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|  | | | **UNIVERSITY OF EAST SARAJEVO**  Faculty of Medicine | | | | | | | | | | |  | | |
| ***Study program:medicine*** | | | | | | | | | | |
| Integrated academic studies | | | | | | II study year | | | | |
| **Full subject title** | | | MICROBIOLOGY | | | | | | | | | | | | | |
| **Department** | | | Department of Propedeutics, Faculty of Medicine in Foca | | | | | | | | | | | | | |
| **Subject code** | | | | | | **Subject status** | | | | | **Semester** | | | **ECTS** | | |
|
| ME-01-1-016-3; ME-01-1-016-4 | | | | | | compulsory | | | | | III,IV | | | 10 | | |
| **Professor/ -s** | | Full professor Nebojsa Arsenijevic,,MD PhD; full professor Ivan Jovanovic, MD, PhD; assistant professor Ružica Lukic, MD PhD; assistant professor Nevena Gajovic, MD PhD | | | | | | | | | | | | | | |
| **Associate/ -s** | |  | | | | | | | | | | | | | | |
| **Number of lectures/ teaching workload (per week)** | | | | | | | **Individual student workload (in hours per semester)** | | | | | | | | **Coefficient of student workload So[[1]](#footnote-1)** | |
| **L** | **E** | | | | **SP** | | **L** | | | **E** | | **SP** | | | **So** | |
| 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 | | | | | | | | | | | | | | | | |
| **Learning outcomes** | | 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  4. apply measures of control and prevention of infectious diseases | | | | | | | | | | | | | | |
| **Preconditions** | | Precondition for taking the exam: all year I exams passed | | | | | | | | | | | | | | |
| **Teaching methods** | | lectures, seminars, exercises, colloquium | | | | | | | | | | | | | | |
| **Subject content per week** | | **Lectures:**  1. Introduction to Microbiology  2. The metabolism of the bacteria; conditions for growth and reproduction of bacteria.  3. Characteristics of genome of bacteria and mechanisms for exchange of gene material of bacteria: transformation, conjugation, transduction.  4. Virulence factors of bacteria (adherence factors, invasive factors, bacterial toxins). Methods for isolating bacteria (nutrients and conditions for cultivation of bacteria in vitro; seeding of nutrients). Identification of isolated culture of bacteria (examination of microscopic, cultural, physiological and biochemical properties).  5. Mechanisms of antibacterial action of antibiotics and chemotherapeutics. Mechanisms of resistance of bacteria to antibiotics and chemotherapeutics.  6. Microorganisms and their products in food, water and environment: risk to human health (basic concepts in the field of sanitary microbiology).  7. Characteristics and medical importance of bacteria Streptococcus pneumoniae, Streptococcus agalactiae and Viridans streptococci. General characteristics and medical importance of bacteria of the genus Enterococcus.  8. General properties of bacteria of the genus Staphylococcus. Characteristics and medical significance of Staphylococcus aureus. Characteristics and medical significance of coagulase negative staphylococci (Staphylococcus epidermidis, Staphylococcus saprophyticus) and the formation of bacteria biofilm.  9. General characteristics of the bacteria of the Enterobacteriaceae family. Characteristics and medical importance of bacteria Escherichia coli. Characteristics and medical significance of opportunistic enterobacteria (Enterobacter, Klebsiella, Serratia, Proteus); characteristics and medical significance of Yersinia genus and Yersinia enterocolitica species.  10. General characteristics of bacteria of the genus Mycobacterium; Characteristics and medical importance of Mycobacterium leprae and opportunistic mycobacteria.  11. General characteristics and medical significance of Gram negative nonfermentative bacteria group; properties and medical significance of Pseudomonas aeruginosa, Acinetobacter spp. and Stenotrophomonas maltophilia. General properties and medical significance of a group of asporogenic anaerobic bacteria; the medical significance of the bacteria of the genus Bacteroides and Propionibacterium.  12. General properties of bacteria of the genus Clostridium; properties and medical significance of Clostridium difficile bacteria, Clostridium perfringens and other clostridial myionecrosis. Characteristics and medical importance of bacteria Clostridium tetani and Clostridium botulinum.  13. General characteristics and medical significance of bacteria of the genus Chlamydia, Chlamydophila, Mycoplasma, Ureaplasma.  14. Medical significance of zoonosis; general characteristics and medical significance of bacteria of the genus Brucella and Francisella. General characteristics and medical significance of the bacteria of the genus Rickettsia, Bartonella, Erhlichia, and Coxiella burnetii.  15. Characteristics and medical significance of Haemophilus influenzae and Bordetella pertussis.  The properties and medical importance of Legionella pneumophila; General characteristics and medical significance of Campylobacter jejuni and Helicobacter pylori.  16. Introduction to virusology. The structure and of the virus. Taxonomic criteria for virus classification.  17. Replication of animal viruses. Different types of transcription of viral iRNA. Replication of the viral genome. Morphogenesis of the virus.  18. The relationship between the virus and the cell. Types of viral infections. Pathogenesis of viral infection.  19. Herpesviridae (Herpes simplex virus types 1 and 2, Varicella Zoster virus, Cytomegalovirus, Epstein-Barr virus, HHV-6, 7 and 8).  20. Viruses are the causative agents of GIT infections (Reoviridae, Coronaviridae, "F" types of Adenovirus, Caliciviridae). Basic characteristics of Retroviridae. Human immunodeficiency virus (HIV 1 and 2).  21. Causes of viral hepatitis (HAV, HBV, HCV, HDV, HEV, HGV). Basic characteristics of the virus, their genome and the basic antigen composition of the virus. Immunopathogenesis of viral hepatitis. Characteristics of acute and chronic infections  22. DNA viruses: Parvoviridae (Parvo B19 v.), Adenovirus, Poxviridae (Variolla v., Vaccinia v., Molluscum contagiosum v.); Papillomaviridae (HPV, Polyomaviridae (JC and BK virus).  23.Picornaviridae, Orthomyxoviridae, Paramyxoviridae  24. Introduction to medical parasitology and mycology.  25. Ecology of protozoa and epidemiology of protozoal diseases. Arthropods important for medicine.  26. Large tropical diseases caused by protozoa.  27. Helminths Ecology and epidemiology of diseases caused by helminths. Helminths - triggers of tropical helminthoses.  28. Morphology and biology of fungi. Epidemiological and ecological characteristics of fungal infections.  29. Biphasic fungi, zygomycetes. Microalgae and mycotoxicosis.  30. Antifungal agents. Antihelmintics. Antiprotozoal and antimalarial agents.  **Exercises:**   1. Pathogenicity and virulence of bacteria. Physiological microflora and ecological associations. 2. Taking samples for bacteriological examination. Sending samples for bacteriological examination. 3. Microscopic visualization of morphological and functional structures of bacterial cells (microscopic examination of native preparations, microscopic examination of preparations stained with free coloring and differential staining according to Gram). 4. Methods for isolating bacteria (nutrients and conditions for cultivation of bacteria in vitro; seeding of nutrients). Identification of isolated culture of bacteria (examination of microscopic, cultural, physiological and biochemical properties). 5. Methods for testing the susceptibility of bacteria to antibiotics and chemotherapeutics (preparation and guidelines for interpretation of the disk diffusion and broth dilution method of the antibiogram). 6. Methods for rapid diagnosis of bacterial infections. Serological reactions in the diagnosis of bacterial infections. 7. Bacteriological diagnosis of bacterial infections caused by bacteria of the genus Streptococcus and Enterococcus (identification of bacteria strains of Streptococcus and Enterococcus by examination of microscopic, cultural and physiological-biochemical properties). 8. Bacteriological diagnosis of infections caused by bacteria of the genus Staphylococcus and Neisseria (identification of bacteria isolates of the genus Staphylococcus and Neisseria by examination of microscopic, cultural and physiological-biochemical properties). 9. Characteristics and medical significance of bacteria of the genus Salmonella and Shigella. General properties of bacteria of the genus Corynebacterium; properties and medical significance of Corynebacterium diphtheriae and the diphtheria group. 10. Bacteriological diagnosis of infections caused by the bacteria of the Enterobacteriaceae family 11. The basic principles of bacteriological diagnosis of infections caused by bacteria of the genus Mycobacterium (Isolation and identification of bacteria of the genus Mycobacterium; microscopy of stained preparations according to Ziehl-Neelsen). 12. Bacteriological diagnostics of infections caused by Gram negative nonfermentative bacteria. General characteristics and medical significance of bacteria Listeria monocytogenes. 13. Basic principles of bacteriological diagnosis of infections caused by anaerobic sporogenic and asporogenic bacteria. Basic principles of bacteriological diagnosis of infections caused by strictly intracellular bacteria of the genus Chlamydia and Chlamydophila; basic principles of bacteriological diagnosis of infections caused by mycoplasma. 14. General characteristics and medical importance of bacteria Yersinia pestis. General properties of bacteria of the genus Bacillus; properties and medical importance of bacteria Bacillus anthracis and Bacillus cereus. 15. The properties and medical importance of Legionella pneumophila; General characteristics and medical significance of Campylobacter jejuni and Helicobacter pylori. 16. General characteristics and medical significance of spiral bacteria; properties and medical importance of Borrelia burgdorferi and Leptospira interrogans. Characteristics and medical importance of Treponema pallidum. 17. Characteristics and medical significance of Vibrio genus; properties and medical significance of Vibrio cholerae. Bacterial vaccines. 18. Current bacterial pathogens I: multiresistant strains of bacteria (MRSA, VRE, multiresistant enteric bacteria, multiresistant Gram negative, non-fermenting bacteria, multiresistant and extensively resistant Mycobacterium tuberculosis). Acute bacterial pathogens II: opportunistic bacteria. Genetics of the virus. Recombinations. 19. Intervention among animal viruses, antiviral effect of interferon. Basic principles of virological diagnostics. Taking, sending, processing and storage of materials for virological tests. 20. Laboratory diagnosis of herpesvirus infections. Viral isolation techniques in living cell systems (cell culture, embryonated eggs, experimental animals). 21. HIV - evolution, variability and consequences for pathogenesis and diagnostics. Techniques of virus identification: EM, proving viral antigens, proving viral genome. 22. Laboratory diagnostics of viral hepatitis. Viral vaccines 23. Oncogenic viruses. Serological diagnosis of viral infections: types of serological reactions. 24. Arboviruses and viral zoonoses. 25. Morphology and biology of medically significant protozoa. Protozoa of digestive and urogenital tract. Causes of amoebiasis, lambliasis, blastocystosis, cryptosporidiosis, trichomoniasis. 26. Protozoa of blood and tissues - causative agents of leishmaniasis, trypanosomiasis, toxoplasmosis and malaria. 27. Intestinal helminths - causes of enterobiasis, ascariasis, trichuriasis, strongyloidiasis and taeniasis. Laboratory diagnosis of infections caused by intestinal helminths. 28. Tissue helminths - causes of trichinosis, toxocariosis, cysticercosis, echinococcosis. Laboratory diagnosis of infections caused by intestinal and tissue helminths. 29. Fungi - common triggers of superficial, invasive or opportunistic infections. Candida yeast and Cryptococcus. Molds: Aspergillus, Fusarium, Penicillium. Genum of Pneumocystis 30. Laboratory diagnosis of fungal infections: skin, hair, nail, mucous membranes, eye, ear. Methods for identifying fungi and antimicrobial susceptibility testing. Laboratory diagnosis of invasive fungal infections: invasive aspergillosis and invasive candidiasis. | | | | | | | | | | | | | | |
| **Compulsory literature** | | | | | | | | | | | | | | | | |
| **Author/s** | | | | **Publication title, Publisher** | | | | | | | | | **Year** | | **Pages (from-to)** | |
| N.Cary Engleberg: | | | | Schaechter's Mechanisms of Microbial Disease.Walters Kluwer, | | | | | | | | | 2012 | |  | |
| Abul K.Abbas,Andrew H.Lichtman,Shiv Pillai | | | | Basic Immunology.Elsevier, | | | | | | | | | 2019 | |  | |
| **Additional literature** | | | | | | | | | | | | | | | | |
| **Author/s** | | | | **Publication title, Publisher** | | | | | | | | | **Year** | | **Pages (from-to)** | |
| **Student responsibilities, types of student assessment and grading** | | **Grading policy** | | | | | | | | | | | | **Points** | | **Percentage** |
| Pre-exam activities | | | | | | | | | | | | | | |
| lecture/exercise attendance | | | | | | | | | | | | 10 | | 10% |
|  | | | | | | | | | | | |  | |  |
| colloquiums | | | | | | | | | | | | 30 | | 30% |
| Final exam | | | | | | | | | | | | | | |
| test | | | | | | | | | | | | 60 | | 60% |
|  | | | | | | | | | | | |  | |  |
|  | | TOTAL | | | | | | | | | | | | 100 | | 100% |
| **Certification date** | | December 13 th 2018 | | | | | | | | | | | | | | |

Responsible Person of the Faculty

1. Coefficient of student workload So is calculated as it follows:

   а) for the study programs not going through the licensing process: So = (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. [↑](#footnote-ref-1)