

Course code	Course group	Volume in ECTS credits	Course hours
BIO 5010	C	6	160

Course type (compulsory or optional)	Compulsory
Course level (study cycle)	Master
Semester the course is delivered	Spring /Autumn
Study form (face-to-face or distant)	Face-to-face

Course title in Lithuanian

VAISTINIŲ AUGALŲ MOLEKULINĖ BIOLOGIJA

Course title in English

MOLECULAR BIOLOGY OF MEDICINAL PLANTS

Short course annotation in Lithuanian

Dalykas yra skirtas supažindinti studentus su vaistinių augalų molekuline biologija ir jos taikymu šiuolaikinėje medicinoje, farmacijoje, maisto pramonėje bei augalinių produktų kokybės, saugumo ir efektyvumo įvertinimui. Studijų metu studentai įgyja žinių apie: augalų taksonomijos, nomenklatūros principus, molekulinės biologijos kryptis, susijusias su biologiškai veikliųjų medžiagų klasifikacija, augalų antriniais metabolitais, augalinių produktų kokybe, fitocheminės analizės-standartizacijos metodais ir jų pritaikymo perspektyvomis. Įgytos žinios panaudojamos tarpdisciplininėse srityse, kūrybiškai taikant instrumentinės analizės metodus ir modernias technologijas.

Short course annotation in English

The course is dedicated to introduce students to the molecular biology of medicinal plants and its modern application in medicine, pharmacy, food industry and evaluation of herbal products quality, safety and efficiency. During the course students will gain knowledge about: taxonomy and nomenclature principles of medicinal plants, fields of molecular biology, that are related with classification of biologically active compounds, secondary metabolites, the quality of herbal products, phytochemical analysis-standardization methods and their application perspectives. The acquired knowledge is used in inter-disciplinary fields, creatively using instrumental analysis methods and modern technologies.

Prerequisites for entering the course

Basic biology BIO1001, Biochemistry BBK3001, Microbiology and basic immunology BBK3010, Physicochemical analysis BBK 3002.

Course aim

The aim of the course is interdisciplinary knowledge of scientific achievements, development of methodologies and perspectives in the field of medicinal plants molecular biology, development of phytochemical analysis methods, validation and application in medicine, pharmacy, food safety and quality control.

Links between course outcomes and criteria of learning achievement evaluation

Course outcomes	Criteria of learning achievement evaluation
-----------------	---

Understanding the principles of current trends of medicinal plants molecular biology	<p>Student presents knowledge about: taxonomy and nomenclature principles of medicinal plants, contemporary fields of molecular biology, plants development cycle and accumulation and classification of biologically active compounds, the quality of herbal products.</p> <p>Student knows methods of plants molecular biology research and their applied and fundamental perspectives and problems. Student is able to describe perspective of application of plants in medicine, in pharmacy, in food and feed safety and quality control.</p>
Ability to select and apply appropriate evaluation and characterization scheme of the plant material according to the characteristic properties of the investigation object and possibilities of the evaluation methods	<p>Student presents interdisciplinary knowledge upon phytochemical analysis and standardization methods and their application, distinguish characteristic biologically active compounds in different groups of plants, can design scheme of plant raw materials or products evaluation and characterization. Student presents how apply the sample collection and preparation methods for raw material preparation and evaluation and herbal products quality control.</p>
Ability to evaluate the results obtained, interpret them and draw the conclusions	<p>Student presents knowledge of statistical methods application for evaluation of the results, critical and comparative evaluation of the data using literature search, proves quality of the results by validation of the methods and equipment used</p>

Content (topics)

12. Biological and geographical sources of herbal products
13. Pharmacological activities of natural products. Synergy in relation to the pharmacological action of phytomedicinals.
14. Plant growth regulators. Plant cell and tissue culture; biological conversions; clonal propagation. Phytochemical variation within a species. Deterioration of stored plant products.
15. Basic metabolic pathways and the origin of secondary metabolites.
16. Plant products and high throughput screening. Traditional plant medicines as a source of new drugs
17. General methods associated with the phytochemical investigation of herbal products. Sample preparation and analysis of volatile compounds.
18. Sample preparation and analysis of non-volatile compounds.
19. Standardized methods and phytochemical analysis. Quality control of raw material and plant products. Evaluation of contaminants in plant material and products.
20. Method validation and statistical evaluation of the results.
21. Plants in complementary and traditional systems of medicine, pharmacy, food, feed industries.
Practical work (contents):
1. Phenological observation, growth and development of medicinal and aromatic plants in the collections of the Botanical Garden.
2. Identification of plants according to the bioactive compounds groups in the collections of the Botanical Garden.
3. Anatomical, morphological analysis of plants raw material.
4. Collection and preparation of raw material of plants in the collections of the Botanical Garden.
5. Sample preparation of plants raw material and products.
6. Analysis of the volatile compounds of plants raw material and products.

7. Analysis of the non-volatile compounds of plants raw material and products.
8. Evaluation of radical scavenging and antioxidant activities of plant extracts.

Distribution of workload for students (contact and independent work hours)

Lectures – 45 hours, laboratory work– 15 hours, examination – 3 hours, individual work – 97 hours.

Structure of cumulative score and value of its constituent parts

Final assessment sums the assessments of written final examination (50%), written mid-term examination (30%) and study of medicinal plants in the collection, and assessment of laboratory works (20%).

Recommended reference materials

No.	Publication year	Authors of publication and title	Publishing house	Number of copies in		
				University library	Self-study rooms	Other libraries
<i>Basic materials</i>						
1.	2006	A.Crozier, M.N.Clifford and H.Ashihara. Plant secondary metabolites: Occurrence, Structure and Role in the Human Diet	Blackwell Publishing			1
2.	2005	Maruška A., Kornyšova O., Machtejevas E. Efektyviosios skysčių chromatografijos pagrindai.	VDU leidykla, Kaunas	40		20
3.	2002	Trease and W.C.Evans Pharmacognosy. 585 p.	15 th International edition Edinburgh/London New York Philadelphia St Louis Sydney Toronto			1
4.	2003	Maruška A., Kornyšova O. Kapiliarinė elektroforezė: mokomoji knyga. Kaunas	VDU leidykla, Kaunas	25		
5.	1998	Mickevičius D. Cheminės analizės metodai. 1 dalis. (Spektrinė analizė). Vilnius	Žiburys	110		100
6.	1999	Mickevičius D. Cheminės analizės metodai. 2 dalis. (Elektrocheminė ir chromatografinė analizė). Vilnius	Žiburys	110		100
<i>Supplementary materials</i>						
1.	2008	Landers J.P. Handbook of capillary and microchip electrophoresis and associated microtechniques.				Taylor & Francis
2.	1999	<u>WHO Monographs on Selected Medicinal Plants - Volume 1</u> (1999; 295 pages) http://apps.who.int/medicinedocs/en/d/Js4927e/				Internet
3.	2004	WHO Monographs on Selected Medicinal Plants - Volume 2, (2004; 358 pages)				Internet

		http://apps.who.int/medicinedocs/en/d/Js4927e/	
4.	2007	<u>WHO Monographs on Selected Medicinal Plants - Volume 3</u> (2007; 390 pages http://apps.who.int/medicinedocs/en/d/Js4927e/	Internet books
5.	2009	<u>WHO Monographs on Selected Medicinal Plants - Volume 4</u> (2009; 456 pages) http://apps.who.int/medicinedocs/en/d/Js4927e/	Internet books
6.	2010	<u>WHO Monographs on Medicinal Plants Commonly Used in the Newly Independent States (NIS)</u> (2010; 450 pages)	Internet books
7.	2012	http://www.ema.europa.eu/ema/index.jsp?curl=pages%2Fincludes%2Fmedicines%2Fmedicines_landing_page.jsp&searchkwByEnter=true&quickSearch=herbal+medicines+for+human+use&spanFlag=0&keywordSearch=Submit	Internet books

Course programme designed by

Ona Ragažinskienė, Faculty of Natural Sciences, Department of Biology
Audrius Maruška, Faculty of Natural Sciences, Department of Biochemistry and Biotechnology