou Hu, - ISBN 9781119159032 – Wiley – 490s.- 2018.*

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

**Subject evaluation**

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

**Notes: - student time load:**

**Teacher: Assoc. Prof. Mgr. Daniel Mihálik, PhD.**

**Date of last change: 31.3.2022**

**Approved: prof. RNDr. Ján Kraic, PhD.**

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

**SUBJECT INFORMATION SHEET**

| | |
|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd304** | **Subject name: Industrial Biotechnology for PhD Students** |
| **Type, scope, and method of educational activities:** compulsory optional subject, **profile subject.**<br>**Subject type (C, CO, O):** CO<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 in external form) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>Elaboration and presentation of work on the assigned topic, answering questions examining knowledge related to individual topics of the subject syllabus. | |
| **Educational outcomes:**<br>Upon successful completion of the subject, the student will gain<br>• knowledge about the basic steps of biotechnological production of selected industrial products, raw materials usable for the given production, organisms or enzymes usable in the given stage of production as well as the applicability of the target products themselves,<br>• the ability to explain the principles of methods used in the processing of feedstock, in the management of the fermentation process as well as the processing and refinement of the final product,<br>• knowledge about biotechnological production of important chemicals, materials and fuels in some sector of the national economy such as chemical, pharmaceutical, food, paper, textile and energy industries, thus acquiring the prerequisites (competence) for the possibility of being able to work in the above mentioned production areas using biotechnology. | |
| **Brief content of the subject:**<br>1. Use of enzymes in organic synthesis. Oxidoreduction, hydrolysis, isomerization, polymerization and other reactions catalyzed by free, immobilized and synthetic enzymes.<br>2. Microbial transformations of alcohols, acids, carbohydrates, amino acids, alkanes, aromatics, heterocyclic compounds, esters, amides and other low molecular weight substances.<br>3. Biotransformations of polymers.<br>4. Biotechnological production of alcohols, acids, solvents and other primary metabolites for chemical applications.<br>5. Biosynthesis of surfactants.<br>6. Biodegradation of detergents and other tensides.<br>7. Bioproduction of polysaccharides.<br>8. Biodegradable plastics.<br>9. Biotechnological preparation of herbicides, insecticides, fungicides. Production of pheromones.<br>10. Fertilizers of biotechnological origin. Biodegradability of chemical pesticides.<br>11. Energy carriers of biological origin.<br>12. Fermentation production of fuel ethanol. Bioproduction of hydrogen. Biodiesel production.<br>13. Biotransformation of energy. Methanogenesis.<br>14. Chemical, biological and engineering aspects of conversion of organic matter (biomass) to biogas.<br>15. Biotechnological processing of lignocellulosic materials. | |
| **Recommended literature:**<br>*Ratledge, C., Kristiansen, B.: Basic Biotechnology. Cambridge Univerzity Press*<br>*Soetaert W., Vandamme E. J.: Industrial biotechnology, Wiley, Weinheim, 2010, 499 p.*<br>*Flickinger M. C. et al.: Encyclopedia of industrial biotechnology, Wilex, New York, 2010, 4887 p.* | |

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|---|---|---|---|
| **Language, knowledge of which is necessary to complete the subject:** English | | | |
| **Subject evaluation** | | | |
| | Passed | Failed | |
| | 0.00 | 0.00 | |
| **Notes: - student time load:** | | | |
| **Teacher: Assoc. Prof. RNDr. Miroslav Ondrejovič, PhD.** | | | |
| **Date of last change: 31.3.2022** | | | |
| **Approved: prof. RNDr. Ján Kraic, PhD.** | | | |

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**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd302** | **Subject name: Medical and Pharmaceutical Biotechnologies for PhD Students** |
| **Type, scope, and method of educational activities:** compulsory optional subject<br>**Subject type (C, CO, O):** CO<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 in external form) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>Final test results. Participation on lectures in according with study rules, commitment of current work in the middle of the semester. | |
| **Educational outcomes:**<br>Upon successful completion of the Medical and Pharmaceutical Biotechnology subject, the graduate<br>• Gain knowledge of the basic principles and fundamental aspects of medical and pharmaceutical biotechnology in general and explain them using a specific selected example.<br>• The student will be able to compare and explain the differences, advantages and disadvantages of classical approaches of medicinal chemistry and medical and pharmaceutical biotechnology.<br>• The student will be proficient in the principles, procedures and techniques of applied, analytical and biochemical methods used in medical and pharmaceutical biotechnology. | |
| **Brief content of the subject:**<br>1. The repeating of selected aspects of biochemistry, associated with course.<br>2. Introduction into medicinal and pharmaceutical biotechnologies, history, basic aspects.<br>3. The general principles for production of pharmaceutically important components.<br>4. Sub-cellular and over-cellular production systems.<br>5. Antibiotics.<br>6. Pharmaceutically applied enzymes and enzyme inhibitors.<br>7. Monoclonal antibodies, SC antibodies, dually active antibodies, chimeric antibodies.<br>8. The production of recombinant peptides and proteins for diagnostic and therapeutic purposes.<br>9. The production of interferons, interleukins, other, cytokines.<br>10. The production of hormones, growth factors and regulators.<br>11. The preparation of bio-catalyzers, microbial metabolites and biopolymers.<br>12. Repeating lessons.<br>13. The presentation of final assignments. | |
| **Recommended literature:**<br>*Bernard R. Glick, Terry L. Delowitch and Cheryl L Patten: Medical Biotechnology, ed. American Society for Microbiology, 2013, 700 p. SBN: 155581705X.*<br>*Provided e-material in *.pptx format.* | |
| **Language, knowledge of which is necessary to complete the subject:** English | |
| **Subject evaluation** | |

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

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| **Notes: - student time load:** |
| **Teacher: Assoc. Prof. Ing. Tibor Maliar, PhD.** |
| **Date of last change: 31.3.2022** |
| **Approved: prof. RNDr. Ján Kraic, PhD.** |

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**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd309** | **Subject name: Modern Methods for Studying the Structure, Properties and Activity of Compounds and Biomolecules** |
| **Type, scope, and method of educational activities:** compulsory optional subject, **profile subject.**<br>**Subject type (C, CO, O):** CO<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 in external form) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>During the semester, the student prepares and presents in the form of ppt three semester works, based on the chosen topic and the latest scientific knowledge from the scientific literature. For each work, the student can get 4-10 points and the work will be evaluated in terms of form and content of the text, presentation and discussion. The condition for the final exam is to obtain at least 20 points. The final exam will take the form of an oral examination testing the knowledge related to the individual areas of the syllabus. | |
| **Educational outcomes:**<br>• The student will gain knowledge about the study of the properties and activities of biological molecules and their application in various biotechnological industries based on the latest knowledge from the world literature and practical applications.<br>• The student will acquire the ability to perceive biotechnology in a systemic and multidisciplinary way and to solve sub-problems related to the use of active substances and biomolecules.<br>• The student will acquire the ability to creatively and comprehensively perceive, present and discuss the assigned problem by developing his/her own term paper and its presentation.<br>• By completing the course, the student will gain basic information and knowledge of advances in various areas of biological, biochemical, physiological and biotechnological research on biomolecules.<br>• The student will acquire the competence to comprehensively understand and, in particular, to approach the solution of a given problem and to effectively and systematically use new knowledge in the theoretical and applied field, i.e. in scientific research, development, as well as in practice. | |
| **Brief content of the subject:**<br>1. Definition of biologically active molecules, importance, classification. Occurrence, sources.<br>2. Metabolic processes of living organisms – microorganisms, fungi, plants, animals.<br>3. History of development of methods for studying the properties and activities of biomolecules.<br>4. Carbohydrates - definition, classification, structure and properties, reactions, biosynthesis, natural products.<br>5. Amino acids, peptides, proteins - classification, synthesis and its methods, biosynthesis, chemical reactions, structure, denaturation of proteins.<br>6. Enzymes - nomenclature and classification, factors influencing enzyme activity, coenzymes, inhibitors, purification, mechanism of catalysis.<br>7. Fermentation - types, importance and practical uses. Biocatalysis - importance in Green Chemistry.<br>8. Pyrimidines, purines, nucleic acids - structure of nucleic acid components, forms of DNA, types of RNA and their structure, genetic code, gene therapy. | |

9. Lipid substances and fats - classification, biological functions, extraction, refining, identification, aromatization, liposomes.
10. Terpenoids - essential oils, classification, identification, isolation, application.
11. Alkaloids - occurrence, sources, extraction from plant sources, properties, methylation, modification, medical importance.
12. Inovative trends in the study, properties and activities of compounds and biomolecules - molecular gastronomy, pharmaceutical biotechnology, genetic therapy, forensic medicine and others.

**Recommended literature:**


- *S. P. Bhutani et al.: Chemistry of Biomolecules, Second Edition. CRC Press, 2019, 474 pp. ISBN 9780367208554*
- *R. K. Delong, Q. Zhou: Introductory Experiments on Biomolecules and their Interactions, 1st Edition. Academic Press, 2015, 126 pp. ISBN: 9780128009697*
- *J. Liang, B. DasGupta: Models and Algorithms for Biomolecules and Molecular Networks. John Wiley & Sons, 2016, 272 pp. ISBN: 0470601930*
- *B. Piršelová, M. Havrlentová: Alkaloids. UCM in Trnave, 2022, in press. (in Slovak).*
- *M. Havrlentová: Selected plants metabolites: characteristics, functions, molecular-biological approaches to their biosynthetic pathways. Inaugural dissertation. UCM in Trnava, 221 pp. (in Slovak).*


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

**Subject evaluation**

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

**Notes: - student time load:**

**Teacher: Assoc. Prof. RNDr. Michaela Havrlentová, PhD.**

**Date of last change: 31.3.2022**

**Approved: prof. RNDr. Ján Kraic, PhD.**

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**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd311** | **Subject name: New Trends, Procedures and Methods in the Study of Living Organisms** |
| **Type, scope, and method of educational activities:** compulsory optional subject<br>**Subject type (C, CO, O):** CO<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 for external study) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 for external study) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>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:**<br>• The student will gain knowledge of new procedures, methods and trends in molecular biology, genetics, biochemistry and genomics, medicine, in the study and analysis of biological systems.<br>• The student will acquire the theoretical foundations of the ability to apply in scientific or diagnostic practice and to solve practical tasks. | |
| **Brief content of the subject:**<br>1. Methods of comparative and evolutionary genomics<br>2. Methods of functional genomics and transcriptomics<br>3. DNA microchip technologies and their use in practice<br>4. Analysis of genetic transformation, gene expression<br>5. Personalized genomic medicine<br>6. CRISPR-CAS9 technology and its use<br>7. Use of stem cells in biology and regenerative medicine<br>8. Technologies of massive parallel sequencing of genomes - 2nd generation of sequencing<br>9. Whole-molecule sequencing technologies - 3rd generation of sequencing<br>10. Technologies of whole-molecule massive parallel sequencing - 4th generation of sequencing<br>11. Genomic databases and bioinformatics procedures in genomic technologies<br>12. Metagenomic and epigenomic approaches and their use | |
| **Recommended literature:**<br>• *J. Radvánszky, T. Szemes: Úvod do biomedicínskych aplikácií vysokoparalelného sekvenovania. Bratislava, CVTI SR, 2021, ISBN 978-80-89965-89-2*<br>• *Next Generation Sequencing: Advances, Apeditor. Rijeka (HR): InTech; 2016 Jan 14. Applications and Challenges [Internet]. Kulski JK*<br>• *Arthur M Lesk, A. M.: Introduction to Genomics. Oxford University Press, 2012*<br>• *Pevsner, J.: Bioinformatics and Functional Genomics, Wiley-Blackwell, 2015*<br>• • *Review publications from research journals.* | |
| **Language, knowledge of which is necessary to complete the subject:** English | |
| **Subject evaluation** | |

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

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| **Notes: - student time load:** |
| **Teacher: prof. RNDr. Ján Kraic, PhD., RNDr. Michal Konečný, PhD.** |
| **Date of last change: 31.3.2022** |

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**Approved: prof. RNDr. Ján Kraic, PhD.**

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**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd303** | **Subject name: Preparation of Projects and Grants in the Field of Biotechnology** |
| **Type, scope, and method of educational activities:** compulsory optional subject<br>**Subject type (C, CO, O):** CO<br>**Recommended scope of teaching (in hours):** 2 hours of lectures and 2 hours of seminars<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits:** 10 (15 in external form) | |
| **Recommended semester/trimester of study:** semester 1-3 (semester 1-5 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>Final test results. Participation on lectures in according with study rules, commitment of final semester work in the end of the semester. | |

**Educational outcomes:**

The subject "Preparation of Projectc and Grants in the Field of Biotechnology" is a specialized subject aimed at providing students with knowledge in the preparation and writing of projects and grant applications.

The student will

- acquire knowledge and basic guidelines for navigating grant agencies and schemes, both domestic and international,
- be able to perceive the nature and objectives of projects, the differences and specifics of different types of projects, the requirements of calls, but above all how to link the scientific sphere, applied research and commercial practice and reality,
- be able to search for sources of funding for research, development and subsequent transfer of results into practice,
- be competent to participate in the preparation of project proposals in various grant schemes.

**Brief content of the subject:**

1. The basic features of the grants.
2. The differences between grants of basic and applied research and realization.
3. The features /items/ of the grant application.
4. The review of the Slovak grant agencies.
5. Grant agencies SGA and CEAGA.
6. Grant agency SRDA and different calls.
7. SF, OPRaI and INTERREG.
8. Enterprising in biotechnologies, „start up“, „spin off“ in SR and abroad.
9. Venture capital funds.
10. The preparation of business plan.
11. The consultation to individual final semester work.
12. The presentation of individual final semester work.

**Recommended literature:**

*HODGETTS, R. -- KURATKO, D. Entrepreneurship. Theory, process, practice. South Western: Thompson, 2007. 700 s.*

*Provided e-material in *.pptx format.*

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

**Subject evaluation**

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

**Notes: - student time load:**

**Teacher: Prof. Ing. Stanislav Miertuš, DrSc.**

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| **Date of last change: 31.3.2022** |
| **Approved: prof. RNDr. Ján Kraic, PhD.** |

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***Creative activity***

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917 01 Trnava

**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd324 – KBT/dd341** | **Subject name:** Publication in a Scientific Journal Registered in the Web of Science Databases Included in Q1 or Q2 in JCF IF (1st or 2nd quarter of the impact factor value in the Journal Citation Report) |
| **Type, scope, and method of educational activities:** compulsory subject/optional subject, **profile subject.**<br>**Subject type (C, CO, O):** C/O<br>**Recommended scope of teaching (in hours):**<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits: 35-50** | |
| **Recommended semester/trimester of study:** semester 1-8 (semester 1-10 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |

**Conditions for completing the subject:**

Independent scientific activity under the supervision of the dissertation supervisor. The student joins the research team of the supervisor within the framework of a domestic or foreign project and plans and implements initial experiments during the semester. Based on the achievement of publishable results, the student will receive a grade 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 ranked in quartiles of at least Q1 or Q2 in the JCF IF. In these published outputs, registered in the Web of Science and Scopus databases, the doctoral student has an appropriate author's share according to the conventions of the respective study programme, which is evidenced by an extract from the publication activity register from the On-line Catalogue of the UCM University Library or the Central Register of Publication Activity Register.

**Educational outcomes:**

- The student has knowledge and overview of the basic scientific methods, knows the problems and tendencies of the development of science in the field of the dissertation topic.
- The student is able to define specific problems and methods of their solution and is ready to solve them.
- The student acquires the competence to decide on the form and manner of presentation of the results of his/her work in the form of scientific publications. The student is able to assess the quality of his/her results and correctly identify appropriate and sufficiently high quality scientific journals for their publication.
- The student will be competent to participate in a scientific team of a training or other workplace, or in a team applying the results of biotechnological research in practice, not only by manual work, but also by correct presentation of the results of experiments.

**Brief content of the subject:**

As part of the scientific part, the student will complete selected activities for which he/she will receive credits:

- Publication in a Scientific Journal Registered in the Web of Science Databases Included in Q1 in JCF IF (1st quarter of the impact factor value in the Journal Citation Report)
- Publication I in a Scientific Journal Registered in the Web of Science Databases Included in Q2 in JCF IF (2nd quarter of the impact factor value in the Journal Citation Report)
- Publication II in a Scientific Journal Registered in the Web of Science Databases Included in Q2 in JCF IF (2nd quarter of the impact factor value in the Journal Citation Report)

**Recommended literature:**

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

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| Subject evaluation | | | |
|---|---|---|---|
| | Passed | Failed | |
| | 0.00 | 0.00 | |
| **Notes: - student time load:** | | | |
| **Teacher: prof. RNDr. Ján Kraic, PhD.** | | | |
| **Date of last change: 31.3.2022** | | | |
| **Approved: prof. RNDr. Ján Kraic, PhD.** | | | |

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**SUBJECT INFORMATION SHEET**

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd324 – KBT/dd341** | **Subject name:** Publication in a Scientific Journal Registered in the Web of Science Databases Included in Q1-Q4 in JCF IF (1st-4th quarter of the impact factor value in the Journal Citation Report) |
| **Type, scope, and method of educational activities:** compulsory subject/optional subject, p**rofile subject.**<br>**Subject type (C, CO, O):** C/O<br>**Recommended scope of teaching (in hours):**<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits: 10-50** | |
| **Recommended semester/trimester of study:** semester 1-8 (semester 1-10 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |
| **Conditions for completing the subject:**<br>Independent scientific activity under the supervision of the dissertation supervisor. The student joins the research team of the supervisor within the framework of a domestic or foreign project and plans and implements initial experiments during the semester. Based on the achievement of publishable results, the student will receive a grade 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 ranked in quartiles of Q1-Q4 in the JCF IF. In these published outputs, registered in the Web of Science and Scopus databases, the doctoral student has an appropriate author's share according to the conventions of the respective study programme, which is evidenced by an extract from the publication activity register from the On-line Catalogue of the UCM University Library or the Central Register of Publication Activity Register. | |
| **Educational outcomes:**<br>• The student has knowledge and overview of the basic scientific methods, knows the problems and tendencies of the development of science in the field of the dissertation topic.<br>• The student is able to define specific problems and methods of their solution and is ready to solve them.<br>• The student acquires the competence to decide on the form and manner of presentation of the results of his/her work in the form of scientific publications. The student is able to assess the quality of his/her results and correctly identify appropriate and sufficiently high quality scientific journals for their publication.<br>• The student will be competent to participate in a scientific team of a training or other workplace, or in a team applying the results of biotechnological research in practice, not only by manual work, but also by correct presentation of the results of experiments. | |
| **Brief content of the subject:**<br>As part of the scientific part, the student will complete selected activities for which he/she will receive credits:<br>• Publication in a Scientific Journal Registered in the Web of Science Databases Included in Q1 in JCF IF (1st quarter of the impact factor value in the Journal Citation Report)<br>• Publication I in a Scientific Journal Registered in the Web of Science Databases Included in Q2 in JCF IF (2nd quarter of the impact factor value in the Journal Citation Report)<br>• Publication II in a Scientific Journal Registered in the Web of Science Databases Included in Q2 in JCF IF (2nd quarter of the impact factor value in the Journal Citation Report)<br>• Publication I in a Scientific Journal Registered in the Web of Science Databases Included in Q3 in JCF IF (3rd quarter of the impact factor value in the Journal Citation Report)<br>• Publication II in a Scientific Journal Registered in the Web of Science Databases Included in Q3 | |

in JCF IF (3rd quarter of the impact factor value in the Journal Citation Report)
- Publication I in a Scientific Journal Registered in the Web of Science Databases Included in Q4 in JCF IF (4th quarter of the impact factor value in the Journal Citation Report)
- Publication II in a Scientific Journal Registered in the Web of Science Databases Included in Q4 in JCF IF (4th quarter of the impact factor value in the Journal Citation Report)

**Recommended literature:**

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

**Subject evaluation**

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

**Notes: - student time load:**

**Teacher: prof. RNDr. Ján Kraic, PhD.**

**Date of last change: 31.3.2022**

**Approved: prof. RNDr. Ján Kraic, PhD.**

University of Ss. Cyril and Methodius in Trnava
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# SUBJECT INFORMATION SHEET

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|---|---|
| **University:** University of Ss. Cyril and Methodius in Trnava | |
| **Faculty/institute: Faculty of Natural Sciences** | |
| **Subject code: KBT/dd324 – KBT/dd341** | **Subject name: Other Creative Activity** |
| **Type, scope, and method of educational activities:** compulsory subject/optional subject<br>**Subject type (C, CO, O):** C/O<br>**Recommended scope of teaching (in hours):**<br>**Study method:** on-site<br>**Study form:** full-time study | |
| **Number of credits: 5-10** | |
| **Recommended semester/trimester of study:** semester 1-8 (semester 1-10 in external form) | |
| **Level of study:** doctoral | |
| **Prerequisite subjects:** without prerequisites | |

**Conditions for completing the subject:**

Independent scientific activity under the supervision of the dissertation supervisor. The student joins the supervisor's research team in a national or international project and plans and implements initial experiments during the semester. During this part of the dissertation, the student may receive credit for learning a new experimental methodology. He/she may also receive credit for obtaining an internal grant. In collaboration with other members of the team, he/she will present preliminary results that can be used in further scientific work at a departmental seminar, at a national or international conference or in a publication in a journal registered in the Web of Science or Scopus databases without a Q1-Q4 classification in the JCF IF. Credit may also be earned in this section for citation of a scientific publication. On the basis of the achievement of publishable results, the student will receive a grade 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 the basic scientific methods, knows the problems and tendencies of the development of science in the field of the dissertation topic.
- The student is able to define specific problems and methods of their solution and is ready to solve them.
- The student acquires the competence to decide on the form and manner of presentation of the results of his/her work in the form of scientific publications. The student is able to assess the quality of his/her results and correctly identify appropriate and sufficiently high quality scientific journals for their publication.
- The student will be competent to participate in a scientific team of a training or other workplace, or in a team applying the results of biotechnological research in practice, not only by manual work, but also by correct presentation of the results of experiments.

**Brief content of the subject:**

As part of the scientific part, the student will complete selected activities for which he/she will receive credits:

- Publication in a Scientific Journal Registered in the Web of Science or Scopus Databases without Inclusion in Q1-Q4 in JCF IF
- Publication in a Peer-Reviewed Proceedings
- Active Participation in a Foreign Scientific Conference (declared by a published contribution in the proceedings)
- Active Participation in a National Scientific Conference (declared by a published contribution in the proceedings)
- Member of the Research Team on a Foreign Scientific Project, Registered at UCM
- Member of the Research Team on a National Scientific Project (eg APVV, VEGA, KEGA, OPVaI), Registered at UCM
- Citation to the Publication Output Registered in the Web of Science or Scopus Databases (it must not be an autocitation, it must be an affiliation of DB FNS UCM)
- Obtaining an internal grant

- Adoption of a New Experimental Methodology I
- Adoption of a New Experimental Methodology II
- Presentation at the Seminar

**Recommended literature:**

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

**Subject evaluation**

| | Passed | Failed | |
|---|---|---|---|
| | 0.00 | 0.00 | |

**Notes: - student time load:**

**Teacher: prof. RNDr. Ján Kraic, PhD.**

**Date of last change: 31.3.2022**

**Approved: prof. RNDr. Ján Kraic, PhD.**