Course Syllabus

I. General Information

Course name	Molecular biology
Programme	Biotechnology
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	BSc
Form of studies (full-time, part-time)	part-time
Discipline	Biological sciences
Language of instruction	English

Course coordinator/person responsible	Dr hab. Maciej Masłyk, Prof. KUL

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS Points
lecture	30	IV	7
tutorial			
classes	45	IV	
laboratory classes			
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	Laboratory techniques, biochemistry, microbiology

II. Course Objectives

Theoretical acquaint students with selected techniques of modern molecular biology
Practical implementation of selected techniques of molecular biology
Development of skills in experiment designing, observation, asking questions and discussing the results.
The acquisition of skills in specific vocabulary of molecular biology
To acquaint students with the most important processes in living organisms.

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	presents terminology used in molecular biology, defines phenomena and molecular processes	K_W01
W_02	presents knowledge in the field of molecular biology used in biotechnology	K_W05
W_03	presents knowledge in the field of molecular biology, molecular techniques and describes their practical use	K_W06
SKILLS		
U_01	applies techniques and research tools in the field of molecular biology	K_U01
U_02	designs and performs research tasks in the field of molecular biology	K_U15
U_03	learns independently in a targeted manner in the field of molecular biology	K_U17
SOCIAL COMPETENCIES		
K_01	is prepared to evaluate his own knowledge and skills in the field of molecular biology	K_K04

IV. Course Content

Lecture: DNA as genetic material. Definition of gene, structure of eukaryotic and prokaryotic genes. Organization of genetic material in pro- and eukaryotic cells. Changes in genome (transposition, conversion, rearangeration). DNA replication. Different mechanisms of genetic material amplification. Mutagenesis and DNA rep air processes. Mechanisms of DNA recombination. Transcription. Structure and function of pro- and eukaryotic RNA polymerases, mechanisms of initation, elongation and termination of transcription. Control of gene expression in eukaryotic and prokaryotic cells. Posttranscriptional modifications of RNA and their regulation. Translation. Genetic code, mechanisms of initiation, elongation and termination of translation as well as regulation of the processes. Protein transport in the cell. Transport mechanisms of proteins to specific localizations. Structure and function of heat shock protein (HSP). Proteolysis. External signal transmission at eukaryotic and prokaryotic organisms. Structure and functional basics of membrane and internal receptors. Proteins as molecular switch in signac cascades: G proteins and Ras protein, MAP kinase, protein p53, caspases. Molecular mechanisms in cell cycle.
Classes: Practical application of reporter genes. Properties, characteristics and visualization of selected reporter genes. Operones. Structure and function of GFP protein. GFP as a tool in molecular biology. Overproduction of CK2 kinase in the bacterial expression system. Cell lysis and purification of the gene product using affinity chromatography. Calculation of the efficiency of expression and purification. Investigation of protein kinase activity with the radioisotope method. Determination of kinetic constants (Km, Vmax). Regulation of enzyme activity with the use of selective inhibitors.

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*

KNOWLEDGE			
W_01	Conventional lecture	exam	Evaluated test
W_02	Conventional lecture	exam	Evaluated test
W_03	Conventional lecture	exam	Evaluated test
SKILLS			
U_01	Classes	presentation written test	presentaton rating card/file, Evaluated written test
U_02	Classes	presentation written test	presentaton rating card/file, Evaluated written test
U_03	Classes	presentation written test	presentaton rating card/file, Evaluated written test
SOCIAL COMPETENCIES			
K_01	Classes	observation	rating card

VI. Grading criteria, weighting factors.

The grades from the written exam, test and presentation are taken into account. The indicated level of knowledge of the content of education applies to each assessed element.

Mark	**Evaluation criteria**	
Very good (5)	the student realizes the assumed learning outcomes at a very good level	the student demonstrates knowledge of the education content at the level of 95-100%
overgood (4.5)	the student accomplishes the assumed learning outcomes an over good level	the student demonstrates knowledge of the education content at the level of 85-94 %
Good (4)	the student accomplishes the assumed learning outcomes at a good level	the student demonstrates knowledge of the education content at the level of 75-84%
Quite good(3.5)	the student accomplishes the assumed learning outcomes at a quite good level	the student demonstrates knowledge of the education content at the level of 65-74%
sufficient (3)	the student accomplishes the assumed learning outcomes at a sufficient level	the student demonstrates knowledge of the education content at the level of 51-64%

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	75
Number of hours of individual student work	100

VIII. Literature

Basic literature
Allison, L.A, Fundamental molecular biology, Wiley, 2012 Clark, D.P., Pazdernik, N.J., McGehee, M.R., Molecular Biology, Elsevier, 2018 Tymoczko, J.L., Berg, J.M., Stryer, L., Biochemistry – a short course, Freeman, 2015
Additional literature
Alberts B., Johnson A., Levis J., Morgan, D., Raff M., Roberts K., Walter P., Molecular Biology of the Cell, Garland Science, 2015