



UNIVERSITY "ISMAIL QEMALI" VLORE  
FACULTY OF TECHNICAL AND NATURAL SCIENCES  
DEPARTMENT OF BIOLOGY

BIO 367 COURSE PROGRAM

<b>SUBJECT:</b>	Biotechnology
<b>Head/Teacher of the subject:</b>	MSc.Xhuljana Arapaj
<b>Charge:</b>	5 hours / week (3 lex / 2 sem)
<b>Subject typology:</b>	Of the characteristic formation of the program
<b>Academic year/semester when it takes place:</b>	2022- 2023/ Spring 2023
<b>Subject type:</b>	Mandatory
<b>Study program:</b>	Bachelor in Biology
<b>Credits:</b>	8 credits
<b>Subject code:</b>	BIO 367
<b>E-mail address of the holder/pedagogue:</b>	<a href="mailto:xhuljana.arapaj@univlora.edu.al">xhuljana.arapaj@univlora.edu.al</a>

**summary AND LEARNING OUTCOMES:**

Biotechnology is defined as the application of scientific and engineering principles to the transformation of matter under the action of living organisms for practical purposes. Biotechnology encompasses a wide range of procedures for modifying living organisms for human purposes ranging from animal domestication, plant cultivation, and their "improvements" through grafting programs using artificial selection and hybridization. Biotechnology studies modern examples such as: genetic cloning, genetic engineering, recombinant DNA technology, the human genome project.

**BASIC CONCEPTS:**

- 1 Biotechnology
- 2 Vector
- 3 Oncological probe
- 4 Gene therapy

**COURSE TOPICS:**

Topics to be covered in the lectures:

- Topic 1** Biotechnology, the key technology of the century. What is biotechnology. Biotechnology is an interdisciplinary activity. The three basic constituent elements of the biotechnological process.
- Topic 2** Food biotechnology. The flavor part of biotechnology. Brewing, winemaking, breadmaking. Dairy products. Yeast, Glucose Transformation. Microbial growth in the gut.
- Topic 3** Protein production in bacteria and yeast. Vectors for use in E.Coli. Plasmids - ideal vectors for genetic material. Bacteriophage vectors for use in E-coli. Phage M13. Plasmid/phage hybrid vectors. Recombinant DNA technology. How to detect genes?
- Topic 4** Incorporation of DNA into bacteria. Direct recognition through transformation. Introduction through mating. Human insulin produced by gene cloning in bacteria. The mode of insulin production in two separate cultures of E.coli. Human proinsulin. Artificial insulin variants created by protein engineering.
- Topic 5** Green biotechnology. Plant biotechnology in economic, ecological and evolutionary perspectives. Traditional breeding and biotechnology. In-vitro propagation of plants. Meristem culture. Callus culture. Fusion of protoplasts. Plant cells in bioreactors produce active substances.
- Topic 6** Agrobacterium and interaction with plants. Formation of tumors and agrobacterium. Identification of A.tumefaciens from the plant. Plasmid Transfer and Tumorigenesis. Vir genes and T-DNA. Genetic engineering with the Ti plasmid. Transgenic plants and herbicide resistance. Biological insecticides. Drought and salt tolerance. Pharmaceutical products.
- Topic 7** The miracle of technology. DNA and applications. DNA cloning. DNA analysis. Allocation of polymorphism in DNA sequence.

- Topic 8** Biotechnology in genetics and human reproduction. Methods of chromosomal analysis. Chromosome preparation and banding. Idiogram. FISH-Fluorescence in-situ hybridization.
- Topic 9** Oncological probes. Analysis of pregnant women related to fetal development. Infertility. Assisted reproductive technology.  
Cloning, embryos, transgenic animals and transplantation. Reproductive cloning. Therapeutic cloning.
- Topic 10** Artificial insemination in animals. Embryo transfer and in vitro fertilization. Transgenic animals. Transgenic fish. Silent mice and tissue shedding.  
Viruses, antibodies, vaccines and diagnostic tests, based on the antigen-antibody reaction. Viruses. How antibodies are discovered. Vaccines. Marker-based immunological tests used in diagnostics.
- Topic 11** antibodies are discovered. Vaccines. Marker-based immunological tests used in diagnostics.
- Topic 12** Biotechnology can save lives. Myocardial infarction and anticoagulants. Interleukins. Human growth hormone (HGH). Epidermal growth hormone. Stem cells, the latest discovery for youth. Gene therapy.  
Environmental biotechnology. Clean water. Aerobic water purification process. Plant farms and drain filters.
- Topic 13** Natural gas. Silent minerals. Bioplastics. Enzymes as supercatalysts. Enzymes, specific biocatalysts. Lysozyme-the first enzyme studied. The role of cofactors in complex enzymes.  
Enzyme sources - animals, plants and microorganisms. Amylases, their use for beer and bread production. Pectinases and increased fruit and vegetable production. Biological detergents. Immobilization-reuse of enzymes.
- Topic 14** enzymes. Glucose isomerases. Use of immobilized enzymes for food production. Immobilized cells.  
  
White or industrial biotechnology. An overview. Glutamine synthetase. Catabolic repression. The mold replaces the lemon. Overproduction of lysine. L-Glutamate. L-Ascorbic Acid (Vitamin C). Fleming's wonderful fungus (Penicillium notatum). Production of antibiotics based on biotechnology. Bioreactors and their development. The fight against microbial resistance. Cyclosporine. Steroid-cortisone hormones and contraceptives.
- Topic 15** wonderful fungus (Penicillium notatum). Production of antibiotics based on biotechnology. Bioreactors and their development. The fight against microbial resistance. Cyclosporine. Steroid-cortisone hormones and contraceptives.

**Topics to be covered in the Seminar:**

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#### FORM OF KNOWLEDGE CONTROL

control	Percentage rating
Control I	30%
Annual assessment: Seminars	10%
Final check	60%

Grading is based on the conversion of the total grade to %, grade 5-10 progressively 41-100%.

Grading	4	5	6	7	8	9	10
ASSESSMENT	-40	41-50	51-60	61-70	71-80	81-90	91-100

#### ATTENDANCE:

The student, who results in less than 75% attendance for the period that belongs to each partial exam, the period for which he will be tested, will not be included in the relevant exam, will be evaluated with M.

If the student has attended the course, but did not appear in the next exam, it is assessed NP (Not Appeared).

#### COURSE FORMAT:

The subject will be evaluated on the basis of a collection, assignments and the final exam. Points earned will be cumulative. Exams will not be repeated for any reason. If you miss an exam without any major reason, then you will lose points for that exam that you did not appear for.

#### COMMUNICATION:

Homework exercises, course assignments and any other announcements will be given in class or at the official address of the "Ismail Qemali" University of Vlora on the Internet: [www.univlora.edu.al](http://www.univlora.edu.al) or at the lecturer's email address.

**Email:** It is the duty of every student to check e-mail regularly. Assignments and notices will only be given via e-mail.

#### HONESTY CODE:

Students are encouraged to work in groups for the exercises and tasks that are given to them. Copying from one another in exams, course assignments, homework, etc. is not allowed. Violation of this rule will be accompanied by punitive measures up to the expulsion of the student from the university.

#### LITERATURE

a) **Mandatory basic literature:**

"Biotechnology" Assoc Prof. Anila Miter FSH, UT-Tirana

**FINAL REMARKS FROM THE SUBJECT TEACHER**

Homework exercises, coursework and any other notices will be given in class. The student should check the e-mail regularly because there will be assignments and notifications that will be given via e-mail. Students in this course must read, complete the tasks that will be checked regularly. Homework will be evaluated not only in terms of quantity but also in terms of the quality of their solutions. Students are also encouraged to work in groups for the homework exercises. Attendance at seminars and lectures is required up to 75% of the hours. The number of absences above 25% excludes students from participating in the exam. The use of mobile phones and smoking in the auditorium is not allowed.

**Lecturer**

**MSc. Xhuljana Arapaj**

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