

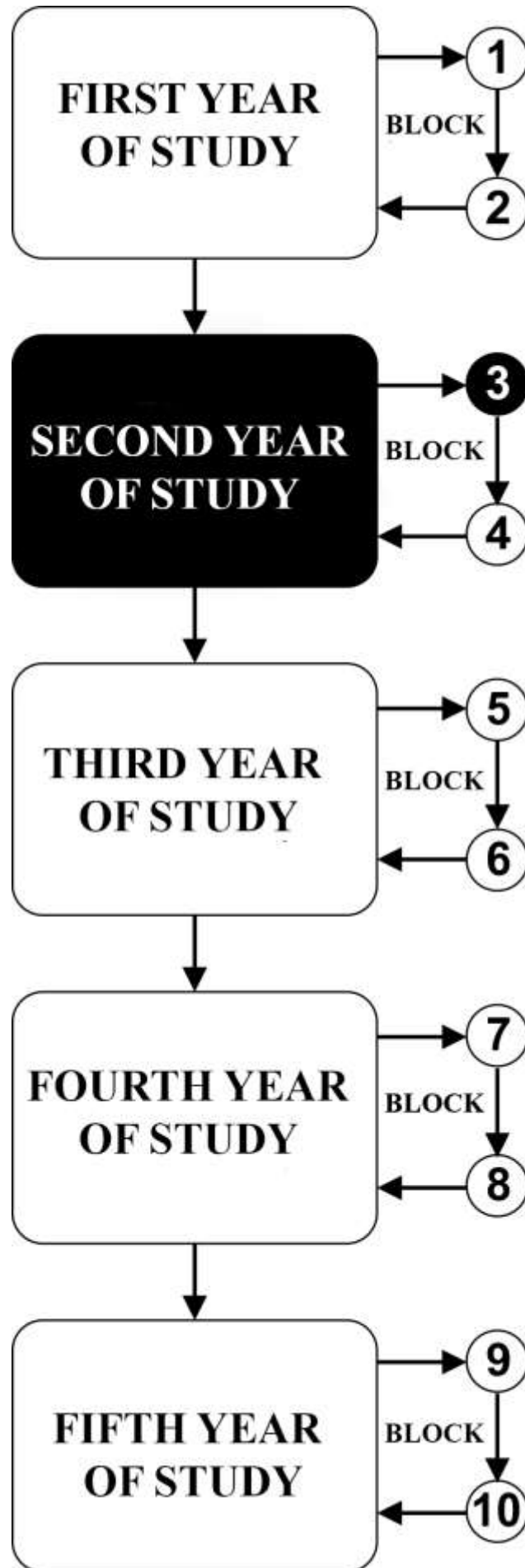


**PHARMACY - INTERGRATED  
ACADEMIC STUDIES**

2<sup>nd</sup> year of the studies

school year 2022/2023.

**PHARMACEUTICAL MICROBIOLOGY**



Course unit:

### **PHARMACEUTICAL MICROBIOLOGY**

The course is evaluated with 6 ECTS credits. There are 4 hours of active classes per week (2 hours of lectures and 2 hours of work in a small group)

**TEACHERS AND ASSOCIATES:**

PB	Name and surname	Email adress	Title
1.	Dejan Baskić	dejan.baskic@gmail.com	Proffesor
2.	Sanja Matic	sanjad.matic@gmail.com	Assistant
3.	Milica Stojković	miciii.stojkovic@gmail.com	Facilitator

**COURSE STRUCTURE:**

Module	Name of the modul	Week	Lectures	Work in a small group	Teacher-leader modules
1	Basic characteristics of infectious agents, prevention, diagnosis and treatment of infectious diseases	4	2	2	Prof. dr Dejan Baskić
2	Bacteriology	4	2	2	Prof. dr Dejan Baskić
3	Virology	4	2	2	Prof. dr Dejan Baskić
4	Parasitology and mycology	3	2	2	Prof. dr Dejan Baskić
					Σ30+30=60

## ASSESSMENT:

The grade is equivalent to the number of points won (see tables). Points are earned in two ways:

### PRE-EXAMINATION ACTIVITIES:

Students are obliged to actively participate in all forms of teaching. Teachers and associates who teach will evaluate their behavior, knowledge, skills and attitudes expressed during teaching and solving assigned problems. In this way, the student can score up to 44 points by passing 4 colloquiums that include the material covered in the lectures.

**FINAL EXAMINATION:** In this way, the student can get up to 56 points by taking an oral exam (performing four exam questions).

Method of taking the exam and grading according to the attached table.

MODULE		MAXIMUM POINTS		
		Pre-examination activities	Final examamination	
		Teaching colloquiums	Oral exam	Σ
1	Basic characteristics of infectious agents, prevention, diagnosis and treatment of infectious diseases	12	56	
2	Bacteriology	12		
3	Virology	12		
4	Parasitology and mycology	8		
	Σ	<b>44</b>	<b>56</b>	<b>100</b>

In order to pass the exam, the student must achieve more than 50 percent of the points in the pre-exam activities and the final exam, that is, the student must:

- pass the pre-exam activities, i.e. acquire more than 50% of the points provided for the pre-exam activities by passing 4 teaching colloquiums.
- to pass the oral exam, i.e. to obtain more than 50% of the points provided for the final exam

### The final grade is formed as follows:

number of points won	grade
0 - 50	<b>5</b>
51 - 60	<b>6</b>
61 - 70	<b>7</b>
71 - 80	<b>8</b>
81 - 90	<b>9</b>
91 - 100	<b>10</b>

**LITERATURE:**

<b>TITLE OF THE TEXTBOOK</b>	<b>AUTHORS</b>	<b>PUBLISHER</b>	<b>LIBRARY</b>
Review of Medical Microbiology and Immunology, 16th Edition	Levinson W.	International Edition. McGraw Hill. 2020.	NO
Basic Immunology: Functions and Disorders of the Immune System, 6th Edition	Abbas A, Lichtman A, Pillai S.	Elsevier Science. 2019	NO
Basic Immunology: Functions and Disorders of the Immune System, 6th Edition	Abbas A, Lichtman A, Pillai S.	Elsevier Science. 2019	NO
Oxford Handbook of Infectious Diseases and Microbiology 2nd Edition	Cooke F, Török E, Moran E	Oxford University Press. 2016.	NO
Clinical Microbiology	Stokes E. Joan et al.	London: Edward Arnold. 1993.	NO
Sherris medical microbiology (a introduction to infectious diseases)	Kenneth, Rayan	New York: Mc Graw-Hill. 2004	NO
Sherris medical microbiology	Kenneth, Rayan .	New York: Mc Graw-Hill. 2010.	NO
Pharmaceutical Microbiology	W.B. Hugo	Oxford: Blackwell Scientific Publications. 2003.	NO
Elisa in the clinical microbiology laboratory	Wreghitt, T.G	London: Public Health Laboratory service. 1990.	NO
<b>All lectures and material for small group work are available on the website of the Faculty of Medical Sciences: <a href="http://www.medf.kg.ac.rs">www.medf.kg.ac.rs</a></b>			

## **PROGRAM**

### **FIRST MODULE: BASIC CHARACTERISTICS OF CAUSES, PREVENTION, DIAGNOSIS, AND TREATMENT OF INFECTIOUS DISEASES**

#### TEACHING UNIT 1 (FIRST WEEK)

##### **BASIC CHARACTERISTICS OF A BACTERIAL CELL**

###### **(lecture 2 hours)**

- Classification and taxonomy of microorganisms. Taxonomy and classification of bacteria. Morphology and structure of the bacterial cell. Physiological conditions for the growth and reproduction of bacteria. Bacterial cell metabolism. Bacterial genetics.

###### **(exercises 2 hours)**

- Antibacterial drugs. Mechanisms of antibacterial action of antibiotics and chemotherapeutic agents. Bacterial resistance to antibiotics. Antibiogram.

#### TEACHING UNIT 2 (SECOND WEEK)

##### **BASIC CHARACTERISTICS OF VIRUSES**

###### **(lecture 2 hours)**

- Taxonomy and classification of viruses. Virus structure. The viral genome. Virus replication. Virus genetics. The relationship between the virus and the host cell. Interferons. Tumor viruses.

###### **(exercises 2 hours)**

- Antiviral drugs. Mechanisms of action of antiviral drugs.

#### TEACHING UNIT 3 (THIRD WEEK)

##### **INFECTION, PATHOGENICITY AND VIRULENCE. PATHOGENESIS OF INFECTIOUS DISEASES**

###### **(lecture 2 hours)**

- Normal microflora (human microbiome). Ecological associations. Opportunistic and intrahospital infections. Pathogenesis of infectious diseases. Establishment and spread of infection. Tissue damage. Transmission to a new host.

###### **(exercises 2 hours)**

- Virulence factors. Bacterial toxins. Mechanisms of action of bacterial toxins.

#### TEACHING UNIT 4 (FOURTH WEEK)

##### **PREVENTION AND DIAGNOSIS OF INFECTIOUS DISEASES**

**(lecture 2 hours)**

- Basic principles of diagnosis of infectious diseases. Taking and sending samples for microbiological examination. Sample processing for microbiological examination. Identification of isolated microorganisms - conventional methods and modern techniques. Vaccines.

**(exercises 2 hours)**

- Asepsis, antisepsis, sterilization, disinfection. Identification of isolated microorganisms.

**SECOND MODULE: BACTERIOLOGY**

TEACHING UNIT 5 (FIFTH WEEK)

**CAUSES OF PYOGENE INFECTIONS. GRAM POSITIVE AND GRAM NEGATIVE COCCIA AND COCCOBACILLI**

**(lecture 2 hours)**

- *Staphylococcus, Streptococcus, Enterococcus, Neisseria, Acinetobacter, Haemophilus, Bordetella, Legionella.*

**(exercises 2 hours)**

- Diagnostics and prevention of pyogenic infections.

TEACHING UNIT 6 (SIXTH WEEK)

**CAUSES OF DIARRHEA SYNDROMES. ENTEROBACTERIA AND OTHER GRAM NEGATIVE BACILLES**

**(lecture 2 hours)**

- *Enterobacteriaceae*: Conditionally pathogenic: *Escherichia, Klebsiella, Enterobacter, Proteus, Morganella, Providencia*. Патогене: *Salmonella, Shigella, Yersinia*. Other Gram-negative bacilli: *Pseudomonas, Vibrio, Campilobacter, Helicobacter*.

**(exercises 2 hours)**

- Diagnosis and prevention of bacterial diarrheal syndromes.

TEACHING UNIT 7 (SEVENTH WEEK)

**CAUSES OF TUBERCULOSIS, LEPROSY AND DIPHTHERIA. ANAEROBIC AND SPOROGENEOUS BACTERIA**

**(lecture 2 hours)**

- *Mycobacterium*: *M. tuberculosis, M. leprae*. Non-sporogenic Gram positive bacilli: *Listeria, Lactobacillus, Corynebacterium, Actinomyces, Nocardia, Streptomyces, Rhodococcus*. Anaerobic and



anaerobic bacteria. Gram negative bacilli and cocci: *Bacteroides*, *Fusobacterium*, *Prevotella*, *Porphyromonas*, *Veillonella*. Gram positive bacilli and cocci: *Bifidobacterium*, *Propionibacterium*, *Peptostreptococcus*. Sporogenic bacteria. Anaerobic Gram-positive bacilli: *Clostridium*. Aerobic Gram-positive bacilli: *Bacillus*.

**(exercises 2 hours)**

- Diagnosis and prevention of infections caused by mycobacteria, anaerobic and sporogenic bacteria.

TEACHING UNIT 8 (EIGHT WEEK)

### **CAUSES OF ZONOSIS AND SEXUALLY TRANSMITTED DISEASES. SPIRAL AND OBLIGATELY INTRACELLULAR BACTERIA**

**(lecture 2 hours)**

Zoonosis agents. Obligate intracellular bacteria: *Rickettsia*, *Coxiella*, *Bartonella*,. Spiral bacteria: *Borrelia*, *Leptospira*. Enterobacteriaceae: *Yersinia pestis*. Causes of sexually transmitted diseases. Spiral bacteria: *Treponema pallidum*. Obligate intracellular bacteria: *Chlamydia*. Bacteria without a cell wall: *Mycoplasma* and *Ureaplasma*. Other bacteria: *Gardnerella vaginalis*, *Haemophilus ducreyi*.

**(exercises 2 hours)**

- Diagnosis and prevention of zoonoses and sexually transmitted infections.

### **THIRD MODULE: VIROSOLOGY**

TEACHING UNIT 9 (NINTH WEEK)

### **VIRUSES SIGNIFICANT FOR THE CAUSE OF DIARRHEA SYNDROME AND RESPIRATORY TRACT INFECTIONS. PICORNAVIRIDAE, REOVIRIDAE, ORTHOMYXOVIRIDAE, PARAMYXOVIRIDAE AND OTHERS**

**(lecture 2 hours)**

- *Picornaviridae*: *Enterovirus* (*Poliovirus*, *Coxsackievirus*, *Echovirus*), *Rhinovirus*. *Reoviridae* (*Rotavirus*) and other viruses important in the development of diarrheal syndrome: *Astroviridae*, *Caliciviridae* (*Norwalk virus*), *Adenoviridae*. *Orthomyxoviridae*: *Influenza virus*. *Paramyxoviridae*: *Mumps virus*, *Parainfluenza virus*, *Respiratory syncytial virus*. *Coronaviridae*: MERS-CoV, SARS-CoV, SARS-CoV-2.

**(exercises 2 hours)**

- Diagnosis and prevention of gastrointestinal and respiratory viral infections

TEACHING UNIT 10 (TENTH WEEK)

### **HERPESVIRIDAE, PAPOVAVIRIDAE, PARVOVIRIDAE, ADENOVIRIDAE**

**(lecture 2 hours)**

- *Herpesviridae*. *Herpes simplex virus 1 and 2*. *Varicella-zoster virus*. *Cytomegalovirus*, *Epstein-Barr virus*. HHV6, HHV7, HHV8. *Papillomavirus*. *Poliomaviridae*: *Poliomavirus (JCV, BK, SV40)*. *Parvoviridae*: *Parvovirus B19*. *Adenoviridae*: *Adenovirus*

**(exercises 2 hours)**

- Diagnosis and prevention of infections with herpes viruses, human papilloma viruses, parvoviruses.

TEACHING UNIT 11 (ELEVENTH WEEK)

**VIRUSES CAUSING RASH FEVERS. ARBOVIRUS INFECTIONS AND VIRAL ZONOSSES**  
**(lecture 2 hours)**

- Rash fevers. *Paramyxoviridae*: *Morbillivirus*. *Togaviridae*: *Rubivirus*. Congenital and postnatal rubella. *Poxviridae*: *Variola virus*, *Vaccinia virus*, *Molluscum contagiosum virus*. Arbovirus infections: *Flaviviridae*, *Togaviridae (Alphavirus)*, *Bunyaviridae*. Viral zoonoses: *Arenaviridae*, *Filoviridae*, *Rhabdoviridae*. *Rabies virus*.

**(exercises 2 hours)**

- Diagnosis and prevention of measles fever and viral zoonoses.

TEACHING UNIT 12 (Twelfth Week)

**HEPATITIS VIRUSES. RETROVIRUSES AND PRIONS**

**(lecture 2 hours)**

HAV, HEV, HBV, HDV, HCV, HGV. *Retroviridae*: HIV, HTLV. Prions and viroids

**(exercises 2 hours)**

- Diagnostics and prevention of viral hepatitis and retroviral infections.

**FOURTH MODULE: PARASITOLOGY AND MYCOLOGY**

TEACHING UNIT 13 (THIRTEENTH WEEK)

**PROTOZOA**

**(lecture 2 hours)**

- Taxonomy and classification of protozoa, helminths and fungi. Morphology and physiology of protozoa, helminths and fungi. Amoebas and ciliates: *Entamoeba histolytica*, *Entamoeba coli*, *Iodamoeba butschlii*, *Endolimax nana*, *Balantidium coli*, *Blastocystis hominis*. Flagellates of the digestive and urogenital tract: *Giardia lamblia*, *Dientamoeba fragilis*, *Chilomastix mesnili*, *Trichomonas*. Blood and tissue flagellates: *Leishmania*, *Tripanosoma*. Apicomplexes and microsporidia: *Plasmodium*, *Babesia*, *Toxoplasma gondii*, *Cryptosporidium*, *Cyclosporida*, *Isospora belli*, *Sarcocystis*, *Microsporidia*.

**(exercises 2 hours)**

- Antiparasitic drugs. Mechanisms of action of antiparasitic drugs, diagnostics and prevention of protozoan infections.

#### TEACHING UNIT 14 (FOURTEENTH WEEK)

##### HELMINTH

###### (lecture 2 hours)

- Intestinal and tissue nematodes: *Ascaris lumbricoides*, *Trichuris trichiura*, *Enterobius vermicularis*, *Ancylostoma duodenale*, *Necator americanus*, *Strongyloides stercoralis*, *Trichinella spiralis*, *Toxocara canis/cati*, *Wuchereria bancrofti*, *Brugia malayi/timori*, *Loa loa*, *Onchocerca volvulus*, *Dracunculus medinensis*. Intestinal and tissue cestodes: *Taenia solium*, *Taenia saginata*, *Hymenolepis nana*, *Diphyllobotridium latum*, *Echinococcus granulosus*. Trematodes: *Fasciola hepatica*, *Fasciolopsis buski*, *Dicrocoelium lanceolatum*, *Clonorchis sinensis*, *Paragonimus westermani*, *Shistosoma*

###### (exercises 2 hours)

- Antiparasitic drugs. Mechanisms of action of antiparasitic drugs, Diagnostics and prevention of infections/infestations caused by helminths.

#### TEACHING UNIT 15 (FIFTEENTH WEEK)

##### MUSHROOMS

###### (lecture 2 hours)

- Opportunistic fungi: yeasts: *Candida*, *Cryptococcus*, *Rhodotorula*, *Pneumocystis* и плесни: *Aspergillus*, *Penicillium*, *Mucor*, *Rhizopus*, *Rhizomucor*. Pathogenic fungi: dermatophytes: *Trichophyton*, *Microsporum*, *Epidermophyton* and biphasic fungi: *Sporothrix schenckii*, *Histoplasma capsulatum*, *Blastomyces dermatitidis*, *Paracoccidioides brasiliensis*, *Coccidioides immitis*.

###### (exercises 2 hours)

- Antimycotics. Mechanisms of action of antifungal drugs. Diagnosis and prevention of fungal infections.

