BIOTECH-09:	**APPLIED MICROBIOLOGY**
GENERAL INFORMATION	
Course Coordinator(s)	Hrvoje Pavlović, PhD, full prof.
Associate(s)	Natalija Velić, PhD, assoc. prof.
Study Programme	Interdisciplinary Graduate Study Programme in English: Biotechnology
Course Status	Obligatory
Year of Study, Semester	1st Year / 2nd Semester
Credits (ECTS)	**6,5**
Teaching Method (number of classes)	Lectures 30; Seminars 15; Exercises 30
Expected Number of Students in the Course	25-30

COURSE DESCRIPTION

Course Aims

The aim of this course is to advance basic knowledge in microbiology and genetics for the application, analysis and evaluation of methods and procedures used for biotechnological application of microorganisms in industry and medicine.

Prerequisites for Enrolment and the Entry Competencies Required for the Course

Undergraduate degree in natural sciences (chemistry, biology) or biotechnology or biomedicine and health.

Learning Outcomes at the Programme Level Contributed by the Course

INDBIOT-2; INDBIOT-3; MEDBIOT-2

Learning Outcomes at the Course Level

After successful completion of this course (lectures, seminars and exercises) and self-directed learning students are expected to be able to:

1. Classify microorganisms into taxonomic units and groups
2. Compare classical microbiological and molecular methods for identification of microorganisms.
3. Identify the interactions and actions of microorganisms in groups.
4. Select and apply isolation methods of microorganisms from natural habitats and preservation of pure cultures.
5. Critically evaluate different microbial modification procedures.
6. Argue the application of microorganisms in medicine, environment protection, agriculture and various industries.

Course Content

Lectures. Systematics of microorganisms, importance of identification and classification of microorganisms. Classical microbiological and molecular identification methods. Microbial ecology and interactions of microbial populations. Microbial communities - the interactions and function of microorganisms in groups. Microbial processes as a part of biogeochemical cycles. Microorganisms in their natural environment (soil, water, atmosphere, extreme environment, plants, animals, humans). Isolation and preservation of microbial pure cultures. Modification of industrial microorganisms (spontaneous and induced mutations, recombination, recombinant DNA technology) and maintenance of production strains. Application of microorganisms in medicine, environment protection, agriculture, production of food, chemicals, pharmaceuticals, nutraceuticals and enzymes. Vaccines and their production. Application of microorganisms for biosensor development.

Seminar. Interactions of microbial populations: microorganism-microorganism, plants-microorganisms, animals-microorganisms. Development of new vaccines. Medical use of biosensors.

Exercises. Application of aseptic technique, isolation and cultivation of microorganisms, pure

cultures growth, simple and differential staining, metabolic and chemical tests of selected microorganisms. Growth and environmental impact on microbial growth. Characteristics of selected microorganisms. Collection, processing and handling of different samples.

Teaching Methods

Lectures; seminars; laboratory 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 at classes and seminars	Keeping records	2	5
Seminar work	2	3,6	Writing a seminar paper	Oral presentation of a seminar paper	13	35
Laboratory exercises	1	1-4	Laboratory exercises	Submitting a report	5	10
Final exam	3.0	1-6	Studying for the final exam	Written exam	30	50
Total	**6.5**				**50**	**100**

Evaluation of the written part of the final exam

Percentage of correct answers (%)	Grade
>95.00	50
90.00-94.99	47
85.00-89.99	45
80.00-84.99	40
75.00-79.99	38
70.00-74.99	35
65.00-69.99	33
60.00-64.99	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

Saxena S: Applied Microbiology, Springer, New Delhi, 2015.	-	-
Glazer AN, Nikaido H: Microbial Biotechnology: Fundamentals of Applied Microbiology, 2nd Ed., Cambridge University Press, Cambridge, 2007.	-	-

Additional Literature

1. Barton LL, Northup DE: Microbial Ecology, Wiley-Blackwell, New Jersey, 2011.
2. Cooper GM, Hausman RE: The Cell: A Molecular Approach, 7th Ed., Sinauer Associates, London, 2015.
3. White D, Drummond J, Fuqua C: The Physiology and Biochemistry of Prokaryotes, 4th Ed., Oxford University Press, Oxford, 2012.
4. Kim BH, Daad GM: Bacterial Physiology and Metabolism, Cambridge University Press, Cambridge, 2008.
5. Scientific papers (available on-line)

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 the Faculty of Medicine Osijek and the Food Technology 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.