1.	Course title	Microbiology and Immunology			
2.	Code	DMMMI2			
3.	Study program	Dentistry - integrated first and second cycle of studies			
4.	Organizer of the study program (unit, i.e., institute, department, division)	University "Ss. Cyril and Methodius" in Skopje. Faculty of Medicine - Skopje, Department of Microbiology with Parasitology			
5.	Degree (first, second, third cycle)	Integrated first and second cycle studies			
6.	Academic year/semester	Year	2	Semester	3
7	Course workload expressed in ECTS credits	7			
8.	Teacher (in case of multiple teachers, designated teacher in charge)	Assoc. Prof. Dr. Maja Jurhar Pavlova, Head of the Department of Microbiology and Parasitology Members of the Department of Microbiology and Parasitology			
9.	Language in which the curriculum is conducted	English			
10.	Necessary prerequisites for listening and taking the class	Listened to all compulsory subjects from the first year			
11.	Course objectives (competences) and learning outcomes:	By studying the specific characteristics of the most common medically significant microorganisms, students will be able to understand the pathogenesis of the infections they cause, their localization, and their spread in the host's body. Key skills: making a proper etiological diagnosis of infections, examining the effect of antimicrobials, and recommending appropriate antimicrobial therapy			
12.	Detailed course content by chapter and units, with the learning outcomes for each chapter	Theoretical teaching - lectures Introduction to Microbiology with Immunology……. 4 classes Bacteria morphology: size, shape, layout. Bacteria structure: Capsule, cell wall, cytoplasmic membrane, cytoplasm, nuclear equivalent, spores, flagelles, and fimbriae……4 Bacterial physiology: nutrition, growth, reproduction, relationship to oxygen Prevalence, Ecosystems; Normal microflora, Effect of physical and chemical agents on bacteria. Sterilization and disinfection in dentistry……..3 classes Antibiotics and chemotherapeutic agents: Mechanisms of the effect of antibiotics and chemotherapeutic agents, Groups of antibiotics and chemotherapeutic agents. Mechanisms of resistance to antibiotics and chemotherapeutics. Side effects of antibiotics and rational use. 3 classes Genetics of microorganisms: Organization of the genome of prokaryotes and viruses, Gene expression, Mutations and modifications in microorganisms, Mechanisms of genetic transfer in prokaryotes and viruses……..2 classes Viruses. Characteristics of viruses. Virus reproduction. Antivirals. Prions. Fungi: Characteristics of fungi. Antifungals...2 classes Pathogenicity and virulence of microorganisms. Pathogenesis of infections. Pathogens on the rise… 2 classes Immunology: organization of the immune system (lymphatic organs and tissues), cells of immune reactions (lymphatic and myeloid), soluble intermediates (cytokines, complement, acute phase proteins...) immune response - antigens and their characteristics. Natural - non-specific immune response. Acquire a specific immune response (T and B lymphocytes, antigen receptors). Humoral and cellular immune response to infections: antibacterial, antiviral, antifungal, antiparasitic. Immune system and oral cavity. (lymphatic tissue, saliva). Regulation and control of immune response. Hypersensitivity, autoimmunity, immunotolerance. Vaccines and serums…8 classes Bacteriology: Classification of medically significant bacteria. Gram-positive cocci: Staphylococcus (aureus, epidermidis, saprophyticus, Micrococcus, Streptococcus pyogenes, Streptococcus pneumoniae, Oral streptococci: mutans, salivarius, mitis, and anginosus. Gram-negative cocci: Neisseria meningitidis, Neisseria gonorrhoeae, Veillonella, Parvobacterium. Gram-positive bacilli: Corynebacterium diphteriae, Difteroidi, Legionella……..3 classes			

		Gram negative bacilli: Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Campylobacter, Helicobacter pylori, Vibrio……..3 classes Anaerobic Gram-negative bacteria: Bacteroides, Porphyromonas, Prevotella Fusobacterium, Spiral bacteria Treponema pallidum, Treponema denticola, Leptotrichia Sporogenous Gram positive bacilli (Bacillus, Clostridium spp); Mycobacterium tuberculosis, Rickettsia, Mycoplasma, Ureaplasma, Chlamydia; Actinomyces, Nocardia Lactobacillus……6 classes Viruses: Picornaviridae, Orthomyxoviridae: Influenzae virus, Paramyxoviridae: Paramyxovirus (Parotitis virus, Parainfluenza virus), Morbillivirus, Pneumovirus (RSV), Rubivirus, Papovaviridae. Hepadnaviridae, HCV, Herpesviridae, (HSV1, HSV2, VZV, CMV, EBV, HHV6, HHV7, HHV8), Retroviridae: HIV……6 classes Fungi relevant to dentistry Candida (albicans and non-albicans), Cryptococcus. Protozoa in general and protozoa important for the oral cavity……2 classes Oral ecosystem, plaque biofilm; Microbiology of dental caries, periodontal diseases…….5 classes Oral cavity infections, salivary gland infections, cardiovascular system infections, sepsis, hemoculture……6 classes Intra-hospital infections in dentistry: infection control. Hand hygiene. Hygiene in a hospital environment ……5 classes Results: Methodological units should familiarize students with the basic biological characteristics of infectious agents, as well as the basic terms and mechanisms of the immune response to infectious agents Students will be able to recognize possible infectious agents as causative agents of the pathological process in the oral cavity. Have an appropriate differential diagnostic approach. Selection of a representative sample of the patient for microbiological analysis. Referral and selection of an appropriate diagnostic method. They will be educated on the application of principles for the rational use of antimicrobial medication as well as the implementation of measures for the control and prevention of infections in dental practice Total:……60 classes Functioning of microbiological laboratories. Behavior in a microbiological laboratory. Correct sampling for microbiological examination, storage of samples, and transport. Microscopic examination, types of microscopes. Preparation and microscopy of native preparations. Coloring of microorganisms and microscoping of colored preparations ……5 classes Cultivation, isolation, and identification of microorganisms. Commonly used biochemical reactions and automated methods. Examination of the susceptibility of microorganisms to antimicrobials (antibiogram). Sterilization and disinfection……..5 classes Immunological laboratory methods (classical e.g. agglutination, precipitation, ACO, RVC and modern ELISE and immunofluorescence). Molecular techniques in microbiology and their application. Diagnosis of viral infections. Viruses important in dentistry (adenoviruses, herpes viruses, HIV)……5 classes Microbiological diagnosis of pyogenic cocci; Causes of caries and periodontal diseases - microbiological diagnosis of infections 5 classes Microbiological diagnosis of GIT infections. Study of methods of anaerobic cultivation. Diagnosis of infections with sporogenous and anaerobic bacteria ……5 classes Viral infections in dentistry. Fungal infections - microbiological diagnosis. Microbiological diagnosis and control of intra-hospital infections……..5 classes Total .....30 classes
13	Interrelation of subjects	
14.	Detailed description of the	Interactive classes (theoretical), working in small groups (laboratory

	teaching and working methods for the subject	exercises), presenting and performing laboratory procedures, demonstrating methods used.		
15.	Total Available Time	210 classes		
16.	Forms of teaching activities	16.1.	Lectures - theoretical teaching. Classes	60 classes
		16.2.	Exercises (laboratory, auditorium), seminars, teamwork: classes	30 classes
		16.3.	Practice: classes	
17.	Other forms of activities	17.1.	Project assignments: classes	
		17.2.	Independent assignments: classes	20 classes
		17.3.	Home study - assignments	100 classes
18	Signature requirements	In order to receive a signature, the student needs to earn a minimum of points from practical teaching (8 points) and from theoretical teaching (7 points)		

19	Method of grading			
	19.1.	Tests: points First colloquium Second colloquium Practical test		Points min.-max. 20-33 20-33 5-9
	19.2.	Activity and participation in lectures and exercises: Theoretical teaching Practical teaching		Points min.-max. 7-15 8-10
	19.3.	Final exam: points		Combination of tests from failed examination (colloquia)
20	Evaluation criteria (points/grade)		up to 59 points	5 (five) (F)
			60 to 68 points	6 (six) (E)
			69 to 76 points	7 (seven) (D)
			77 to 84 points	8 (eight) (C)
			85 to 92 points	9 (nine) (B)
			93 to 100 points	10 (ten) (A)
21.	Method of monitoring the quality of teaching	Self-evaluation by students, assistant control during the practical teaching and assessment of the achieved student success, as well as the pass rate of students who have passed the subject		

22. Literature

22.1. Required literature

Ord. number	Author	Title	Publisher	Year
1.	Prof. Dr. Kaja Popovska et al.	Microbiology for Dental Students	Department of Microbiology and Parasitology	2016
2.	Panovski Nikola et al.	Medical microbiology - general part	Department of Microbiology and Parasitology	2008
3.	Prof. Dr. Gordana Jankoska et al.	Biochemistry practicum for students of dentistry	Department of Microbiology and Parasitology	2017

22.2. Additional literature

Ord. number	Author	Title	Publisher	Year
1.	Simon Bejker, Xejn Niklin, Navid Kan, Ricard Kilington	A brief overview of microbiology	Translated within the framework of the project of the Government of the Republic of Macedonia for translation of professional and scientific books	2010