COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biologically active compounds from natural sources [S1Bioinf1>ZBC]

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 presents basic knowledge of organic compounds of natural origin, characterized by biological activity. The course aims to familiarize students with the structure, properties, occurrence and biological significance of selected compounds of animal origin, which are used in pharmacology, medicine, food and cosmetics.

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 the set of raw materials of natural origin, their source, key biological activity and importance for cosmetic, pharmaceutical, medical and food preparations [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:

Learning outcomes presented above are verified as follows:
Lecture - written pass; evaluation criteria: in accordance with the Regulations of First- and Second-Cycle Studies (§ 21)
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 the definition, classification, properties, biological activities, and practical applications of bioactive substances derived from natural sources, with an emphasis on their use in cosmetics, medicine, and the food industry.

Course topics

Lecture:
1. Definition and classification of biologically active substances (bioactive substances) of natural origin.
2. Bioactive substances of animal origin: hormones, pheromones (fragrance substances), lipids, proteins (collagen and elastin), and others (royal jelly), their physicochemical properties and biological activity.
3. Applications of bioactive compounds derived from animals in cosmetics, pharmacy, medicine, and the food industry (bioactive ingredients in food products, uniqueness of fragrance substances, bee products in medicine and cosmetology, natural emulsifiers).
4. Selected animal-derived ingredients in cosmetics: chitosan, elastin, keratin, collagen, lanolin, beeswax, sodium salt of animal fat (soaps).
5. Bioactive substances found in food: L-carnitine, taurine, carnosine, anserine, creatine, coenzyme Q10, glutathione, conjugated linoleic acid (CLA), bioactive peptides, ovalbumin, conalbumin, ovomucoid, cystatin.
6. Honey as a rich source of biologically active substances (vitamins, minerals, simple sugars and their derivatives, e.g., methylglyoxal).
7. Animal-derived dyes – e.g., cochineal, shellac, sepia.
8. Animal fats and polysaccharides with special medicinal applications.
9. Amino sugars - naturally derived antibiotics.
10. Introduction to the synthesis and analysis of the properties of biologically active compounds based on natural raw materials. Features affecting the difficulty level of synthesizing biologically active compounds. Synthetic approach to creating biologically active compounds.

Laboratory Class Topics: Students will use the knowledge acquired in the lecture to master practical skills related to laboratory techniques used in the synthesis, modification, analysis, and study of the activity of selected representatives of biologically active compounds of animal origin.

Teaching methods

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

Bibliography

Basic
1. A. Kołodziejczyk, Naturalne związki organiczne, PWN, Warszawa, 2013.
2. Z.E. Sikorski (red.), Chemia żywności,WNT ,Warszawa, 2012.
3. Z.E. Sikorski, H. Staroszczyk, Chemia żywności, PWN, Warszawa, 2017.
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. Syguda A., Wojcieszak M., Materna K., Woźniak-Karczewska M., Parus A., Ławniczak Ł., Chrzanowski Ł.
(2020) Double-Action Herbicidal Ionic Liquids Based on Dicamba Esterquats with 4-CPA, 2, 4-D, MCPA, MCPP, and Clopyralid Anions, ACS Sustain. Chem. Eng., 14584.

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