COURSE DESCRIPTION CARD - SYLLABUS

Course name
Bioorganic Chemistry

Course

Field of study
Pharmaceutical Engineering
Area of study (specialization)
-
Level of study
First-cycle studies
Form of study
full-time

Year/Semester
2/4
Profile of study
general academic
Course offered in
polish
Requirements
compulsory

Number of hours

Lecture
15
Laboratory classes
15
Other (e.g. online)
0
Tutorials
0
Projects/seminars
0

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
Dr hab. Michał Sobkowski, prof. ICHB PAN
msob@ibch.poznan.pl
618528503 wewn. 182
Instytut Chemii Bioorganicznej PAN
ul. Noskowskiego 12/14
61-704 Poznań

Responsible for the course/lecturer:
Dr Jacek Kolanowski
jkolanowski@ibch.poznan.pl
618528503 wewn. 165
Instytut Chemii Bioorganicznej PAN
ul. Noskowskiego 12/14
61-704 Poznań

Prerequisites

A student starting the subject "Bioorganic chemistry" should have structured knowledge of organic, physical and analytical chemistry and biochemistry; knowledge of basic equipment and reagents used in

the chemical laboratory and the ability to perform chemical calculations. The student should also be able to use basic laboratory techniques in the synthesis, isolation and purification of chemical compounds. In addition, the student should understand the need for further training and raising his professional and personal competences.

Course objective

The course aims are to familiarize students with the basic topics of bioorganic chemistry, such as: general knowledge of organic compounds found in organisms, methods for chemical synthesis and purification of natural compounds and their modified derivatives and analogues. Strategies for rational choice of protective groups for given synthetic purposes will be presented. The most important properties and applications of synthetic analogues of natural compounds will be discussed. Contemporary trends in research related to bioorganic chemistry will be presented.

Course-related learning outcomes

Knowledge

1. has basic knowledge of techniques and methods for the synthesis and purification of natural compounds and their analogues [K_W7, K_W13]

2. has basic knowledge of the techniques and methods of analysis of synthetic natural compounds and their analogues [K_W7, K_W13]

3. has basic knowledge in designing and selection of molecular tools for given biomedica applications [K_W7, K_W13, K_W14]

4. has basic knowledge of modern methods of identification and development of bioactive compounds [K_W14]

5. has basic knowledge of the properties and applications of synthetic analogues of natural compounds [K_W24]

6. has basic knowledge in current studies in the field of bioorganic chemistry [K_W7, K_W13, K_W24]

Skills

1. is able to plan the synthesis of simple analogues of natural compounds [K_U12]

2. is able to use scientific publications to solve simple synthetic problems related to bioorganic chemistry and to evaluate a utility and suitability of molecular tools for biological applications [K_U1, K_U3, K_U8, K_U10]

3. selects methods analytical methods adequate to determine the structure and purity of synthetic analogues of natural compounds [K_U11]

Social competences

1. understands the need to improve professional qualifications [K_K1]

2. is responsible for the tasks carried out in the team [K_K2]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified by a 45-minute written test carried out during the 15th lecture, consisting of open questions covering the topics presented during the lectures. Passing threshold: 50% of points.

Knowledge acquired during the tutorials is verified by the attendance at classes and continuous assessment during the tutorials. After 14 classes, students will complete written essays that will be discussed and evaluated during 15th class.

Programme content

Methods for the synthesis of nucleosides and nucleotides. Protective groups - types and application in bioorganic chemistry. Artificial enzymes. Polypeptide synthesis. Synthesis of natural and modified oligonucleotides. Methods for isolation, purification and determination of the structure and purity of synthetic biomolecules. Applications of synthetic biopolymers. Antigen and antisense therapy. Synthetic aptamers. DNA quadruplexes - occurrence, division, preparation and application. DNA orgami. Basics of stereochemistry of synthetic biomolecules. Therapeutic applications of nucleoside and nucleotide analogues.

Small molecule organic compouns (probes and drugs) for application in biology and medicine. Design criteria of small molecule tools for biology and medicine. Tags vs probes. Types of responsive probes. Mechanisms of interaction of tools with biological environment. Types of responsive groups and molecular targets (small molecule analytes, proteins, nucleic acids). Designing of molecular probes. Properties and applications of pro-drugs. Strategies for pro-drugs development.

Teaching methods

Lecture: multimedia presentation

Tutorials: multimedia presentation, discussed on a regular basis with students; analysis of scientific publications.

Bibliography

Basic

1. P. Kafarski, B. Lejczak, "Chemia bioorganiczna", PWN, Warszawa, 1994

2. A. Kołodziejczyk, "Naturalne związki organiczne", PWN, Warszawa 2004

Additional

1. Podręczniki chemii organicznej i biochemii.

2. R.M. Silverstein, F.X. Webster, D.J. Kremle, "Spektroskopowe metody identyfikacji związków organicznych", PWN, Warszawa, 2007

3. "Metody spektroskopowe i ich zastosowanie do identyfikacji związków organicznych", praca zbiorowa pod red. W. Zielińskiego i A. Rajcy, WNT, Warszawa, 1995

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,2
Student's own work (literature studies, preparation for laboratory, preparation for tests) [1]	20	0,8

[1] delete or add other activities as appropriate