COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biologically active plant substances [S1Bioinf1>BASR]

Course

Field of study
Bioinformatics

Year/Semester
4/7

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

dr hab. inż. Katarzyna Materna prof. PP
katarzyna.materna@put.poznan.pl

Lecturers

Prerequisites

Student will gain well-ordered and theoretically grounded knowledge of key issues of organic chemistry. Student is able to solve elementary problems of organic chemistry on the basis of possessed knowledge, the ability to acquire information from indicated sources in Polish and foreign language. Student understands the need of further education, the necessity of broadening his/her competence, readiness to cooperate within a team.

Course objective

The course aims to familiarize students with the structure, properties, occurrence and biological significance of selected biologically active compounds, which are plant secondary metabolites.

Course-related learning outcomes

Knowledge:
1. Student knows basic issues of organic and bioorganic chemistry related to bioactive substances [K_K04].
2. Student knows selected groups of bioactive compounds and their properties, including possible influence on cells and living organisms. He knows set of raw materials of natural origin, their source, key

biological activity and meaning for cosmetic and pharmaceutical preparations. He has basic knowledge about methods of extraction of primary secondary metabolites from plant material [K_W08].

Skills:
1. Student is able to use basic laboratory techniques in synthesis, isolation and purification of chemical compounds, including biologically active compounds [K_U03].
2. Student is able to use basic laboratory techniques and tools to solve problems in organic and bioorganic chemistry, evaluate their usefulness [K_U05].

Social competences:
1. Student is ready to lifelong learning and improving his competences [K_K01].
2. Student is ready to cooperate and work in a group, taking various roles in it [K_K02].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture - written pass; evaluation criteria: 3 - 50.0-59.9%; 4 - 70.0-79.9%; 5 - from 90.0%.
Laboratory - reports from laboratory classes, colloquium, oral/written answer, presentation of theoretical and experimental material, solving of posed scientific problems, evaluation of student activity during classes, evaluation of the implementation and solving of posed tasks, evaluation of teamwork and self-presentation skills, evaluation criteria: 3 - basic theoretical and practical preparation, ability to prepare reports on laboratory exercises, basic participation in theoretical and practical classes without additional involvement; 4 - practical preparation supported by theoretical knowledge, ability to formulate appropriate conclusions from the data obtained during the laboratory, active participation in classes supported by the desire to acquire additional practical and theoretical knowledge; 5 - complete preparation for classes, the ability to formulate conclusions at an advanced level and defend the theses, precise performance of assigned tasks, independent search for additional theoretical knowledge, coordination of work in a research team, ambitious approach to the subject.

Programme content

The course covers issues related to the structure, properties, and biological activity of plant secondary metabolites, as well as their practical applications in cosmetics, medicine, and the food industry.

Course topics

1. Plant primary and secondary metabolites.
2. Methods of isolation of organic compounds from plant products.
3. Chirality of biologically active compounds. Influence of changes in the structure of the molecule on its biological activity (isomerism, stereoisomerism, enantiomers).
4. Vitamins - division, physicochemical properties and biological activity of individual vitamins, their occurrence and methods for obtaining them.
5. Alkaloids. Classification. Occurrence. Medicinal and toxic effects.
6. Polyphenols. Structure, classification, biological properties and application.
7. Phytoestrogens. Biological activity. Application in food supplements.
8. Pharmacological significance of tannins, coumarins and glycosides.
9. Phytoncides as natural antibiotics.
10. Terpenes and terpenoids.
11. Other biologically active substances of plant origin: flavonoids, anthocyanins, karetenoids, organic hydroxyacids, essential oils, saponins, isothiocyanates, glucosinolates, phytosterols, their properties and biological activity.
12. Genetically modified plants. Enhancement of bioactive compounds.

Laboratory:
Laboratory problems: students will use the knowledge acquired in the lecture to master practical skills related to such issues as: methods of obtaining and extracting biologically active substances from plants (e.g. The students will use the knowledge gained at the lectures to acquire and extract biologically active substances from plants (e.g. extraction in a Soxhlet apparatus), quality assessment of plant medicinal substances with respect to their content of essential oils (distillation in a Derynga apparatus), determination

of the total content of polyphenols and flavonoids in herbal materials, determination of antioxidant activity of flavonoid plant materials and ability to scavenge selected reactive oxygen species, and others.

Teaching methods

Lecture - multimedia presentation, discussion.
Laboratory exercises - practical classes.

Bibliography

Basic
1. Z.E. Sikorski (red.), Chemia żywności,WNT ,Warszawa, 2012.
2. Z.E. Sikorski, H. Staroszczyk, Chemia żywności, PWN, Warszawa, 2017.
3. A. Kołodziejczyk, Naturalne związki organiczne, PWN, Warszawa, 2013.
4. R.B. Silverman, Chemia organiczna w projektowaniu leków, WNT ,Warszawa, 2004.
5. P. Kafarski, B.Lejczak, Chemia bioorganiczna, PWN, Warszawa, 1994.
6. G.L. Patrick, Chemia medyczna, PWN, Warszawa, 2019.
Additional
1. M. Molski, Nowoczesna kosmetologia, PWN, Warszawa, 2014.
2. K. Kacprzak, K. Gawronska, Chemia kosmetyczna, Wydawnictwo Naukowe UAM, Poznań, 2010.
3. Rzemieniecki T., Gwiazdowska D., Rybak K., Materna K., Jus K., Pernak J. (2019) Synthesis, Properties, and Antimicrobial Activity of 1-Alkyl-4-hydroxy-1-methylpiperidinium Ionic Liquids with Mandelate Anion. ACS Sustain. Chem. Eng., 15053.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50