

1.	Subject	<b>MEDICAL BACTRIOLOGY AND VIROLOGY</b>			
2.	Code	MLD – 215			
3.	Study program:	Three-year professional studies of medical laboratory diagnostics			
4.	Conducted by	UKIM – Medical Faculty Department of Microbiology with Parasitology			
5.	Degree of education (first or second cycle)	First cycle			
6.	Academic year/semester	II/III-IV	7.	Credits	9
8.	Professor	Head of the Department of Microbiology with Parasitology – prof. d-r Elena Trajkovska Dokikj The lessons are held by all the members of the Department of Microbiology and Parasitology			
9.	Prerequisite				
10.	Goals	<p>The main goal of the subject program is for the students to gain basic knowledge about the microorganisms with which the human gets into interaction throughout his life. The gained knowledge will be a foundation for understanding the beneficial effects of the “good microorganisms” and the harmful effects of pathogenic microorganisms on the human health.</p> <p>After finishing the subject program, the students will gain knowledge about:</p> <ul style="list-style-type: none"> <li>• Morphology and physiology of different microorganisms</li> <li>• The occurrence of the microorganisms in different ecosystems and their associations between each other, including the normal micro flora of the host;</li> <li>• Genetics of microorganisms</li> <li>• Virulence factor of the microorganisms and pathogenesis of the diseases caused by them</li> <li>• Testing methods for sensitivity of the causes for infections to antibiotics</li> <li>• Host defense of infectious agents</li> <li>• Viruses as important microorganisms</li> <li>• Structure of viruses</li> <li>• Multiplication of viruses</li> <li>• Detecting technique of viruses as ethological agents of different viral diseases</li> <li>• Classification of viruses</li> <li>• Viruses of medical importance</li> </ul>			
11.	Content summary:	<p><b>General bacteriology (theoretical lessons):</b></p> <ul style="list-style-type: none"> <li>• Introduction to microbiology</li> <li>• Morphology and structure of microorganisms</li> <li>• Bacteria physiology</li> <li>• Bacteria genetics</li> <li>• The influence of physical and chemical agents on bacteria</li> <li>• Antimicrobioagents</li> <li>• The occurrence of microorganisms and their interactions between each other</li> </ul>			

	<ul style="list-style-type: none"> <li>• Bacteria pathogenesis and infections pathogenesis</li> <li>• Host defense from pathogenic bacteria</li> <li>• General principles of microbiologic analysis</li> <li>• Sanitary microbiology</li> </ul> <p><b>Specialized bacteriology (theoretical lessons):</b></p> <ul style="list-style-type: none"> <li>• Analysis of Gram-positive bacteria: staphylococcus, streptococcus, enterococcus, corynebacteria, legionella, gardnerella, bacillus, clostridium</li> <li>• Analysis of Gram-negative bacteria: neisseria, hemophilus, enterobacteriaceae (Escherichia, klebsiella, proteus, salmonella, shigella), campylobacter, helicobacter, brucella, pseudomonas, acinetobacter, vibrio</li> <li>• Analysis of aerobic and anaerobic bacteria, microbacteria, spiral bacteria, mycoplasma, Chlamydia and rickettsia</li> </ul> <p><b>Bacteriology (practical lessons):</b></p> <ul style="list-style-type: none"> <li>• The aims and the ways of functioning of a microbiology laboratory</li> <li>• Microscopic analysis of bacteria</li> <li>• Types of staining in microbiology</li> <li>• Isolation and identification of bacteria</li> <li>• Analysis of biochemical activity of bacteria</li> <li>• Sterilization and disinfection; Providing and following the conditions for antiseptic working; control of the successfulness of sterilization</li> <li>• Use of serological techniques in laboratory diagnostics</li> <li>• Techniques of analyzing the antimicrobial effect</li> <li>• Automatic techniques for identifying bacteria and analysis of their sensitivity</li> <li>• Automatic analysis of hemoculture</li> <li>• Proper taking, transporting and analysis of biological samples for microbiologic analysis</li> <li>• Molecular methods and their analysis and interpretation</li> </ul> <p><b>Virology (theoretical lessons):</b></p> <ul style="list-style-type: none"> <li>• The viruses as microorganisms, their form, structure and characteristics</li> <li>• Classification of viruses and their replication</li> <li>• Detection techniques of viruses as etiological agents of different viral diseases</li> <li>• Most important viruses and viral diseases in medicine, antiviral means</li> <li>• RNA viruses – <i>Picornaviridae</i>, <i>Paramyxoviridae</i>, <i>Orthomyxoviridae</i>, <i>Retroviridae</i>, <i>Reoviridae</i>, <i>Flaviviridae</i>, <i>Coronaviridae</i>, <i>Rhabdoviridae</i>, <i>Togoaviridae</i></li> <li>• DNA viruses – <i>Hepadnaviridae</i>, <i>Adenoviridae</i>, <i>Herpesviridae</i>, <i>Poxviridae</i>, <i>Papovaviridae</i>.</li> </ul> <p><b>Virology (practical lessons):</b></p> <ul style="list-style-type: none"> <li>• Cultivation of viruses in chick embryos and tissue culture: analysis of cytopathogenic effect of viruses</li> <li>• Reading and analyzing serological reactions for identification of viruses: agglutination, hemagglutination, hemadsorption, precipitation, RVK, fluorescence (direct and indirect), ELISA, neutralization test</li> <li>• Reading and analyzing molecular technique for virus detection: PCR, RT – PCR, Real-time PCR</li> </ul>
12.	<p>Teaching methods:</p> <ul style="list-style-type: none"> <li>• Interactive theoretical lessons</li> <li>• Individual learning</li> </ul>

	<ul style="list-style-type: none"> <li>• Practical lessons/seminars</li> <li>• Problem-based learning and problem solving</li> <li>• Independent analysis of microscopic samples, bacterial culture, biochemical reaction of bacteria identification</li> <li>• Individual interpretation of microbiological results with special attention to the antibiotic choice in the treatment of specific isolated microorganism</li> <li>• Independent analysis of viral structure – microscope slides, cell culture, cytopathogenic effect of viruses, application of embryo chick eggs</li> </ul>			
13.	Total classes:	120		
14.	Organization			
15.	Types of teaching activities	15.1	Lessons: theoretical classes	30 lessons +15 lessons seminars
		15.2	Practical lessons, seminars	75
16.	Other types of activities	16.1	Training	
		16.2	Self-supporting practice	
		16.3	Learning at home	120
17.	Knowledge assessment	Points		
	17.1	Mid-term exam in bacteriology	Written form test theoretical lessons 9 – 15 Practical oral exam 15-25	
		Mid-term exam in virology	Written form test theoretical lessons 9-15 Practical oral exam 15 – 25	
	17.2	Paper/essay	<b>0.5-2</b>	
	17.4	Active participation	<b>Min. – Max.</b> Theoretical lessons 1.5 - 3 Practical lessons 10 - 15  The student can miss 2 of the practical lessons	
18.	Grading criterion (points/grades)	Up to 59	5 (five) F	
		60-68	6 (six) E	
		69-76	7 (seven) D	
		77-84	8 (eight) C	
		85-92	9 (nine) B	
		93-100	10 (ten) A	
19.	Requirements for obtaining a signature and attending the final examination	To obtain a signature, the student must gain 60% of the points of the theoretical lessons, practical lessons and paper/essay. The grade for the subject is formed according to the grading criterion table, and is based on the sum of the points from all the activities		
20.	Language	Macedonian		
21.	Method of evaluating the quality of the lessons	Students' anonymous evaluation of the subjects, the professors and collaborators who hold the lessons.		

22.	Literature:	
	22.1	Mandatory literature
	1.	Grinvud D. with collaborators, Translated by: prof. d-r Nikola Panovski, prof. d-r Milena Petrovska, prof. d-r Elena Trajkovska Dokikj, prof. d-r Kakja Popovska, Medical Microbiology, 17 <sup>th</sup> edition 2006, translated as part of the project of the Government of the R. N. Macedonia for translation of professional and scientific books, 2010
	2.	Prof. d-r Kakja Popovska, prof. d-r Nikola Panovski, prof. d-r Milena Petrovska, prof. d-r Elena Petrovska Dokikj, Microbiology with Parasitology, Textbook and practicum for the students of professional studies, Department of Microbiology with Parasitology, 2008
	3.	Prof. d-r Milena Petrovska et al. Practicum of Medical Microbiology with Parasitology, Department of Microbiology with Parasitology, 5 <sup>th</sup> edition, 2010
	4.	Prof. d-r Nikola Panovski et al. Medical Microbiology – general part, Department of Microbiology and Parasitology, 2011
	5.	Prof. d-r Nikola Panovski et al. Medical Microbiology – specialized part, Department of Microbiology and Parasitology, 2011
	22.2	Additional literature
		Jawetz E, Melnik II, Adelberg EA. Medical Microbiology, Savremena administracija, Belgrade, 21 <sup>st</sup> ed., 2004