

Name of the subject: BASIC AND MOLECULAR SYSTEMATICS AND ECOLOGY OF FUNGI		
Teacher(s): Dr. Maja Karaman, Dr. Vladislava Galović, Dr. Ivica Tamaš		
Status of the subject: Elective		
Number of ECTS points: 15		
Condition: No		
Goal of the subject : The course is designed to introduce students to modern basic principles in the systematics and ecology of fungi, as well as new molecular-technological platforms currently used in extensive application of molecular methods in various fields of mycology including genetics, systematics, ecology and biotechnology of fungi. Introducing a program of molecular methods in the study of fungal systematics, their taxonomic affiliation and phylogenetic relationship, as well as their environmental aspect, students have the opportunity to become familiar with the use of various types of biomolecules (DNA, RNAs) and molecular platforms (genomics, transcriptomics) that would make many advances in research to date.		
Outcome of the subject : Training students to handle with techniques that will enable them to make cultures collections of fungi of different systematic affiliation, preservation of cultures as a gene bank depot, DNA isolation, RNA; use of molecular platforms regarding the research preferences; training students to handle independently with master molecular procedures in the laboratory environment. Students would be able to learn how to use bioinformatics search engines and be able to independently interpret the results of molecular analysis as well as to independently form and use the fungal gene databases available on NCBI and other data bases sites.		
Content of the subject: <i>Theoretical part:</i> Through lectures, in this course students will become acquainted with contemporary trends in the field of basic and molecular systematics and ecology of fungi. Emphasis will be placed on different methods of sampling, which is the most important prerequisite to obtain a valid final result of molecular analyzes. Further on they will be able to learn different methods of isolation of different biomolecules from the fungi genome. Participants will be introduced with the standard PCR technique and its principles as well as various identification techniques like enzymatic reactions using endogenous nucleases, RFLP, sequencing, SNP, EF1, alpha tubulin, DNA barcoding techniques. In the case of sequence analyzes within molecular systematics and taxonomy as well as phylogeny in species identification, they would be introduced to the principles and use of different searching engines (BLAST, UNITE, FinchTV, MEGA 6.6, ClustalW, MAFFT, RaxML). Molecular ecology would clarify the role of different types of fungi in natural ecosystems, their diversity, as well as their basic life strategies. Particular attention would be paid to the molecular characterization of relationships and host-pathogen interactions and their immune responses. <i>Practical part:</i> Demonstration exercises: different methods of isolation of fungi from the natural environment, methods of cultivation and preservation for isolation of DNA and RNA from the fertile bodies of macrofungi, as well as from pure “ <i>in vitro</i> ” mycelium cultures from the collection. Mastering of PCR techniques, gel-electrophoretic identification of amplified target fragments, spectro-photometry and fragment purification as part of the preparation for sequencing parts of the genome of fungi, learning about the latest identification technologies (MALDI-TOF mass spectroscopy technology). The results processing would be directed towards the analysis of cladograms and phylogenetic trees as well as reading sequences after multiplication of the target genes and interpretation of their expression. <i>Theoretical exercises:</i> Laboratory part of nucleic acid isolation, PCR, electrophoresis, small volume spectrophotometry, calculation of nucleic acid purity and quality, preparation of agarose gel, purification from agarose gel. Working with search engines and bioinformatic analysis of results.		
Recommended literature <ol style="list-style-type: none"> 1. Application of PCR in Mycology. Eds. P. D. Bridge. CAB International, 1998. 2. Sepp Hochreiter. Bioinformatics Sequence Analysis and Phylogenetic lecture Notes. Bioinformatics ISequence Analysis and Phylogenetics Institute of Bioinformatics, Johannes Kepler University Linz, 2013. 3. Lecture Notes Bioinformatics.ed.,Canberra, 2006 4. Introduction to Computational Molecular Biology and Genomics. Princeton University Computer Science Dept., 1998. 5. The mycology of the Basidiomycetes. Canberra, 2006. 6. Quantitative Real-time PCR in Applied Microbiology. Caister Academic Press, Martin Filion Department of Biology, Université de Moncton, Canada, 2012 7. Pathogenic Fungi: Structural Biology and Taxonomy Caister Academic Press. Eds. Martin Filion Department of Biology, Université de Moncton, Canada, 2012. 8. Arora D. K. <i>Handbook of Fungal Biotechnology</i>. Marcel Dekker, Inc., New York, USA, 2004. 9. G. M. Muller, G. F. Bills, M. S. Foster. Biodiversity of Fungi, Inventory and Monitoring <i>Methods</i>. Elsevier Academic Press, Burlington, San Diego, London, 2004. 10. The Mycota. A comprehensive Treatise on Fungi as experimenta; System for Basic and Applied <i>Research</i>. eds.K.Esser,J.W.Bennett &H.D.Osiewacz. Vol X. Industrial applications. Springer-Verlag Berlin Heidelberg, 2002. 		
Number of active classes	Theory: 5	Practice: 5
Methods of delivering lectures: Lectures, demonstration exercises, seminars, consultations. With personal affinity, students choose a topic of the reveal type for their seminar work, which they prepare on the basis of standard and accessible literature.		
Evaluation of knowledge (maximum number of points 100)		
Design and defence of seminar paper: 10 points;written part: 40 points; oral part: 50 points.		