SYLLABUS – A COURSE DESCRIPTION
I. General informaion
1. Course name: **New generation pharmaceuticals**
2. Course code: **01-BTA-NEWPHARM**
3. Course type (compulsory or optional): **compulsory**
4. Study programme name: **Biotechnology**
5. Cycle of studies (1st or 2nd cycle of studies or full master's programme): **2nd cycle of studies**
6. Educational profile (general academic profile or practical profile): **general academic profile**
7. Year of studies (if relevant): **II**
8. Type of classes and number of contact hours (e.g. lectures: 15 hours; practical classes: 30 hours):
   lectures: 20 hours
   laboratory classes: 35 hours
9. Number of ECTS credits: **5**
10. Name, surname, academic degree/title of the course lecturer/other teaching staff:
   prof. dr hab. Krzysztof Sobczak, ksobczak@amu.edu.pl
   dr Agnieszka Piasecka, agamyk@amu.edu.pl
   mgr Daria Niewiadomska
   mgr Zuzanna Rogalska
   dr hab. Michał Gdula, michal.gdula@amu.edu.pl
   dr hab. Kinga Kamieniarz-Gdula, kinga.kamieniarz-gdula@amu.edu.p
   dr hab. Katarzyna Raczyńska, doracz@amu.edu.pl
   Visiting professors:
   prof. Rob Willemsen from Erasmus University Medical Center, Rotterdam, The Netherlands - a specialist in mouse disease models related to CGG repeat expansion
   prof. Ruben Artero from the Universidad de Valencia INCLIVA Biomedical Research Institute, Valencia, Spain - a specialist in insect models (mainly Drosophila) of neuromuscular and neurodegenerative diseases

11. Language of classes: **english**
12. Online learning – yes (partly – online / fully – online) / no:
II. Detailed information
1. Course aim (aims)
   1. Understanding the principles of health and safety at work in the laboratory.
   2. Understanding and knowledge in techniques of eukaryotic cell culture and methods of delivering nucleic acids and biologically active compounds to different cell types.
   3. Understanding and knowledge in different methods to monitor molecular, cellular and phenotypic changes resulting from pathological processes.
   4. Understanding and knowledge in a strategy of selection different phenotypic features enabling determination of the activity of active substances.
   5. Transfer of knowledge and developing skills in constructing biochemical and biological model systems for testing the activity of active compounds including high throughput screening systems.
   6. Transfer of knowledge in the field of bioinformatic design of ligands binding to macromolecules by modeling their structures and interaction dynamics.
   7. Transfer of knowledge about large-scale methods and design-based methods of searching for ligands that bind to macromolecules and regulate specific biochemical processes and pathways.
   8. Transfer of knowledge in the field of pre-clinical and clinical trials to assess the quality, safety and activity of potential pharmaceuticals (pharmacokinetics and pharmacodynamics).
   9. Developing skills in the selection of appropriate molecular biology and cell-based techniques to monitor the activity of small compounds and potential drugs.
   10. Developing skills in the design and use of appropriate control models in testing biologically active compounds and drugs.
2. Pre-requisites in terms of knowledge, skills and social competences (if relevant)
   Advanced knowledge of structure and function of prokaryotic and eukaryotic cells and animal tissues as well as general processes and pathways important for proper activity of different cell types. Basics of general biochemistry, molecular biology,

genetics, genetic engineering, molecular genetics and biotechnology obtained during the first degree studies (bachelors degree) in a field of biology, biotechnology, bioinformatics or related fields.

3. Course learning outcomes (EU) in terms of knowledge, skills and social competences and their reference to study programme learning outcomes (EK)

Course learning outcome symbol (EU)	On successful completion of this course, a student will be able to:	Reference to study programme learning outcomes (EK)
EU_01	identify and monitor phenotypic changes resulting from pathological processes and the effect of active compounds and drugs	BT_W01, BT_W02, BT_W04, BT_U01, BT_U02, BT_U06, BT_K01
EU_02	select, design and construct biochemical and biological model systems for testing the activity of active substances	BT_W03, BT_W04, BT_U01, BT_U02, BT_U06, BT_K01
EU_03	select and apply molecular biology and cell-based techniques and functional tests to monitor the activity of active substances	BT_W01, BT_W03, BT_W06, BT_U01, BT_U02, BT_U06
EU_04	explain bioinformatic approaches to design ligands binding to macromolecules by modeling their structure and dynamics	BT_W05, BT_U02
EU_05	explain the basics of large-scale methods of searching for ligands that bind to macromolecules and regulate specific biochemical processes	BT_W01, BT_W03, BT_U01
EU_06	explain the use of preclinical and clinical tests to assess the quality of potential pharmaceuticals	BT_W02, BT_W06, BT_W08, BT_U03
EU_07	determine the structural and biochemical basics of biologically active substances	BT_W02, BT_W04, BT_W06, BT_U03, BT_K02
EU_08	explain and apply safety rules in the laboratory	BT_U06

4. Learning content with reference to course learning outcomes (EU)

Course learning content	Course learning outcome symbol (EU)
Review of the molecular basis of the pathomechanism of several diseases and design of biochemical and biological model systems of these diseases	EU_01, EU_02
Approaches to study the activity of active substances in model biochemical and biological systems	EU_02, EU_03, EU_07
Ways to design and search for new active compounds to endure specific pathological changes or to obtain a different phenotypic effect	EU_04, EU_05
Study on the activity of active substances in pre-clinical tests and clinical trials	EU_02, EU_03, EU_06
The use of biochemical and biological control models in the study of the activity of biologically active substances and drugs	EU_02, EU_03, EU_06
Health and safety principles in the cell culture and molecular biology laboratories	EU_08

5. Reading list (fragments indicated by the teachers)

1. Michael WiBT, Ed: An Introduction to Molecular Biotechnology: Molecular Fundamentals, Methods and Applications in Modern Biotechnology, Wiley-VCH, , 2006

2. Clark DP & Pazdernik NJ, Ed: Biotechnology - Applying the Genetic Revolution, Elsevier Academic Press, , 2009

3. Berg, Stryer, Tymoczko, Gatto Ed: Biochemistry, W.H. Freeman and Company, , 2015

Artykuły w czasopismach

1. Zuzana Antosova, Martina Mackova, Vladimir Kral and Tomas Macek (2009): Therapeutic application of peptides and proteins: parenteral forever?, Trends in Biotechnology, 27

2. Mahesh Uttamchandani, Jia Ling Neo, Brandon Ngiap Zhung Ong and Shabbir Moochhala (2009): Applications of microarrays in pathogen detection and biodefence, Trends in Biotechnology, 27

3. Douglas S. Jones, Adam P. Silverman and Jennifer R. Cochran (2008): Developing therapeutic proteins by engineering ligand–receptor interactions, Trends in Biotechnology, 26

4. Y. John Shyu and Chang-Deng Hu (2008): Fluorescence complementation: an emerging tool for biological research, Trends in Biotechnology, 26

5. Daniel H. Kim and John J. Rossi (2007): Strategies for silencing human disease using RNA interference, NATURE REVIEWS GENETICS, 8

6. Ian Collins & Paul Workman (2007): The promises and pitfalls of RNAinterference-based therapeutics,, Nature, 457

III. Additional information

1. Teaching and learning methods and activities to enable students to achieve the intended course learning outcomes (please indicate the appropriate methods and activities with a tick or/and suggest different methods)

Teaching and learning methods and activities	
Lecture with a multimedia presentation	X
Interactive lecture	
Problem – based lecture	
Discussions	
Text-based work	
Case study work	
Problem-based learning	
Educational simulation/game	
Task – solving learning (eg. calculation, artistic, practical tasks)	
Experiential work	X
Laboratory work	X
Scientific inquiry method	
Workshop method	
Project work	
Demonstration and observation	
Sound and/or video demonstration	
Creative methods (eg. brainstorming, SWOT analysis, decision tree method, snowball technique, concept maps)	
Group work	

2. Assessment methods to test if learning outcomes have been achieved (please indicate with a tick the appropriate methods for each LO or/and suggest different methods)

Assessment methods	Course learning outcome symbol							
	EU_1	EU_2	EU_3	EU_4	EU_5	EU_6	EU_7	EU_8

Written exam	X			X	X	X	X	
Oral exam	X			X	X	X	X	
Open book exam								
Written test	X			X	X	X	X	
Oral test	X			X	X	X	X	
Multiple choice test								
Project								
Essay								
Report		X	X					
Individual presentation								
Practical exam (performance observation)		X	X					X
Portfolio								

3. Student workload and ECTS credits

Activity types	Mean number of hours spent on each activity type
Contact hours with the teacher as specified in the study programme	55
Preparation for classes	10
Reading for classes	20
Essay / report / presentation / demonstration preparation, etc.	15
Project preparation	
Term paper preparation	
Exam preparation	25
Total hours	125
Total ECTS credits for the course	5

4. Assessment criteria according to AMU in Poznan grade system

Very good (bdb; 5,0): Clear attainment of the course outcomes, showing complete and comprehensive understanding of the course content, with development of relevant skills and intellectual initiative to an extremely high level.

Good plus (+db; 4,5): Substantial attainment of the course outcomes, showing a high level of understanding of the course content, with development of relevant skills and intellectual initiative to a high level.

Good (db; 4,0): Sound attainment of the course outcomes, showing good understanding of the course content, with development of relevant skills and intellectual initiative to good level.

Satisfactory plus (+dst; 3,5): Some attainment of the course outcomes, showing some understanding of the course content, with development of relevant skills and intellectual initiative to rather good level.

Satisfactory (dst; 3,0): Weak attainment of the course outcomes, showing acceptable understanding of the course content, with development of relevant skills and intellectual initiative to acceptable level.

Unsatisfactory (ndst; 2,0): Very weak attainment of the course outcomes, showing not passable understanding of the course content, with development of relevant skills and intellectual initiative to not acceptable level.