Study Programme : MSc in Ecology

Degree level: **Master degree**

Course Title: APPLIED MYCOLOGY

Professor: Dr. Milan Matavulj, Dr. Maja Karaman

Elective Course

Number of ECTS: 6

Prerequisites: Credit points of Chemistry, Cell Biology and credit points of Microbiology and of Biology of Algae and Fungi.

Course Objective: A course designed to acquaint students with biology, role and significance of fungi, with their cultivation and contemporary application, together with other saprotrophic microorganisms in the frame of "non-green revolution". Students get acquainted with biotechnological (bio)transformations of low-value nusproducts into high-value products, and with bioconversion of high-toxic xenobiotics into low-toxic or non-toxic compounds. Emphasis will be placed on fungal enzyme activity research, their metabolism as the basis of natural matter cycle and energy flow through ecosystem.

Course Outcome: Enabling students to understand the role of fungi in processes of matter cycle, and their significance in biotechnological processes. Also enabling them for independent and individual research work: experiment design, results recording, analysis, interpretation of results, elaboration and presentation, eventually use of new experience in conducting simple experiments related to the specific interrelationship fungi with other organisms; to explain the role of fungi in biotechnological processes and in natural environments: bioconversion of by-products of agricultural and industrial production into high-value products; bioconversion of xenobiotics into non-oxic compounds.

Course Content: *Theoretical part:* Students get acquainted with (eco)physiological profiles of fungi, necessary conditions for their cultivation, especially as producers of extracellular and intracellular enzymes as the basis of biotechnological processes, with their significance in biodegradation of natural and anthropogenic waste materials and their bioconversion into high-value products (bioconversion of straw into sugars and alcohol; fermentation carbohidrates into alcohol or organic acids, antibiotics, antioxidants, alkaloides, immunomodulative agents; Production of single-cell proteins; Bioconversion of precursors into active hormons, provitamines into vitamines; Bioconversion of high-toxic xenobiotics into low-toxic or nontoxic, etc. Biotechnological processes as the basis of non-green revolution expected in this century. Production of food, pharmaceuticals and energy, based on heterotrophic activity of fungi and other heterotrophs. Fungal saprotrophism as the basis of function of wastewater purification plants, and bioremediation processes and methods. Fungi as producers of single-cell proteins, as the healthy food, biopesticides, etc.

Practical part: Developing competence in cultivation of fungi. Principles of experimental work, cultivation procedure. Developing skills in results recording procedure. Getting knowledge in methods of purification of fungal isolates. Conservation for culture collection and learning rules and procedures for culture maintenance. Through the practicals, students get acquainted with physiological characteristics of isolated cultures of fungi. Cultivation with the aim of optimization of fungal growth in different experimental conditions in order to understand fungal (eco)physiology (enzyme activity: hydrolase, esterase, protease, lypase, saccharase, cellulase, etc.) as the basis of biotransformations. Fungal degradation of phenolic compounds, oil derivatives, polycyclic aromatic hydrocarbons, pesticides, what is in the basis of biodegradative processes used in environmental protection technology. Biomass biosynthesis.

Reading List:

1. Matavulj M, Gajin S, Petrović O (1998): Bioactive compounds from higher plants, fungi, algae and bacteria. Monograph. Institute of Biology, Faculty of Sciences, University of Novi Sad (In Serbian).

2. Muntanjola–Cvetković M (1981): General Mycology. NIRO Književne novine, Belgrad (In Serbian)

3. Pejin D. (2003): Industrial Microbiology. Univerzsity of Novi Sad, Faculty of Technology (In Serbian).

4. Radnović D, Matavulj M, Karaman M (2007): Mycology. Department of Biology and Ecology, Faculty of Sciences, University of Novi Sad and WUS Austria (In Serbian)..

5. Rouz AH (1975): Chemical Microbiology. ICS Beograd; Butterworths, London (In Serbian and in English)

6. Duraković S, Duraković L (2003): Mycology in Biotechnology. University of Zagreb (In Croatian).

7. Matavuly M , Karaman M. (2011): Lecture outlines and Power-point presentations (In Serbian and in English)

Total hours:

Lectures: **2**	Practicals: **2**	Other:	Student research work: **5**	

Methods of instruction: lectures, practicals, consultations, seminars, colloquia, visiting local brewery

Assessment (maximum number of points 100)

Requirements	**points**	**Final exam**	**points**
Active participation in lectures	5	Practical exam	15
Colloquia (Pre-exam tests)	40	Oral exam	40

Remark: - Students will develop a deeper understanding of experimental work in microbiological laboratory through independent study. Part of the learning material will be available on the internet.