

## SYLLABUS

concerning the cycle of education 2018-2024

(date range)

### 1.1. BASIC INFORMATION CONCERNING THIS SUBJECT / MODULE

Subject / Module	<b>Microbiology with parasitology</b>
Course code / module *	<b>Mb/C</b>
Faculty of (name of the leading direction)	<b>Faculty of Medicine, University of Rzeszow</b>
Department Name	<b>Department of Microbiology</b>
Field of study	<b>medical direction</b>
Level of education	<b>uniform master's studies</b>
Profile	<b>practical</b>
Form of study	<b>stationary / extramural</b>
Year and semester	<b>year II, semesters 3 and 4</b>
Type of course	<b>Pre-clinical sciences</b>
Coordinator	<b>dr hab. n. farm. Urszula Kosikowska</b>
First and Last Name of the Teacher	<b>dr hab. n. farm. Urszula Kosikowska</b>

\* - According to the resolutions of the Faculty of Medicine

### 1.2. Forms of classes, number of hours and ECTS

Lecture	Exercise	Conversation	Laboratory	Seminar	ZP	Practical	Self-learning	Number of points ECTS
30	45			20				9

### 1.3. The form of class activities

classes are in the traditional form

classes are implemented using methods and techniques of distance learning

### 1.4. Examination Forms / module (semester 3 - credit with grade, semester 4 - examine)

Lectures, classes, seminars - credit with grade including: attendance, grades from partial tests and final test.

## 2. REQUIREMENTS

Knowledge of biology and chemistry at the extended level
----------------------------------------------------------

## 3. OBJECTIVES, OUTCOMES, AND PROGRAM CONTENT USED IN TEACHING METHODS

### 3.1. Objectives of this course/module

C1	Knowledge to classify bacteria, viruses, fungi and parasites taking into account their pathogenicity and microbiological diagnostics.
C2	Understanding the mechanisms of interaction in the microbial-host system.
C3	Knowledge to diagnosis of etiopathogenesis and epidemiology of infective diseases.
C4	Knowledge with disinfection, antiseptic and sterilization processes and the aseptic in the aspects of the safety and of the problem of nosocomial infections.
C5	Acquainting with the possibilities of prophylaxis and treatment of infectious diseases. Knowledge on the correct selection of antibiotics and other antimicrobial compounds depending on the microorganism's type and sensitivity. Teaching the principles of the rational chemotherapy
C6	Knowledge of diagnostic procedures in bacterial, viral and fungal infections and the ability to use this knowledge to appropriate interpretation of results of the microbiological diagnostic
C7	Knowledge of diagnostic procedures in parasitic infections and the ability to use this knowledge to appropriate interpretation of results of the microbiological diagnostic

### 3.2 OUTCOMES FOR THE COURSE / MODULE (TO BE COMPLETED BY THE COORDINATOR)

EK (the effect of education)	The content of the learning effect defined for the subject (module)	Reference to directional effects (KEK)
EK_01	The Student classifies germs, including pathogens and is able to explain the role of microorganisms living in the microbiota in various healthy state or infecting sensitive organisms	C.W.12
EK_02	The Student can prepare a preparation directly from clinical and breeding material, can recognize basic microbes under a microscope techniques, and have a knowledge about phenotypic methods including the biochemical, serological and molecular methods useful during microbials identification and classification	C.W.13.
EK_03	The Student knows the epidemiology of infections with viruses, bacteria, fungi and parasitic infections, taking into account the geographical regions and range of their occurrence.	C.W.14
EK_04	The Student knows the basics of disinfection, sterilization, antiseptic methods as well as aseptics importance; knows the basics of epidemiology of nosocomial infections.	C.W.19
EK_05	The Student can evaluate environmental hazards and uses basic methods to detect the presence of harmful biological factors for the human. He/she has a knowledge about alert pathogens and negative	C.U6

	consequences of the work with patients and in the hospital environment	
EK_06	The Student has knowledge about various infectious diseases based on the analysis of various infectious diseases and selected clinical cases, their symptoms connected with the etiological agents and therapeutic options , taking into account the risks.	C.U.9

### 3.3 CONTENT CURRICULUM (filled by the coordinator)

#### A. Lectures

<b>Course contents</b>
The history and scope of microbiology and medical microbiology, including bacteriology, mycology, virology. Characterisation and classification of microorganisms.
The safety during working with patients and microorganisms, risk factors. Disinfection, antiseptic and sterilization, aseptic conditions. Methods of sterilization and disinfection. Epidemiology of infective factors.
Pathogenicity of microorganisms. Pathogenic (primary pathogens) and condition-dependent (opportunistic pathogens) microorganisms pathogenic for humans.
Microbiota. Source and reservoir of infectious agent (etiological agent disease). Risk factors of infections.
The history and scope of microbiology. Characterisation and classification of microorganisms. Microbials morphology and physiology, structure of microbials cells. Applications of microscopy in diagnostic microbiology.
Infections. The infectious process and diseases. Routs of infections. Adhesion, colonization. Virulence factors, toxins. Opportunistic infections. Virulence factors. Biofilm – definition, positive and negative functions of it.
Genetics and variability of traits. Mobile genetic elements (plasmids, insertion sequence elements, transposones), mutations, recombination, conjugation, mechanisms of gene transfer and its consequences including antimicrobials resistance.
Bacteria - morphology of bacteria. Systematics. Structure of bacterial cells. Grounds for classification. Bacterial pathogenesis. Mechanisms of bacterial infections. Determinants of bacterial pathogenicity.
Division of antimicrobial drugs. Antimicrobials, chemotherapeutics. Division. Group overview. Scope and mechanisms of action. Rules for the use of antimicrobial agents
Mechanisms of resistance to antibiotics and other chemical compounds. The threats. Current epidemiological situation in Poland and in the world, including WHO, ECDC, FDA, EUCAST, CLSI documents. The consequences.
Infective diseases prevention and prophylaxis. A vaccine and vaccination. The principle of vaccination. Types of vaccines. Consequences of vaccination.

Hospital infections. Epidemiological investigation. Microbial typing methods. Prophylaxis of infections. Organization of infections and etiological factors.
Virology - virus construction. Grounds for classification. Pathogenesis of infections. Antiviral drugs. Prions as an etiological agents of infective diseases
Fungal infections - the construction of mushrooms. Grounds for classification. Pathogenesis of infections. Diagnostic methods. Antifungal drugs.
Basic parasitology. Grounds for classification. Parasites life cycles. Pathogenesis of infections. Transmission

## B. Exercises

<b>Course contents of the exercises</b>
Practical aspects of risk factors connected with the work and contact with infective samples and microorganisms. A critical infection control issue. Hand care and hygiene in laboratory and hospital. Successful promotion of safety.
Stains in microbiology. Selected staining techniques: Gram staining, capsule-staining, acid-fast staining (Ziehl-Neelsen staining). Microscopic observation of microorganisms.
Principles of microbiological diagnostics. Overview of methods (including phenotypic, genotypic, serological methods) used for bacterial identification and clinical samples diagnostic.
Diagnostic of infective agents of diseases. Pathogens and opportunistically pathogenic bacteria for humans.
Gram-positive bacteria, mainly staphylococci and streptococci. Diagnostic. Growth condition, atmospheric conditions. Phenotypic characteristics. Morphotypes. Morphology of bacterial cells.
Gram-negative rods (glucose-fermentative and non-fermentative). Diagnostics. Growth condition, atmospheric conditions. Phenotypic characteristics. Morphotypes. Morphology of bacterial cells.
Anaerobes. Microaerophilic and kapnofilic bacteria. Systematics. Reservoir, sources and routes of infection. Pathogenicity. Mechanisms and pathogens. Diagnostics. Treatment. Prevention.
Diagnostics of infections caused by mycobacteria and actinomycetes. Propionibacterium
Prevention of infective diseases. Antimicrobial treatment.
Methods of bacterial resistance to antibiotics detection. Antibiotic osensitivity testing. Consequences of resistance.
Virology - methods of breeding. Serological tests. The principles of laboratory diagnosis of viral infections. Selected pathogens for humans and diseases caused by them
Fungal infections - etiological factors. Diagnostic methods. Diagnosis of infections caused by dermatophytes, moulds, and yeasts, mainly <i>Candida</i> spp.
Parasite infections diagnostic. Diagnostic of infections with the species of selected <i>Leishmania</i> , <i>Plasmodium</i> , <i>Trypanosoma</i> , <i>Trichomonas</i> and other.
Systemic infective diseases – diagnostic of the gastrointestinal infections.

Systemic infective diseases – diagnostic of respiratory tract infections.
Diagnostic of urinary tract infections. Significant bacteriuria
Practical aspects of diagnostic of selected viral infections. <i>Paramyxoviruses</i> . <i>Rubella</i> virus. <i>Sars-Coronavirus</i> . <i>Influenzavirus</i> . Rotaviruses, <i>Respiratory Syncytial Virus (RSV)</i> , <i>Mumps</i> virus, <i>Measles</i> virus, and other.

### C. Seminars

<b>Course contents of the seminar</b>
Laboratory hygiene and safety, rules for working with infectious material.
Rules for downloading and sending material for microbiological tests. Microbiota, carriage, colonization, infection.
Gram-positive bacteria. Reservoir, sources and routes of infection. Pathogenicity. CNS infections. Mechanisms and pathogenesis on the basis of samples.
Gram-negative bacteria. Reservoir, sources and routes of infection. Pathogenicity. Mechanisms and pathogenesis on the basis of samples.
Basics of infectious immunology. Definitions. Anti-infective defense mechanisms.
Effect of chemical compounds and physical factors on the microorganisms. Disinfection and sterilization, the influence of factors on their course. Review of disinfectants and antiseptics: mechanism of action. Microbial resistance to disinfectants.
Antimicrobial drugs. Infective diseases treatment. Prevention.
Mechanisms of bacterial resistance to antibiotics and genetics of resistance. The beta-lactamase family: classification, detection, and interpretive criteria
Screening for multidrug-resistant bacteria in health care setting.
The problem of mycobacterial infections. Tuberculosis - epidemiology, drug resistance Actinomyces, Nocardia.
Discussion of selected groups of bacteria, including species e.g. <i>Bacillus</i> , <i>Clostridium</i> , <i>Rickettsia</i> , <i>Chlamydia</i> , <i>Mycoplasma</i> , <i>Legionella</i> , <i>Gardnerella</i> , <i>Bordetella</i> , <i>Francisella</i> , <i>Brucella</i> , spirochetes etc.
Human pathogenic DNA and RNA viruses.
Parasitology and medically important parasites. Classification. Cases.
Central nervous system infections (including cases).
Upper and lower respiratory tract infections (including cases).
Sexually transmitted diseases and genital infections (including cases).
Septicemia, SIRS, MODS, bacteremia, and haematogenous infections (including cases).
Skin and soft tissue infections (including cases).

Urinary tract infections (including cases).
Infections in immunocompromised patients. Infections in pediatric patients.
The risk of bioterrorism and higher (3, 4) class of microorganisms.

### 3.4 TEACHING METHODS

**Lecture:** Lecture with multimedia presentation

**Laboratory exercises:** Analysis of laboratory tasks concerning selected medical cases with discussion. Practical tasks related to the implementation of microbiological diagnostics and results interpretation. Work in groups. Performing practical tasks. Interpretation of exemplary test reports.

**Seminars:** Student presentations. Short problem lectures with discussion.

## 4 METHODS AND EVALUATION CRITERIA

### 4.1 Methods of verification of learning outcomes

Symbol of effect	Methods of assessment of learning outcomes (Eg.: tests, oral exams, written exams, project reports, observations during classes)	Form of classes
EK_01 -05	Written colloquium I - test Written colloquium II - test Written colloquium III - test Written colloquium IV – test Oral discussion observations during classes	Lectures, Exercise, Seminars
EK_06	Practical pass	Exercise

### 4.2 Conditions for completing the course (evaluation criteria)

**Exercises, seminars:**

- a) full participation and activity in exercises
- b) partial written exams and passing the tests

Range of ratings: 2.0 - 5.0

**Lectures/Seminars:** Credit based on attendance and on an average of partial tests results. Credit of each semester based on an average of partial tests and activity and preparation for classes. In the case of an unsatisfactory grade from the partial colloquium, the student has the right to one correction term. In the case of failing a partial colloquiums/tests, the Student is assessed at the end of the semester by means of grades of a comprehensive colloquium/test including themes from semester III or IV.

The final grade from the subject is the average of the grades obtained a partial colloquiums in semester III and IV, and the grade of a comprehensive final colloquium (test, material from both semesters) at the end of IV semester. The student has the right to two comprehensive retake tests. In the case of receiving a negative grade, the student has the right to apply to the Dean for the commission colloquium/test. In order to verify the student's preparation for the seminar, the lecturer may do a preliminary test from previous and current classes, counted as "+" or "-". The resulting +/- are included in the final assessment as exercise activity.

**Exercises:** The condition for receiving the credit for laboratory exercises is to describe the results together with the conclusions in the positively evaluated report. Passing the report is a necessary

condition allowing for the next exercises. The final mark of the exercises is the average of the partial marks, i.e. from tests and the average grade from reports from the exercises. The student has the right to one repetition period for each of the tests. In the case of failing a partial colloquium, the student is assessed at the end of the semester by means of a final and final colloquium. The student has the right to two comprehensive tests. In the case of not receiving a positive grade, the student has the right to apply to the Dean with a request for a commission colloquium.

**Examination:**

The end exam after one-year course - test pass (50 questions) with closed, open and multiple-choice questions:

- A: Questions in the field of messages to remember;
  - B: Questions in the field of speech to understand;
  - C: Solving a typical written task;
  - D: Solving a non-standard written task.
- Duration of the test 50 minutes.

The condition for admission to the exam is a positive grade from the seminar (both semesters), laboratory exercises (both semesters), and credit from lectures (both semesters).

Students have two exam dates: the first and the second term.

The final grade is the grade from the exam.

Knowledge assessment:

Written test grades – the Student has knowledge of each of the education content at the level of:

- 93% -100%: 5.0
- 85% -92%: 4.5
- 77% -84%: 4.0
- 69% -76%: 3.5
- 60% -68%: 3.0
- below 60%: 2.0

Skill assessment

5.0 - the Student actively participates in classes, recognizes and is able to properly name biological phenomena in the human body, and to assess the microbiological regularities of the functioning of the human body. Skillfully uses basic laboratory techniques and interpretative criteria,

4.5 - the Student actively participates in the classes, with little help from the teacher recognizes and is able to properly name biological phenomena in the human body, and to assess the microbiological regularities of the functioning of the human body. He uses basic techniques and interpretative criteria well

4.0 - the Student actively participates in classes, with minor corrections of the teacher, committing minor mistakes in the recognition of microbial phenomena in the human body. He uses laboratory techniques well, rare making mistakes while using laboratory techniques and interpretative criteria

3.5 - the Student participates in classes, with numerous corrections and teacher's instructions recognizes and is able to correctly name microbiological phenomena in the human body, often making mistakes while using laboratory techniques and interpretative criteria

2.0 - the Student passively participates in classes, commits blatant errors in the diagnosis and proper naming of microbiological phenomena, unskilfully uses laboratory techniques and interpretative criteria, committing many errors many times

### 5. Total student workload required to achieve the desired result in hours and ECTS credits

Activity	Hours / student work
Hours of classes according to plan with the teacher	95
Preparation for classes	95
Participation in the consultations	-
The time to write a paper / essay	16
Preparation for tests	80
Participation in colloquia	-
Other (e-learning)	-
SUM OF HOURS	286
TOTAL NUMBER OF ECTS	9

### 6. TRAINING PRACTICES IN THE SUBJECT / MODUL

Number of hours	-
Rules and forms of apprenticeship	-

### 7. LITERATURE

#### READING:

- 1.M. Gladwin, B. Trattler "Clinical Microbiology Made Ridiculously Simple", 4th Edition (or next), MedMaster, Miami, 2010,
- 2.W. Levinson "Review of Medical Microbiology and Immunology", 11th Edition, 2010
- 3.Ryan KJ, Ray CG. „Sherris Medical Microbiology” 5th Edition, 2010
- 4.Murray PR, Rosenthal KS, Pfaller MA: Mikrobiologie. Elsevier 2011
- 5.Hawley L. „High-Yield Microbiology and Infectious Diseases”, Lippincott Williams & Wilkins 2007
- 6.Goering RV et al. „Mims’ Medical Microbiology”, 4th edition, Mosby Elsevier 2008
- 7.Mahon C, Lehman DC, Manuselis G. „Textbook of Diagnostic Microbiology”, 3rd edition, Saunders Elsevier 2007
- 8.Internet sources (Google) and e.g. <https://microbenotes.com>

#### Additional literature:

- 1.Koonin EV, Wolf YI. „Evolution of microbes and viruses: a paradigm shift in evolutionary biology?” Frontiers in Cellular and Infection Microbiology 2012; doi: 10.3389/fcimb.2012.00119
- 2.Gladwin M., Trattler B. "Clinical Microbiology Made Ridiculously Simple", 4th Edition, 2010
- 3.Forbes B.A. et al. „Bailey & Scott’s Diagnostic Microbiology”, Mosby 2002
- 4.Harvey RA, Champe PC, Fisher BD. "Microbiology" (Lippincott’s Illustrated Reviews) 2nd edition, Lippincott Williams & Wilkins 2007
- 5.Bannister B.A. et al. „Infectious Disease”, Blackwell Science 2000
- 6.Tortora GJ, Funke BR, Case CL. „Microbiology – an introduction”, Benjamin Cummings 2001
- 7.Collier L, Oxford J. „Human Virology” Second edition, Oxford University Press 2003



