

Study Programme : PhD in Biology			
Degree level: Doctoral degree			
Course Title: Microbial toxins			
Professor: Dr. Milan Matavulj, Dr. Zorica Svirčev, Dr. Jelica Simeunović			
Elective Course			
Number of ECTS: 15			
Prerequisites: Credit points of Chemistry; Cell Biology, Microbiology, and of Biology of algae and fungi.			
Course Objective: A course designed to acquaint students with the principles and procedures in laboratory experimental work, and the best practice of microbial culture isolation, cultivation and preparation for culture identification, and maintenance in laboratory culture collection. Emphasis will be placed on systematization of basic knowledge on microbial toxins and other bioactive metabolites and connecting this experience with the possibilities of use of microorganisms as a resource of bioactive compounds in pharmacy and medicine, as well as in a biotechnology of environmental protection.			
Course Outcome: Enabling students for independent and individual experimental work in the field of microbial toxicology: microbial primary and secondary metabolism: experiment design, results obtaining and recording, analysis and interpretation of results, and elaboration and presentation, eventually use of new experience.			
Course Content: <i>Theoretical part joined with practical part:</i> Through the lectures, joined with the practicals, in this course students get acquainted with the contemporary concept of microbiological laboratory practice, considering predominantly microbial secondary metabolism; The effect of ecological factors on primary and secondary metabolism, as the basis for microbial toxins production and bioactive compounds production; Ecophysiology of microbial community; Bacteria and bacterial toxins, their nomenclature and classification (exo-, endo-, and mesotoxins). Localization of their impact: on cell membrane, direct impact on inner cell components (cytotoxins), modification of functional activity (functional blockers), the effect on interactions of cells with intercellular compounds (exfoliatin and erythrocin). The significance of botulinum toxin, tetanospasmin (<i>Clostridium tetani</i> toxin), and enterotoxin from <i>Staphylococcus aureus</i> and <i>E. Coli</i> . Cyanobacteria and cyanotoxins. Risk in recreative zones. Toxicity of water of aquifers. Endemic nephropathy and other diseases. Mechanism of cyano- and phycotoxin appearance in aquatic ecosystems. The presence of cyano- and phycotoxins in freshwater accumulations designed for recreation and water supply. Basic principles of monitoring and mode of detection and identification of algal toxins. Fungal toxins, mycotoxins: aflatoxins, ochratoxins, zearalenones, citrinin, patulin, trichothecenes, fumonisins, ergot alkaloids, etc. Mycetisms (mushroom poisoning). Microbial toxins as bioactive agents in medicine and pharmacy, as biopesticides, etc. Emphasis will be placed on the methodology of examination of fungal toxins, what should enable students to understand contemporary tendencies of use of microorganisms in different biotechnology fields, as well as to understand the microbial toxins role and problems related to biologically active substances in the environment. Through the active engagement, students will be involved in experimental research in the frame of research projects and transfer of knowledge.			
Reading List:			
1. Madigan MT and Martinko JM (2006): BROCK – Biology of Microorganisms. Pearson, Prentice Hall, 11 edition, 2006.			
2. Antoni H Rouz (1975): Hemijska mikrobiologija. ICS Beograd (In Serbian and in English);			
3. Turnet WB: Fungal metabolites. Academic press, London..., 1971 (In English).			
4. Matavulj M, Gajin S, Petrović O, Radnović D (1998): Biološki aktivne materije viših biljaka, gljiva, algi i bakterija. PMF, Univerzitet u N. Sadu, PMF, (In Serbian)			
5. Prentis S: Biotehnologija – nova industrijska revolucija, Školska knjiga, Zagreb, 1991 (In Croatian)			
6. M. Muntanjola-Cvetković: Opšta mikologija. NIRO Književne novine, Beograd. (In Serbian)			
7. Chaudhry GR (ed.)(1994): Biological Degradation and Bioremediation of Toxic Chemicals. Capman & Hall, London, (In English).			
8. Svirčev Zorica (2005): Mikroalge i cijanobakterije u biotehnologiji. PMF, Novi Sad, (In Serbian).			
9. Djarmati A Šimon, Djarmati V Danica: Toksini biološkog porekla. IP "Praktična knjiga", Beograd, 1994. (In Serbian).			
10. Wiessner W, Schnepf E, Starr RC (1995). Algae, Environment and Human Affairs. Biopress Ltd., Bristol England (In English)			
11. Радновић Д, Матавуљ М, Караман М. (2007): Микологија. PMF, Департман за биологију и екологију, Универзитет у Новом Саду. WUS Austria ISBN 9787-86-7031-118-3. (In Serbian).			
12. Chaudhry GR (ed.) (1994): Biological Degradation and Bioremediation of Toxic Chemicals. Capman & Hall, London, (In English).			
Total hours:			
Lectures: 5	Practicals:	Other:	Student research work: 5
Methods of instruction: Lectures, practicals, consultations, seminars, colloquia participation in scientific meetings and seminars, visiting microbiological laboratories and active participation in research projects. Student choose two topics for seminar work which should be elaborated using internet or standard literature sources.			
Assessment (maximum number of points 100)			
Requirements			
Remark: During the semester students' seminar works will be evaluated, and remarks will be incorporated into summary remark making 60% of points. Another 30% they will gather through the oral exam, and 10% through the evaluation of their experimental research work.			