COURSE DESCRIPTION CARD - SYLLABUS

Course name
Molecular biology [S1IFar2>BM]

Course

Field of study
Pharmaceutical Engineering

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Students taking the course should have well-established theoretical knowledge of the basics of molecular biology, biochemistry, genetics and human cell physiology.

Course objective

The aim of education is for the student to acquire knowledge and skills enabling understanding: - basics of genetically determined features and mechanisms of regulation of gene expression - molecular basis of the cell cycle - pathomechanism of genetically determined human diseases - mechanisms of cancer transformation and cell death and mastering molecular biology methods used in laboratory diagnostics, biotechnology, gene therapy and recombinant protein technology. - methods of detection and quantitative determination of nucleic acids and proteins - genome testing methods (hybridization, polymerase chain reaction - PCR) - principles of using basic gene analysis techniques

Course-related learning outcomes

Knowledge:
1. Has knowledge of the physicochemical and biological basis of health sciences to the extent appropriate for pharmaceutical engineering, including basic issues in subjects such as biology,

pharmaceutical botany, biotechnology, biochemistry, molecular biology, human anatomy and physiology [K_W5]
2. Knows the basic principles of occupational health and safety [K_W27]

Skills:
1. Understands the literature on pharmaceutical engineering in Polish; reads and understands simple scientific and technical texts in a foreign language, is able to obtain information from literature, databases and other sources related to pharmaceutical engineering, also in a foreign language, integrate it, interpret it, draw conclusions and formulate opinions [K_U1]
2. Applies basic techniques, equipment and research apparatus useful in biotechnology, synthesis and analysis of pharmaceutically active substances, drug form technology and toxicology, appropriate for pharmaceutical engineering, uses pharmacopoeial methods, prepares documentation [K_U8]
3. He has the ability to self-educate [K_U24]

Social competences:
1. Is ready to critically evaluate his knowledge, understands the need to educate himself, expand his knowledge and improve his professional, personal and social competences, understands the importance of knowledge in solving problems and is ready to seek the opinion of experts [K_K1]
2. Is aware of the social role of a graduate of a medical and technical university, and especially understands the need to initiate and cooperate for the benefit of both the social environment and the public interest [K_K7]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Observation of student work during seminars and analysis of his or her ability to work independently and in a team; assessment of understanding of classes. Final colloquium. Continuous assessment while performing exercises. Partial written tests, min. 2 colloquia. Checking the ability to perform exercises independently. Final assessment - test. (stationary or remote form depending on the epidemiological situation).

Programme content

Lectures:
- structure and functioning of the genome, transcriptome and proteome;
- DNA recombination and cloning; restriction enzymes, vectors, introduction of DNA into cells, cloning, analysis and use of cloned DNA;
- molecular aspects of signal transduction and interdependence with the cell cycle (protein kinases, cyclins and their kinases, types of cell death, tumorigenesis);
- methods of detection and analysis of proteins and nucleic acids used in molecular biology; analytical techniques used in molecular diagnostics (PCR, qPCR, RTPCR, nested PCR, RFLP, HRM, sequencing);
- molecular biology methods in oncology (oncogenes and tumor suppressor genes); application of DNA testing in justice and forensics;
Laboratories:
Students become familiar with the theoretical and practical foundations regarding the impact of polymorphisms on drug metabolism and response to pharmacotherapy, and, as a result, the need to individualize therapy based on genetic profiling. Detailed issues:
- genetically determined diseases. The importance of polymorphisms for basic metabolism - pharmacokinetics and pharmacogenomics, functional genomics, multidrug resistance
- the world of enzymes and ribozymes in molecular biology and medical biotechnology
- design of methods and tests
- cell death (apoptosis and autophagy)
Exercises:
- structure and types of nucleic acids;
- isolation of nucleic acids from various tissues (liquid, solid) with division and discussion of individual stages, variants, modifications, issues related to working with nucleic acids and their storage;
- PCR + agarose gel electrophoresis;
- proteins, protein isolation methods, inhibitors, polyacrylamide gel electrophoresis and its variants, when we use electrophoresis in denturating conditions and when in native conditions, staining of proteins separated in the gel with PAA;

- transfer of proteins from PAA gel to membrane, immunodetection (WB) with discussion of transfer methods (wet, dry, semi-dry), ELISA.

Course topics

none

Teaching methods

discussions, multimedia presentations

Bibliography

Basic:
1. Bal J. (red.) Biologia molekularna w medycynie, 2013.
2. Lewiński A, Liberski P. (red.) Biologia molekularna człowieka; R. Epstein, 2006.
3. Słomski R. (red) Analiza DNA - Teoria i Praktyka , Wydawnictwo Uniwersytetu Przyrodniczego w Poznaniu, 2008.

Additional:
11. Rybczyńska M. (red) Wybrane zagadnienia z biologii molekularnej: skrypt do ćwiczeń dla studentów kierunku analityka medyczna. , Wyd. Uczeln. AMiKM Poznaniu, 2002.
2. Szweykowska-Kulińska Z. (red.) Biologia molekularna. Krótkie wykłady; P.C. Turner, A.G. McLennan, A.D. Bates, M.R.H. White , PWN Warszawa, 2012.
3. Bednarski W. Fiedurek J. Podstawy biotechnologii przemysłowej. , Wydawnictwo Naukowo-Techniczne, 2007.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00