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| **Code:\*** | **Subject name: PHARMACEUTICAL BIOTECHNOLOGY** |
|  |
| **Level:** | **Year: IV (4th)****Semester:VII (7th)** |  **ECTS credits: 4 (Four)** |
| **Integrated studies**  |  |
| **I and II cycle** |  |
| **Status:** | **Number of hors:****LECTURES TWO – THREE (2 – 3)****EXCERCISES TWO – THREE (2 – 3)** | **Total number of hours:** |
| **OBLIGATORY** | **LECTURES (L) : 30** |
|  | **(thirty) hours;** |
|  | **EXCERCISES (E): 30** |
|  |  **(thirty) hours;** |
|  |  | **SEMINARS (S): 15 (fifteen)** |
|  | **hours;** |
| **Course teacher:** | **Assistant professor Una Glamočlija PhD** |  |
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1. **Aim of the course:** Introduction tobasic and advanced techniques in modern biotechnology on levels of molecule, chromosome, cell and whole organism

**1.1.**

**Lectures:**

Course content

Introduction to biotechnology, Basic terms regarding cell growth and development, DNA structure and replication, Genetic code, Transcription and translation, Gene identification and expression, Phases of DNA analysis, Amplification of DNA fragments, Interpretation of amplification results, Molecular markers, Levels of genetic engineering and perspectives of recombinant DNA technology, Basic terms of cell culture (induction and maintenance of plant and animal cell cultures), Gene therapy, Bioprocess techniques, Basics of biotechnological production, Application of biotechnology in pharmacy, medicine and other health-related fields, Basics of detection and usage of genetically engineered organisms, Ethical challenges of biotechnology, Basics of organization of biotechnological laboratories and laboratories for molecular genetic engineering, Basics of experimental work in biotechnology, Principles of publishing results of research in the area of biotechnology.

**Exercises:**

Rules for working in genetic laboratories, Techniques in genetic laboratories, Taking samples, DNA extraction from different sample types, Electrophoretic methods, Spectrophotometric methods, PCR and Real time PCR, RFLP, Transformation of bacteria, Transformation of plants, Genes *knock out* in mice, Monitoring the course of the disease, Genetic testing of paternity.

**Seminar work:**

Student is REQUIRED to deliver written work on the topic previously agreed with course teacher. Minimal number of obtained points is 50% of maximal number of points.

**1.2. Outcomes** Outcomes will be evaluated with two partial exams and one final exam

Independence for interpretation and critical thinking about topics rearding pharmaceutical biotechnology will be evaluated by direct communication with student;

1. **FORMAT OF INSTRUCTION: Lectures, exercises, seminar works and projects**

***Activity description (%)***

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| **2.1. Types of teaching** |  | 1. theoretical lectures, | 1. | 40 % |
|  |  | 2. exercises, | 2. | 30 % |
|  |  | 3. seminars, | 3. | 15 % |
|  |  | 4. consultations.  | 4. | 15% |
|  |  |  |  |  |  |  |
|  |  | *Proportion of mark (%)* |  |  |
| **2.2. Grading** |  | MENTION ALL ACTIVITIES THAT ARE EVALUATED DURING FORMATION |  |  |  |
| **system** |  | OF FINAL GRADE: |  |  |  |
|  |  | 1. CLASS ATTENDANCE AND PARTICIPATION
 | 1. | 10 % |
|  |  | 2. SEMINAR WORK | 2. | 15 % |
|  |  | 3. FIRST AND SECOND PARTIAL EXAM | 3. | 30 % |
|  |  | 4. FIRST AND SECOND COLLOQUIUM | 4. | 15 % |

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|  | 5. FINAL EXAM | 5. 30 % |

1. LITERATURE

**Required:**

1. Uvod u genetičko inženjerstvo i biotehnologiju, 2.izdanje (Gl.ured.: Lejla Pojskic) INGEB, Sarajevo. 2014.
2. Introduction to Biotechnology. Thieman WJ, Palladino MA. Benjamin Cummings, USA, 2012.

**Optional:**

1. Molecular Biotechnology: Principles and Applications of Recombinant DNA. Glick BR, Pasternak JJ, Patten, CL ASM Press, 2009.