

## Course specification

<b>Study programme:</b> Master Academic Studies of Biology- Module Microbiology				
<b>Course:</b> Biology of Cyanobacteria				
<b>Course code:</b> MB26				
<b>Teacher:</b> Dr. Jelica Simeunović				
<b>Status of the course:</b> elective				
<b>Nuber of credits:</b> 7				
<b>Requirement:</b> -				
<p><b>The objective of the course</b> is to introduce students to: morphological, physiological, biochemical, genetic and ecological characteristics of cyanobacteria as a specific group of microorganisms, to familiarize themselves with the significance of cyanobacteria in different areas of human activity, as well as to master the basic methods of isolating them from different environments, cultivation and analysis of their properties.</p>				
<p><b>The outcome of the subject</b>            After the successfully completed examinations, the student can            - learn and understand a wide spectrum of specific characteristics inherent in cyanobacteria            - to recognize the importance of cyanobacterial examination in terms of their possible application in various fields such as food, pharmaceutical industry, medicine, biotechnology and environmental protection            - to properly formulate and apply methods of isolation, cultivation and testing of different properties of cyanobacteria</p>				
<p><b>Contents of the course</b>  <i>Theory teaching:</i>            Introductory section on cyanobacteria and their position in the living world; Morphological characteristics and morphological transformations of cyanobacteria; Photosynthetic apparatus of cyanobacteria, phycobilins and phycobiliproteins - the structure and function; Carotenoids and carotenogenesis in cyanobacteria; Introduction to the phenomenon of chromatic adaptation in cyanobacteria; An overview of the physiological characteristics of cyanobacteria; Biochemical properties of cyanobacteria; Anaerobic metabolism of cyanobacteria (azotofixation and fermentation); Bioluminescence and bioluminescence reporters of cyanobacteria - role and significance; Genetics of cyanobacteria: DNA cyanobacteria, plasmids and gene transfer; Ecology and prevalence of cyanobacteria; Characteristics of extreme habitat cyanobacteria - adaptation mechanisms and survival strategies; Biotechnological potential of cyanobacteria (cyanobacteria in the production of biofuels, etc.); Cyanobacteria in bioengineering; Application of molecular tools in biotechnology and ecology of cyanobacteria; Characteristics of toxic cyanobacteria; Cyanophages - introduction to the cyanophage characteristics.  <i>Practical teaching</i>            Isolation of cyanobacteria from the habitat with extreme conditions; Application of different methods of purification and preservation of isolated strains of cyanobacteria; Application of cyanobacterial culture methods in laboratory conditions; Determination of morphological characteristics of isolated cyanobacteria and their determination; Determination of the curve and rate of growth of cyanobacteria; Investigation of the influence of various factors (light, nutrients, temperature) on the pigment composition of cyanobacteria; Examination of mixotrophic growth in selected cyanobacterial strains; Determination of protein content in cyanobacteria; Determination of polysaccharide production in cyanobacteria; Testing the production of antibacterial compounds in cyanobacteria; Testing the production of antifungal compounds in cyanobacteria; Examination of the toxicity of selected strains of cyanobacteria; Detection of cyanobacteria toxigenicity (determination of the presence of the gene of toxicity); Detection of cyanophage selected strains of cyanobacteria.</p>				
<p><b>Literature</b></p> <ol style="list-style-type: none"> <li>Jelica Simeunović (2005): Kolekcija kultura cijanobakterija (Cyanobacterial culture collection). Andrejević Lj. and Andrejević T.(eds.). Beograd, Biblioteka Academia, Zadužbina Andrejević, ISBN 86-7244-479-5, str.102.</li> <li>Percy M. Gault and Harris J. Marler (2009): Handbook on Cyanobacteria –Biochemistry, Biotechnology and Applications. Nova Science Publishers, Inc. <i>New York</i>, 2009, ISBN: 978-1-60741-092-8 (E-Book), p.556.</li> <li>Antonia Herrero and Enrique Flores (2008): The Cyanobacteria: Molecular Biology, Genomics and Evolution. Caister Academic Press, ISBN: 978-1-904455-15-8. (selected chapters)</li> <li>Martin Dworkin, Stanley Falkow, Eugene Rosenberg, Karl-Heinz Schleifer, Erko Stackebrandt (2006): The Prokaryotes- A Handbook on the Biology of Bacteria Third Edition Volume 2: Ecophysiology and Biochemistry, Springer, e-ISBN: 978-0-387-30744-2 (selected chapters)</li> <li>H. Kenneth Hudnell (2008): Cyanobacterial Harmful Algal Blooms: State of the Science and research needs. Springer, p. 955, e-ISBN: 978-0-387-75865-7. (selected chapters)</li> <li>Naveen K. Sharma, Ashwani K. Rai, Lucas J. Stal (2014): Cyanobacteria-An Economic Perspective. Wiley Blackwell, ISBN 978-1-119-94127-9</li> <li>Laura Barsanti and Paolo Gualtieri (2006): Algae -Anatomy, Biochemistry and Biotechnology, CRC Press Taylor and Francis Group, Boca Raton, FL, p.320 (selected chapters)</li> </ol>				
<b>Number of active classes:</b>				
Lectures: 2	Exercises:	Other forms of teaching: 2	Student research work: 4	Other :
<p><b>Methods of teaching</b>            Lectures using pp presentations on video beam, exercises, consultations</p>				
Knowledge assessment (maximum score 100)				
<b>Pre-exam obligations</b>	points	<b>Final exam</b>	points	
activity during lectures	5	written exam	-	
practical teaching		oral exam	60	
colloquium	35	.....		