
		<b>UNIVERSITY OF EAST SARAJEVO</b> Faculty of Medicine					
		<b>Study program: medicine</b>					
		Integrated academic studies		II study year			
<b>Full subject title</b>		MICROBIOLOGY					
<b>Department</b>		Department of Propedeutics, Faculty of Medicine in Foca					
<b>Subject code</b>			<b>Subject status</b>		<b>Semester</b>		<b>ECTS</b>
ME-02-1-016-3; ME-02-1-016-4			compulsory		III,IV		10
<b>Professor/ -s</b>		prof. Ivan Jovanovic, MD PhD; assist. Prof. Nevena Gajovic, MD PhD					
<b>Associate/ -s</b>		ass. Zorana Maric Ostovic, MD; ass. Vladimir Markovic, MD					
<b>Number of lectures/ teaching workload (per week)</b>			<b>Individual student workload (in hours per semester)</b>			<b>Coefficient of student workload S<sub>0</sub><sup>1</sup></b>	
<b>L</b>	<b>E</b>	<b>SP</b>	<b>L</b>	<b>E</b>	<b>SP</b>	<b>S<sub>0</sub></b>	
2	3	0	2*15*1	3*15*1	0*15*1	1	
2	3	0	2*15*1	3*15*1	0*15*1	1	
total teaching workload (in hours, per semester) 2*15 + 3*15 + 0*15 = 75 2*15 + 3*15 + 0*15 = 75				total student workload (in hours, per semester) 2*15*1 + 3*15*1 + 0*15*1 = 75 2*15*1 + 3*15*1 + 0*15*1 = 75			
Total subject workload (teaching + student): 150+150=300 hours							
<b>Learning outcomes</b>		Knowledge gained during the course of teaching allows the doctor of medicine to: 1. recognize possible causes of infectious diseases within clinical manifestations 2. determine the type of patient material for diagnosing the disease 3. properly interpret the microbiological findings. Principles of recognition and identification of different forms of microorganisms. 4. apply measures of control and prevention of infectious diseases					
<b>General competences</b>		They possess broad fundamentals of theoretical knowledge and practical skills, preparing them for any type of postgraduate education as well as for collaboration with other medical professionals. They have acquired a systemic thinking approach as well as a structured approach to medical problems during their education. They are acquainted with a specific diagnostic algorithm. They are capable of making appropriate therapeutic decisions. They are acquainted with methodology of scientific research. They are acquainted with health improvement and disease prevention and are eager to make medical professionals adopt more positive attitude towards it. They are eager to collaborate with other medical professionals. They are able to achieve effective teamwork and develop leadership skills.					
<b>Preconditions</b>		Precondition for taking the exam: all year I exams passed					
<b>Teaching methods</b>		lectures, seminars, exercises, colloquium					
<b>Subject content per week</b>		<b>Lectures:</b>  1. BACTERIAL CELL BIOLOGY 1. Infection. Pathogenicity. Virulence. Mechanisms of tissue damage. Normal microflora. 2. BACTERIAL CELL BIOLOGY 2. Prokaryotic and Eukaryotic cells. Specifics of the structure of G+ and G- bacterial cell walls. Acid-resistant bacteria. Capsule, flagella, pili, adhesion, and chemotaxis of bacterial cells. Bacterial DNA. Bacterial metabolism. 3. BACTERIAL CELL BIOLOGY 3. Zoonoses. Antibiotics. Antibigram. Mechanisms of bacterial resistance to antibiotics. Sterilization and disinfection. 4. GRAM-POSITIVE AND GRAM-NEGATIVE COCCI 1. Staphylococcus: Pyogenic infections and toxin-mediated diseases. Staphylococcus aureus. Staphylococcus epidermidis. 5. GRAM-POSITIVE AND GRAM-NEGATIVE COCCI 2. Streptococcus, Enterococcus. Pneumococcus, bacterial pneumonia. Gram-Negative cocci, Neisseriae. 6. HAEMOPHILUS AND OTHER FASTIDIOUS GRAM-NEGATIVE BACILLI. Bordetella pertussis and parapertussis, whooping cough. Legionella, intracellular parasite. Haemophilus influenzae. 7. ENTERIC BACTERIA CAUSING SECRETORY DIARRHEA. Enterobacteriaceae, Vibronaceae.					

<sup>1</sup>Coefficient of student workload S<sub>0</sub> is calculated as it follows:

a) for the study programs not going through the licensing process: S<sub>0</sub> = (total workload in semester for all the subjects 900 hrs – total teaching workload L+E in semester for all the subjects 870 hrs)/ total teaching workload L+E in semester for all the subjects \_\_\_\_ hrs = \_\_\_\_\_. Consult form content and its explanation.

b) for the study programs going through the licensing process, it is necessary to use form content and its explanation.

8. INVASIVE GASTROINTESTINAL INFECTIONS. *Shigella*. *E. coli*. *Salmonella*. *Helicobacter pylori*.
9. NON-INVASIVE GASTROINTESTINAL AND INTRA-ABDOMINAL INFECTIONS. *Pseudomonas aeruginosa*. *Bacteroides*, intra-abdominal infections, and abscesses.
10. ZOONOSSES. *Brucella* spp. *Leptospira* spp.
11. ANAEROBIC GRAM-POSITIVE BACTERIA. *Clostridium difficile*. *Clostridium perfringens*. *Clostridium botulinum*. *Clostridium tetani*.
12. MYCOBACTERIA. *Mycobacterium tuberculosis*. *Mycobacterium leprae*. *Corynebacterium diphtheriae*: Cat scratch disease, *Bartonella henselae*.
13. SPIRAL BACTERIA. *Treponema pallidum*. *Borrelia burgdorferi*, Lyme disease.
14. INTRACELLULAR BACTERIA. *Chlamydiae*. *Rickettsiae*.
15. *Mycoplasma*. *Ureaplasma*.
16. INTRODUCTION TO PARASITOLOGY. Types of parasites and modes of transmission (protozoa, helminths, vectors, reservoirs). Establishment of parasitic infection: entry, spread and multiplication, mechanism of tissue damage/disease, diagnosis.
17. PROTOZOA AND INSECTS. Blood and tissue protozoa. Intestinal protozoa.
18. HELMINTHS. Intestinal helminths. Blood and tissue helminths.
19. INTRODUCTION TO MYCOLOGY. Pathogenic fungi: characteristics, transmission, spread and multiplication, mechanisms by which they induce tissue damage, diagnosis of infection, treatment, and prevention.
20. MYCOSES. Endemic mycoses. Histoplasmosis, Coccidioidomycosis, Blastomycosis.
21. OPPORTUNISTIC FUNGAL INFECTIONS. Characteristics of the causative agents of candidiasis, cryptococcosis, aspergillosis, mucormycosis, and pneumocystosis. Subcutaneous, cutaneous, and superficial mycoses.
22. VIROLOGY. Structure and classification of viruses. Virus replication. Diagnosis of viral diseases. Antiviral drugs.
23. PICORNAVIRUSES, CORONAVIRUSES, AND ADENOVIRUSES. Picornaviruses and coronaviruses. Viruses causing gastroenteritis: Rotavirus, Norovirus. Adenoviruses.
24. ORTHOMYXOVIRUSES, PARAMYXOVIRUSES, RASH FEVERS. Paramyxoviruses: Morbili virus, Respiratory syncytial virus RSV. Mumpsvirus. Variolavirus. Rubivirus. Influenza virus.
25. HERPESVIRUSES, PAPILLOMAVIRUSES. Alphaherpesvirinae; Herpes simplex virus, Varicella-Zoster virus. Beta and Gama-herpesvirinae; Cytomegalovirus, Epstein-Barr virus. Papillomaviridae.
26. RABIES VIRUS. Rabies virus, rabies.
27. HEPATITIS VIRUSES, PRION DISEASES. Characteristics of infections caused by hepatitis viruses. HAV, HBV, HCV, HDV, HEV. Prion diseases Creutzfeldt-Jakob disease.
28. ARBOVIRUSES AND VIRUSES CAUSING HEMORRHAGIC FEVERS. Arboviruses transmitted by arthropods, West Nile virus, Eastern equine encephalitis virus, St. Louis encephalitis virus, Dengue virus, Crimean-Congo hemorrhagic fever virus. Ebolavirus, Marburgvirus, Lassavirus.
29. PATHOGENIC HUMAN RETROVIRUSES, REVERSE TRANSCRIPTASE, HISTORY OF RETROVIROLOGY. Human immunodeficiency viruses (HIV). Acquired immunodeficiency syndrome (AIDS).
30. VACCINES. Concept of immunization and vaccination.

#### Exercises:

1. Taking samples for bacteriological examination. Sending samples for bacteriological examination.
2. Establishment of infection. Pathogenicity. Virulence. Mechanisms of tissue damage. Distribution of microorganisms. Normal microflora.
3. Forms of bacteria, structure of bacterial cells. The structure of the cell wall of G + and G- bacteria. Capsule, flagel, pili. Bacterial DNA. Microscopic visualization of morphological and functional structures of bacterial cells.
4. Conditions for the growth and reproduction of bacteria. Bacterial metabolism. Methods for isolating and identification of bacteria.
5. Tissue damage by toxins of microorganisms. Antibiotics. Methods for testing the susceptibility of bacteria to antibiotics and chemotherapeutics. Guidelines for interpretation.
6. Bacteriological diagnosis of bacterial infections caused by bacteria of the genus *Streptococcus* and *Enterococcus*, *Staphylococcus* and *Neisseria*
7. Bacterial diagnosis of infections caused by genus bacteria: *Bordetella pertussis* and *parapertussis*. *Legionella*, *Haemophilus influenzae*.
8. Diagnosis of intestinal bacteria that cause secretory diarrhea. *Enterobacteriaceae*, *Vibrionaceae*.
9. Diagnosis of intestinal bacteria that cause invasive gastrointestinal infections. *Shigella*. enterohemorrhagic *E. Coli*. *Salmonella*. *Helicobacter pylori*.
10. Diagnosis of infections caused by bacteria *Pseudomonas aeruginosa* and *Bacteroides*.
11. Diagnosis of infections caused by anaerobic gram positive bacilli. *Clostridium difficile*.

	Clostridium perfringens. Clostridium botulinum. Clostridium tetani.			
	12. Diagnosis of infections caused by mycobacteria: Mycobacterium tuberculosis. Mycobacterium leprae.			
	13. Potential biological weapons: anthrax, plague, tularemia, botulism. Corynebacterium dyphteriae. Cat scratch disease, Bartonella henselae.			
	14. SPIRAL BACTERIA. Treponema pallidum. Borrelia burgdorferi. ZOONOSSES. Brucella spp. Leptospira spp.			
	15. Diagnosis of infections caused by intracellular bacteria. Chlamydiae. Rickettsiae. Mycoplasmae.			
	16. INTRODUCTION TO PARASITOLOGY. Intestinal protozoa.			
	17. PROTOZOA AND INSECTS. Blood protozoa. Sarcoptes scabiei, lice, fleas, mosquitoes, ticks.			
	18. HELMINTHS 1 . Intestinal helminths.			
	19. HELMINTHS 1 Blood and tissue helminths.			
	20. INTRODUCTION TO MYCOLOGY. ENDEMIC MYCOSES.			
	21. OPPORTUNISTIC FUNGAL INFECTIONS. Subcutaneous, cutaneous, and superficial mycoses..			
	22. VIRUS BIOLOGY .Genetics, recombination, interference. Taking and transporting materials for virological examination.			
	23. Techniques of isolating viruses in living cell systems. Virus identification techniques: EM, proving viral antigens and the viral genome.			
	24. Serological tests of viral infections, types of serological reactions			
	25. ORTHOMYXOVIRUSES, PARAMYXOVIRUSES, CORONAVIRUSES			
	26. ADENOVIRUSES. RASH FEVERS. Viral vaccines.			
	27. HERPESVIRUSES, PAPILLOMAVIRUSES			
	28. HEPATITIS VIRUSES, PICORNAVIRUSES			
	29. RABIES VIRUS. ARBOVIRUSES AND VIRUSES CAUSING HEMORRHAGIC FEVERS.			
	30. PATHOGENIC HUMAN RETROVIRUSES, REVERSE TRANSCRIPTASE, HISTORY OF RETROVIROLOGY. PRION DISEASES			
	Compulsory literature			
	Author/s	Publication title, Publisher	Year	Pages (from-to)
	N. Cary Engleberg	Schaechter's Mechanisms of Microbial Disease Sixth edition, Walters Kluwer	2021	
	Ernest. Jawetz, Joyeph Melnick, Edward Adelberg	Medical Microbiology. Appleton & Lange	1998	
	Murray P, Rosenthal K	Medical Microbiology	2009	
	Goering R, Dockrell H	Mims' Medical Microbiology	2012	
	Additional literature			
	Author/s	Publication title, Publisher	Year	Pages (from-to)
	Student responsibilities, types of student assessment and grading	Grading policy		Points
Pre-exam activities				
lecture/exercise attendance		10	10%	
Colloquium 1		20	20%	
Colloquium 2		20	20%	
Final exam				
	test	50	50%	
	TOTAL	100	100%	
Certification date	June 17th 2024			