BIOTECH-05:	**PROTEIN ENGINEERING**
GENERAL INFORMATION	
Course Coordinator(s)	Ivica Strelec, PhD, full prof. Barbara Viljetić, PhD, assist. prof.
Associate(s)	Hrvoje Brkić. PhD, assist. prof. Frane Čačić Kenjerić, PhD, assist. prof.
Study Programme	Interdisciplinary Graduate Study Programme in English: Biotechnology
Course Status	Obligatory
Year of Study, Semester	1st Year / 1st Semester
Credits (ECTS)	**6**
Teaching Method (number of classes)	Lectures 30; Seminars 20; Exercises 10
Expected Number of Students in the Course	25-30
COURSE DESCRIPTION	
Course Aims	
The aim of this course is to provide advanced knowledge on molecular biology techniques and methods, and recombinant DNA technology used for protein engineering, with emphasis on application in biotechnology, medicine and pharmacy.	
Prerequisites for Enrolment and the Entry Competencies Required for the Course	
Completed undergraduate university study programme of Natural sciences (chemistry, biology), Biotechnical sciences, Biomedicine or Health.	
Learning Outcomes at the Programme Level Contributed by the Course	
INDBIOT-1; INDBIOT-2; INDBIOT-3; MEDBIOT-1	
Learning Outcomes at the Course Level	
After successful completion of this course students should be to: 1. Compare genomic, transcriptomic and proteomic research 2. Select appropriate expression systems for recombinant protein/enzyme production 3. Recommend manipulation of gene expression in prokaryotes and eukaryotes, including transgenic organisms 4. Suggest methods and techniques for production of enhanced and/or recombinant proteins 5. Critically evaluate different expression systems for recombinant protein/enzyme production 6. Evaluate application of protein engineering in biotechnology, medicine and pharmacy	
Course Content	
Lectures. Introduction to protein design and protein engineering. Experimental protein engineering. Chemical modifications. Protein overexpression in prokaryotes and eukaryotes. Direct mutagenesis. Protein and genetic engineering for production of therapeutic proteins (pharmaceuticals, nutraceuticals, enzymes, monoclonal antibodies, recombinant antibodies); production and stabilization of industrial enzymes (fusion proteins, mutant proteins with unusual amino acids, direct mutagenesis); synthesis of commercial products by recombinant microorganisms (restriction endonucleases, small biological molecules, antibiotics, polymers). Large-scale production of proteins and plasmid DNA from recombinant microorganisms. CRISP technology in genetic engineering of plants and animals. **Seminars.** Applicability of genetic and protein engineering in the production of selected pharmaceuticals, nutraceuticals and antibodies. Microfluidics based screening platforms. **Laboratory exercises**. High Throughput Screening. Fluorescence-activated cell sorting (FACS). **Computational exercises.** Computer algorithms in protein engineering.	
Teaching Methods	
Lectures; seminars; computational exercises	

Students' Obligations

Attendance at all forms of classes is mandatory and the students are obligated to attend all knowledge tests. The students may be absent from 30% (full-time students) and 50% (part-time students) of each of the forms of classes, provided that the absence is justified. An exercise or a seminar which has not been completed must be made up.

Monitoring the Activity of the Students (Connecting Learning Outcomes, Teaching Methods, and Grading)

Class-related activity	ECTS	Learning outcome	Student activity	Evaluation method	Grade points	
					Min.	Max.
Classes	0.5	1-6	Attendance to classes	Keeping records	2	10
Seminars	1.5	1-6	Preparation of seminar presentation	Seminar presentation	13	25
Laboratory/computer exercises	0.5	3-6	Practical work	Written report	5	15
Partial exams or final exam	3.5	1-6	Studying for the partial exams or final exam	Written exam	30	50
Total	**6.0**				**50**	**100**

Evaluation of the written part of the final exam

Percentage of correct answers (%)	Grade points
99.00 – 100.00	50
97.00 – 98.99	49
95.00 – 96.99	48
93.00 – 94.99	47
91.00 – 92.99	46
89.00 – 90.99	45
87.00 – 88.99	44
85.00 – 86.99	43
83.00 – 84.99	42
81.00 – 82.99	41
79.00 – 80.99	40
77.00 – 78.99	39
75.00 – 76.99	38
73.00 – 74.99	37
71.00 – 72.99	36
69.00 – 70.99	35
67.00 – 68.99	34
65.00 – 66.99	33
63.00 – 64.99	32
61.00 – 62.99	31
60.00 – 60.99	30

Forming the final grade:

The points granted for the final exam are added to the grade points awarded during class attendance. The grading process is conducted by absolute distribution, i.e. based on total achievements, and compared to the numerical system in the following manner:

A – Excellent (5): 90-100 grade points; B – Very Good (4): 80-89.99 grade points; C – Good (3): 65-79.99 grade points; D – sufficient (2): 50-64.99 grade points

Mandatory Literature (available in the library and via other media)

Title	Number of copies in the library	Availability via other media
Kaumaya P: Protein Engineering, InTech, Rijeka, 2012	-	yes
Park SJ, Cochran JR: Protein Engineering and Design, CRC Press, Boca Raton, 2009	-	-

Additional Literature

1. Albergina L: Protein Engineering in Industrial Biotechnology, Harwood Academic Publishers, Amsterdam, 2000
2. Glick BR, Patten CL: Molecular Biotechnology: principles and applications of recombinant DNA, 5th Ed., ASM Press, Herdon, 2017
3. Scientific and professional papers related to the specific areas of the course

Quality Assurance Procedures Designed to Ensure the Acquisition of Outcomes and Competencies

Anonymous, quantitative, standardised student survey on the course and the teacher's work implemented by the Quality improvement office of the Faculty of Food Technology Osijek and/or the Faculty of Medicine Osijek.

Note

E-learning is not included in the class quota, but it is used in teaching and it contains links to various sites and video and audio materials available on websites.