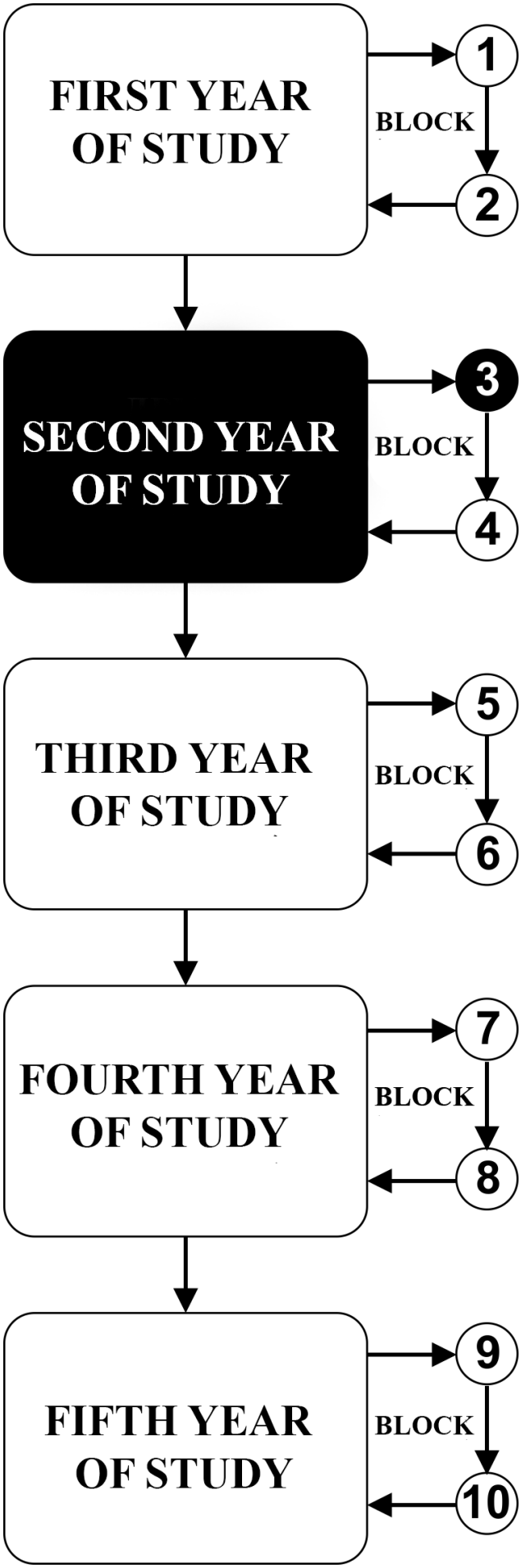
PHARMACEUTICAL MICROBIOLOGY

PHARMACY - INTERGRATED ACADEMIC STUDIES

2nd year of the studies

school year 2024/2025.


FIRST YEAR OF STUDY
BLOCK
1
2
SECOND YEAR OF STUDY
BLOCK
3
4
THIRD YEAR OF STUDY
BLOCK
5
6
FOURTH YEAR OF STUDY
BLOCK
7
8
FIFTH YEAR OF STUDY
BLOCK
9
10

Subject:

PHARMACEUTICAL MICROBIOLOGY

The course is evaluated with 5 ECTS credits. There are 4 classes of active teaching per week (2 classes of lectures and 2 classes of work in a small group).

TEACHERS AND ASSOCIATES:

РБ	Name and surname	Email address	Title
1.	Dejan Baskić	dejan.baskic@gmail.com	Full Professor
2.	Sanja Matić	sanjad.matic@gmail.com	Teaching Assistant
3.	Milica Stojković	miciii.stojkovic@gmail.com	Teaching Facilitator
4.	Tijana Marković	tianafeels@gmail.com	Teaching Facilitator
5.	Ana Todorović	ana.todorovic.nani@gmail.com	Teaching Facilitator

COURSE STUCTURE:

Module	**Name of the module**	**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	Full Prof. Dr. Dejan Baskić
2	Bacteriology	4	2	2	Full Prof. Dr. Dejan Baskić
3	Virology	4	2	2	Full Prof. Dr. Dejan Baskić
4	Parasitology and mycology	3	2	2	Full 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: In this way, the student can earn up to 30 points according to the attached table. To pass the module the student must obtain more than 50% points in that module.

FINAL EXAMAMINATION: In this way, the student can get up to 70 points by taking a final written exam.

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

MODULE		**MAXIMUM POINTS**		
		Pre-examination activities	**Final examination**	
		Colloquiums	**Written exam**	**Σ**
1	Basic characteristics of infectious agents, prevention, diagnosis and treatment of infectious diseases	8 (16 questions)		
2	Bacteriology	8 (16 questions)		
3	Virology	8 (16 questions)		
4	Parasitology and mycology	6 (12 questions)		
	Σ	**30**	**70**	**100**

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 final exam, i.e. to obtain more than 50% of the points provided for the final written exam.

The final grade is formed as follows:

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

LITERATURE:

TITLE OF THE TEXTBOOK	AUTHORS	PUBLISHER	LIBRARY
Medical Microbiology 8th Edition, 2016	Patrick R. Murray, Ken Rosenthal, Michael A. Pfaller	Elsevier Inc. Science	YES (e-book)
All lectures and material for small group work are available on the website of the Faculty of Medical Sciences: www.medf.kg.ac.rs			

PROGRAM

FIRST MODULE: BASIC CHARACTERISTICS OF INFECTIVE AGENTS, PREVENTION, DIAGNOSIS, AND TREATMENT OF INFECTIOUS DISEASES

TEACHING UNIT 1 (FIRST WEEK)

BASIC CHARACTERISTICS OF A BACTERIAL CELL

(lecture 2 classes)

- 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.

(practice 2 classes)

- 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 classes)

- 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.

(practice 2 classes)

- Antiviral drugs. Mechanisms of action of antiviral drugs.

TEACHING UNIT 3 (THIRD WEEK)

INFECTION, PATHOGENICITY AND VIRULENCE. PATHOGENESIS OF INFECTIOUS DISEASES

(lecture 2 classes)

- 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.

(practice 2 classes)

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

TEACHING UNIT 4 (FOURTH WEEK)

PREVENTION AND DIAGNOSIS OF INFECTIOUS DISEASES

(lecture 2 classes)

- 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.

(practice 2 classes)

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

SECOND MODULE: BACTERIOLOGY

TEACHING UNIT 5 (FIFTH WEEK)

CAUSATIVE AGENTS OF PYOGENE INFECTIONS. GRAM POSITIVE AND GRAM NEGATIVE COCCIA AND COCCOBACILLI

(lecture 2 classes)

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

(practice 2 classes)

• Diagnostics and prevention of pyogenic infections.

TEACHING UNIT 6 (SIXTH WEEK)

CAUSATIVE AGENTS OF DIARRHEA SYNDROMES. ENTEROBACTERIA AND OTHER GRAM NEGATIVE BACILLES

(lecture 2 classes)

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

(practice 2 classes)

• Diagnosis and prevention of bacterial diarrheal syndromes.

TEACHING UNIT 7 (SEVENTH WEEK)

CAUSATIVE AGENTS OF TUBERCULOSIS, LEPROSY AND DIPHTHERIA. ANAEROBIC AND SPOROGENEOUS BACTERIA

(lecture 2 classes)

- *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.*

(practice 2 classes)

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

TEACHING UNIT 8 (EIGHT WEEK)

CAUSATIVE AGENTS OF ZOONOSIS AND SEXUALLY TRANSMITTED DISEASES. SPIRAL AND OBLIGATELY INTRACELLULAR BACTERIA

(lecture 2 classes)

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

(practice 2 classes)

• Diagnosis and prevention of zoonoses and sexually transmitted infections.

THIRD MODULE: VIROLOGY

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 classes)

- *Picornaviridae: Enterovirus (Poliovirus, Coxackievirus, 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.

(practice 2 classes)

• Diagnosis and prevention of gastrointestinal and respiratory viral infections

TEACHING UNIT 10 (TENTH WEEK)

HERPESVIRIDAE, PAPOVAVIRIDAE, PARVOVIRIDAE, ADENOVIRIDAE

(lecture 2 classes)

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

(practice 2 classes)

• 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 ZOONOSES

(lecture 2 classes)

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

(practice 2 classes)

• Diagnosis and prevention of measles fever and viral zoonoses.

TEACHING UNIT 12 (TWELFTH WEEK)

HEPATITIS VIRUSES. RETROVIRUSES AND PRIONS

(lecture 2 classes)

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

(practice 2 classes)

• Diagnostics and prevention of viral hepatitis and retroviral infections.

FOURTH MODULE: PARASITOLOGY AND MYCOLOGY

TEACHING UNIT 13 (THIRTEENTH WEEK)

PROTOZOA

(lecture 2 classes)

- 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,Balantidijum coli, Blastocistis 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, Cryptosporydium,Cyclosporidia,Isospora belii, Sarcocystis, Microsporidia.*.

(practice 2 classes)

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

TEACHING UNIT 14 (FOURTEENTH WEEK)

HELMINTH

(lecture 2 classes)

- Intestinal and tissue nematodes: *Ascaris lumbricoides, Trichuris trichiura, Enterobius vermicularis, Ancylostoma duodenale, Necator americanus, Strongyloides stercoralis, Trichinela 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, Diphylobotridium latum, Echinococcus granulosus.* Trematodes: *Fasciola hepatica, Fasciolopsis buski, Dicrocoelium lancelatum, Clonorchis sinensis, Paragonimus westermani, Shistosoma*

(exercises 2 classes)

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

TEACHING UNIT 15 (FIFTEENTH WEEK)

FUNGI

(lecture 2 classes)

- Opportunistic yeasts: *Candida, Criptococcus, Rhodotorula, Pneumocystis and mildew: 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 classes)

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

LECTURE SCHEDULE

MONDAY
FMN PLATFORM
13:00 – 14:30

SCHEDULE OF EXERCISES

WEDNESDAY	
C37	**C35**
15:10-16:40 IIgroup **16:40 – 18:10** Vgroup **18:10 – 19:40** VIIgroup **19:40 – 21:10** Igroup	**16:40 – 18:10** IIIgroup **18:10 – 19:40** VIgroup **19:40 – 21:10** IVgroup

GROUP ROTATION

WEDNESDAY	
C37	**C41**
15:10-16:40 IIgroup **16:40 – 18:10** VIIgroup **18:10 – 19:40** Vgroup **19:40 – 21:10** IVgroup	**16:40 – 18:10** VIgroup **18:10 – 19:40** IIIgroup **19:40 – 21:10** Igroup

LESSON SCHEDULE FOR THE SUBJECT PHARMACEUTICAL MICROBIOLOGY

week	type	method unit name	teacher
1	L	Basic characteristics of a bacterial cell	Dejan Baskić
	E	Antibacterial drugs	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
2	L	Basic characteristics of viruses	Dejan Baskić
	E	Antiviral drugs	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
3	L	Infection, pathogenicity and virulence	Dejan Baskić
	E	Virulence factors. Bacterial toxins	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
4	L	Prevention and diagnosis of infectious diseases	Dejan Baskić
	E	Asepsis, antisepsis, sterilization, disinfection	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
5	L	Causative agents of pyogenic infections. Gram positive and gram negative cocci and coccobacilli	Dejan Baskić
	E	Diagnosis and prevention of pyogenic infections	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
6	L	Causative agent of diarrheal syndromes. Enterobacteriaceae and other gram-negative bacilli	Dejan Baskić
	E	Diagnosis and prevention of bacterial diarrheal syndromes	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
7	L	The causative agents of tuberculosis, leprosy and diphtheria. Anaerobic and sporogenic bacteria	Dejan Baskić
	E	Diagnosis and prevention of infections caused by mycobacteria, anaerobic and sporogenic bacteria	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković,

LESSON SCHEDULE FOR THE SUBJECT PHARMACEUTICAL MICROBIOLOGY

week	type	method unit name	teacher
			Ana Todorović
8	**L**	Agents of zoonoses and sexually transmitted diseases. Spiral and obligate intracellular bacteria	Dejan Baskić
	E	Diagnosis and prevention of bacterial zoonoses and sexually transmitted infections	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
9	**L**	Viruses important for diarrheal syndrome and respiratory tract infections.	Dejan Baskić
	E	Diagnosis and prevention of gastrointestinal and respiratory viral infections	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
10	**L**	*Herpesviridae, Papovaviridae, Parvoviridae, Adenoviridae*	Dejan Baskić
	E	Diagnosis and prevention of infections with herpes viruses, human papilloma viruses, parvoviruses	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
11	**L**	Viruses causing rash. Arboviral infections and viral zoonoses	Dejan Baskić
	E	Diagnosis and prevention of measles and viral zoonoses	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
12	**L**	Hepatitis viruses. Retroviruses and prions	Dejan Baskić
	E	Diagnostics and prevention of viral hepatitis and retroviral infections	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
13	**L**	Protozoa	Dejan Baskić
	E	Antiparasitic drugs. Diagnosis and prevention of protozoan infections	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
14	**L**	Helminths	Dejan Baskić

LESSON SCHEDULE FOR THE SUBJECT PHARMACEUTICAL MICROBIOLOGY

week	type	method unit name	teacher
	E	Antiparasitic drugs. Diagnostics and prevention of infections / infestations caused by helminths	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović
15	**L**	Fungi	Dejan Baskić
	E	Antimycotics. Diagnosis and prevention of fungal infections	Dejan Baskić, Sanja Matić, Milica Stojković, Tijana Marković, Ana Todorović