SYLLABUS – A COURSE DESCRIPTION

I. General informaion

1. Course name: **High-throughput technologies in biotechnology**
2. Course code: **01-BTA-HIGHTECHBIOT**
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): **I**
8. Type of classes and number of contact hours (e.g. lectures: 15 hours; practical classes: 30 hours):
   lectures: 30 hours
   practical classes: 30 hours
9. Number of ECTS credits: **5**
10. Name, surname, academic degree/title of the course lecturer/other teaching staff:
    prof. dr hab. Izabela Makałowska, izabel@amu.edu.pl
    dr hab. Agnieszka Ludwików, ludwika@amu.edu.pl
    prof. dr hab. Joanna Wesoły, j.wesoly@amu.edu.pl
11. Language of classes: **English**
12. Online learning – yes (partly – online / fully – online) / no:

II. Detailed information

1. Course aim (aims)
   1. Gain knowledge about basic sequencing high-throughput sequencing technics
   2. Gain knowledge about varieties of RNA and DNA sequencing approaches and protocols
   3. Acquire understanding of differences between basic high-throughput technics used in studies of genomes, transcriptomes, DNA modifications, protein-DNA and protein-RNA interactions
   4. Gain knowledge of bioinformatics tools and their practical use for analysis of DNA and RNA sequencing data
   5. Gain knowledge about high-throughput proteomic methods.
   6. Gain knowledge of bioinformatics tools and their practical use for analysis of mass spectrometry data
   7. Acquiring the ability to use specialist literature for proteomic analyzes
2. Pre-requisites in terms of knowledge, skills and social competences (if relevant)
   NONE
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	use different methods, technologies and strategies in the field of genomics, transcriptomics, and proteomics	BT_U01, BT_W01, BT_W08
EU_02	suggest suitable approaches for specified aspects of genomes, transcriptomes, and proteoms studies	BT_U01, BT_U03, BT_W03
EU_03	select and use basic bioinformatics tools and approaches for processing DNA and RNA sequencing data	BT_U01, BT_W05
EU_04	suggest suitable tools and solutions for bioinformatics analysis of proteomic data	BT_U01, BT_W03
EU_05	participate in scientific discussions regarding genomics, transcriptomics, and proteomics technologies critically evaluate scientific results	BT_K01, BT_K03, BT_W02, BT_W06

EU_06	design experiments involving high-throuput technologies	BT_U02, BT_W01
EU_07	use databases containing genomic, transcriptomic, and proteomic data	BT_U05, BT_U01

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

Course learning content	Course learning outcome symbol (EU)
Advances in DNA and RNA sequencing methods	EU_01
Overview of genomes sequencing applications - whole genome sequencing, exome sequencing, DNA methylation, protein-DNA interactions	EU_01, EU_02, EU_06
Transcriptomes sequencing - applications and protocols - RNA-seq, small RNA-seq, protein-RNA interactions, ribosome association, RNA degradation	EU_01, EU_02, EU_06
Troubleshooting in transcriptomes sequencing	EU_01, EU_02, EU_05
Basic processing of RNA and DNA sequencing data	EU_03, EU_07
Background and recent advances of proteomics methods	EU_01, EU_02
Mass spectrometry: ion sources; separation methods; multidimensional mass spectrometry; proteins identification	EU_01, EU_02
Overview of the different proteomics applications	EU_01, EU_02, EU_04
Mass spectrometry experiment design and data analysis using available platforms	EU_05, EU_06, EU_07

5. Reading list

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	X
Problem – based lecture	X
Discussions	X
Text-based work	X
Case study work	
Problem-based learning	
Educational simulation/game	
Task – solving learning (eg. calculation, artistic, practical tasks)	X
Experiential work	X
Laboratory work	X
Scientific inquiry method	
Workshop method	
Project work	X
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
Written exam	X	X	X	X		X	
Oral exam							
Open book exam							
Written test							X
Oral test							
Multiple choice test							
Project							
Essay							
Report					X		X
Individual presentation							
Practical exam (performance observation)							
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	60
Preparation for classes	10
Reading for classes	20
Essay / report / presentation / demonstration preparation, etc.	20
Project preparation	
Term paper preparation	
Exam preparation	20
Total hours	130
Total ECTS credits for the course	5

4. Assessment criteria according to AMU in Poznan grade system

Very good (bdb; 5,0): all elements of the report prepared on time, in accordance with the given principles, full knowledge of the learning contents, student correctly solves min. 90% of tasks in exam and test

Good plus (+db; 4,5): generally elements of the project/report prepared on time, in accordance with the given principles, full knowledge of the learning contents, slight delays in time or non-compliance with the given rules, almost full knowledge of the learning contents, student correctly solves min. 90% of tasks in written exam and test

Good (db; 4,0): generally elements of the project/report prepared on time, in accordance with the given principles, slight delays in time or non-compliance with the given rules, small knowledge gaps, student correctly solves min. 75-85% of tasks in written exam and test

Satisfactory plus (+dst; 3,5): some elements of the project/report prepared with the significant delay or without accordance with the given principles, significant knowledge gaps, student correctly solves min. 71-74 % of tasks in written exam and test

Satisfactory (dst; 3,0): some elements of the project/report prepared with the significant delay and without accordance with the given principles, significant knowledge gaps, student correctly solves min. 60-70% of tasks in oral test
Unsatisfactory (ndst; 2,0): no completed project/report, significant knowledge gaps, student correctly solves less than 60% of tasks in written exam and test