

SYLLABUS
CONCERNS THE EDUCATION CYCLE 2020-2026

Academic year 2021/2022

1. BASIC INFORMATION ABOUT SUBJECT

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|-------------------------------------------|------------------------------------------------------------------|
| Subject | Microbiology with parasitology. |
| Subject code* | Mb/C |
| Name of the unit providing the course | Medical Science Institute |
| Name of the unit carrying out the subject | Department of Microbiology |
| Field of study | Medicine |
| Level of study | Uniform Master's Degree |
| Profile | General academic |
| Forms of study | Stationary and extramural |
| Year and semesters of study | Year: II semesters: III i IV |
| Type of subject | obligatory |
| Language | English |
| Co-ordinator | Dr hab. n. med. Anna Róžańska |
| Names of teachers | Dr hab. n. med. Anna Róžańska, dr n. med. Paweł Krzyściak |

* - optional, as agreed by the Unit

1.1. Forms of classes, number of hours and ECTS points

| Semester (no) | Lectures | Classes | Konw. | Lab. | Sem. | ZP | Prakt. | Others (what?) | Number of ECTS points |
|---------------|----------|---------|-------|------|------|----|--------|----------------|-----------------------|
| III | 12 | 28 | | | | | | | 5 |
| IV | 18 | 31 | | | 6 | | | | 4 |

1.2. The method of carrying out the classes

☒ **classes in traditional form**

☐ classes carried out with the use of distance learning methods and techniques

1.3 Form of passing the course (in progress) (exam, credit with a grade, credit without a grade)

2. PREREQUISITES

Extended knowledge of biology and chemistry.

3. OBJECTIVES, LEARNING OUTCOMES, PROGRAM CONTENT AND TEACHING METHODS USED

3.1 Objectives of the course

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| O ₁ | To familiarize students with microorganisms constituting the physiological flora, as well as pathogens causing infections. |
| O ₂ | Presenting to the students current knowledge of the methods of identification and differentiation of microorganisms (microscopy, culture techniques, serological methods, methods of molecular biology). |
| O ₃ | To acquaint students with the methodology of determining the sensitivity of bacteria to antibiotics and chemotherapeutic agents in relation to the current recommendations. |
| O ₄ | To acquaint students with the main groups of antibiotics, the mechanisms of bacterial resistance to antibiotics and methods of their detection. |
| O ₅ | To acquaint students with the problems of virological infections and parasitic infections. |
| O ₆ | To acquaint students with the problems of systemic infections. |
| O ₇ | Acquainting students with methods of preventing and fighting infections - disinfection, sterilization, asepsis, antibiotic therapy, vaccinations. |

3.2 Learning outcomes for the subject

| LO (learning outcome) | The content of the learning outcome defined for the subject | A reference to directional effects ¹ |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| | The student knows the genetic mechanisms of acquiring drug resistance by microorganisms. | C.W11 |
| LO_01 | The student recognizes and classifies microorganisms taking into account their pathogenicity, as well as the composition of the physiological flora of the human body. | C. W12 |
| LO_02 | The student knows the epidemiology of infections with viruses, bacteria, fungi and parasitic infections, taking into account the geographical range of their occurrence. | C.W13 |
| LO_03 | The student knows the influence of abiotic and biotic (viruses, bacteria) environmental factors on the human body and the human population, and the ways of their penetration into the human body. | C.W14 |
| LO_04 | The student knows the consequences of exposure of the human body to various chemical and biological factors and the principles of prevention; | C.W15 |
| LO_05 | The student knows invasive forms or development stages of selected parasitic protozoa, helminths and arthropods, | C.W16 |

¹ In the case of an education path leading to a teaching qualification, also take into account the learning outcomes from the standards of education preparing for the teaching profession.

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| | taking into account the geographical range of their occurrence. | |
| LO_o6 | the principle of functioning of the parasite-host system and basic disease symptoms caused by parasites; | C.W17 |
| LO_o7 | The student knows the symptoms of iatrogenic infections, the ways of their spread and pathogens causing changes in individual organs. | C.W18 |
| LO_o8 | The student knows the basics of microbiological and parasitological diagnostics. | C.W19 |
| LO_o9 | The student knows the basics of disinfection, sterilization and aseptic procedures. | C. W20 |
| LO_10 | The student knows the problem of drug resistance, including multi-drug resistance. | C.W40 |
| LO_11 | The student is able to assess environmental threats and use the basic methods to detect the presence of harmful factors (biological and chemical) in the biosphere; | C.U6 |
| LO_12 | The student is able to recognize the most common human parasites on the basis of their structure, life cycles and disease symptoms. | C.U7 |
| LO_13 | The student is able to use the antigen-antibody reaction in current modifications and techniques for the diagnosis of infectious diseases. | C.U8 |
| LO_14 | The student is able to prepare preparations and recognize pathogens under the microscope. | C.U9 |
| LO_15 | The student is able to interpret the results of microbiological tests. | C.U10 |
| LO_16 | The student is able to propose rational empirical and targeted antibiotic therapy for infections. | C. U15 |
| LO_17 | Student noticing and recognizing own limitations and self-assessment of deficits and educational needs; | K.5 |
| LO_18 | The student is ready to draw conclusions from his own measurements or observations; | K.8 |
| LO_19 | accepting responsibility for decisions made in the course of professional activity, including in terms of one's own safety and that of others. | K.11 |

3.3 Treści programowe

A. Problematyka wykładu

| Course contents - semester III (12 h). | |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | General bacteriology with pathogenesis of bacterial infections. Structure, physiology, genetics and principles of bacterial classification. Pathogenesis of bacterial infections. Fundamentals of bacteriological diagnostics methods. |
| 2. | Antimicrobial drugs and antibiotic therapy of infectious diseases. Overview of the main groups of antibiotics, chemotherapeutic agents, antiviral drugs and antimycotics with regard to their scope of action. |
| 3. | Mechanisms of bacterial resistance to antibiotics and chemotherapeutic agents. Rational antibiotic therapy. |

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| 4. General mycology with pathogenesis of fungal infections. Morphology, metabolism and reproduction of fungi. Systematics of pathogenic fungi for humans. Pathogenesis of fungal infections. Fundamentals of mycological diagnostics methods. |
| 5. General virology - structure and basics of classification of viruses pathogenic for humans. Pathogenesis of viral infections. Prevention of viral infections. Methods of virological diagnostics. |
| 6. Basics of nosocomial infections in health care units. Hospital infections microbiology - etiological factors. Basics of hospital infection control (hand hygiene, principles of patient isolation). Organization of the infection control system. |
| Course contents - semester IV (18h). |
| 1. Infections of the cardiovascular system caused by microorganisms. Bacteraemia and sepsis. |
| 2. Infections of the respiratory system caused by microorganisms. |
| 3. Infections of the digestive system caused by microorganisms. |
| 4. Infections of the nervous system caused by microorganisms. Eye infections. |
| 5. Infections of the skin and subcutaneous tissue, infections of the osteoarticular system, urinary tract infections. |
| 6. Congenital and perinatal infections as well as sexually transmitted infections. |
| 7. General parasitology. Structure and physiology of parasites. Systematic classification of human parasites. Pathogenesis of infections. Fundamentals of methods of parasitological diagnostics. |

B. The subjects of auditorium, seminar and laboratory exercises, practical classes

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| Course contents - semester III (9 ćwiczeń – 28 h) |
| 1. (3h). Fundamentals of bacteriological diagnostics. Bacterial morphology, basics of optical microscopy, methods of staining slides, methods of bacterial cultivation. |
| 2. (3h). Gram positive cocci and gram-positive rods, and oxygen rods. Classification and clinical significance. Morphology, growth requirements, isolation, methods of species identification and differentiation, treatment and prevention. |
| 3. (3h). Gram-negative rods, Gram-negative cocci. Classification and clinical significance. Morphology, growth requirements, isolation, methods of species identification and differentiation, treatment and prevention. |
| 4. (3h). Bacteria growing anaerobically. Classification and clinical significance. Morphology, growth requirements, isolation, methods of species identification and differentiation, treatment and prevention. |
| 5. (3h). <i>Mycobacterium</i> (mycobacteria), actinomycetes (<i>Actinomyces</i>, <i>Nocardia</i> , related bacteria). Classification and clinical significance. Morphology, growth requirements, isolation, methods of species identification and differentiation, treatment and prevention. |
| 6. (3h). Fungi - yeast-like, filamentous fungi, dermatophytes. Classification and clinical significance. Morphology, growth requirements, isolation, methods of species identification and differentiation, treatment and prevention. |
| 7. (3h). Fundamentals of Virology. Breeding methods, serological and molecular techniques. Review of selected DNA and RNA viruses pathogenic for humans. |
| 8. (3h). Bacterial resistance to antibiotics, the mechanisms of its formation and clinical significance. Review of resistance mechanisms of Gram-positive cocci and Gram-negative rods - detection methods and clinical interpretation. |

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| 9. (4h). Practical test. Checking the theoretical and practical knowledge of the above-mentioned classes, taking into account the ability to prepare and evaluate preparations, breeding, mechanisms of antibiotic resistance, interpretation of antibiotics and the implementation of antibiotic therapy. |
| Course contents - semester IV (8 ćwiczeń – 31 h) |
| 1. (3h). Infections of the cardiovascular system caused by microorganisms. Bacteraemia and sepsis. Method of blood collection, number of samples and collection time, volume of blood sample, selection of culture media, incubation time, evaluation of the culture. Catheter-related bloodstream infections. Assessment of catheter colonization. |
| 2. (3h). Infections of the respiratory system (RTI). The microbiome of the respiratory system. Infectious diseases of the respiratory tract. Diagnostics of the RTI. |
| 3. (3h). Infections and infestations of the gastrointestinal tract. Digestive tract microbiota. Infections / infestations. Epidemiology, collection of materials for clinical trials. Microbiological diagnostics. |
| 4. (3h). Infections of the central nervous system (CNS). Risk groups, etiological factors, epidemiology, ZOMR, CNS diagnostics, treatment, prevention. |
| 5. Eye infections. The microbiome of the organ of sight. Infections. Download material. |
| 6. (3h). Urinary tract infections (UTIs). Collection of urine for microbiological testing. Determination of the number of bacteria in the urine. Identification, antibiogram and result interpretation. Sexually transmitted and perinatal infections. Microbiome of the genital tract, assessment of the degree of vaginal cleanliness, material collection, diagnostics, treatment. |
| 7. (3h). Infections of the skin, subcutaneous tissue and the bone and joint system. Skin microbiome, skin and subcutaneous tissue infections, differentiation of colonization from wound infection - etiological factors, research materials. Diagnosis of infectious diseases of the osteoarticular system. Microbiological examination in the diagnosis of osteomyelitis. Infections associated with the implantation of artificial joints. |
| 8. (4h). Protozoa of the gastrointestinal tract and the genitourinary system. Collection of research materials, methods of diagnostics and identification of protozoa. Diagnostic materials, research methods - microscopic slides (demonstration, discussion). Microscopic observations of preparations of selected protozoa. |
| 9. (3h). Protozoa parasitizing blood and organs of the genus: <i>Trypanosoma</i>, <i>Leishmania</i>, <i>Babesia</i>, <i>Plasmodium</i>. Free-living amoebas. Diagnostic materials, research methods - microscopic slides (demonstration, discussion). Microscopic observations of slides of selected protozoa. |
| 10. (3h). Flukes and tapeworms. Diagnostic methods used in identification, research methods. Direct preparations from faeces, microscopic slides of selected representatives of the above-mentioned groups. Microscopic observations of preparations of selected flukes and tapeworms. |
| 11. (3h). Nematodes and ectoparasites. Diagnostic methods used in identification, research methods of the above-mentioned groups. Microscopic observations of preparations of selected roundworms and ectoparasites. |

C. Topics of the seminar - semester IV.

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| Course contents - semester IV (6h). |
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| 1. (2h). The human microbiome. |
| 2. (2h). Molecular biology methods in microbiological diagnostics. |
| 3. (2h). Disinfection, sterilization and antiseptics. |

3.4 Teaching methods

Lecture: Problem lecture, lecture with multimedia presentation, distance learning methods.

Classes: Practical classes: Practical microbiological culture of clinical materials, microscopic preparations, collection of clinical materials for microbiological tests.

Presentation of cultures of clinically important microorganisms, culture media, methods of microbiological diagnostics (phenotypic, serological, molecular), antibiograms, mechanisms of bacterial resistance to antibiotics. **Analysis of clinical cases** with discussion, group work (solving problems, discussion), **practical implementation** of the tasks presented in the content of the laboratory exercises. **Interpretation of microbiological test reports.** Introduction to the exercises in the form of a lecture with **a multimedia presentation**, where the substantive issues presented during the exercises are discussed in detail.

Seminar: The aim of the seminar is to present problems with a multimedia presentation, as well as a discussion, distance learning methods by means of which the student obtains extended knowledge in the field of medical microbiology.

4. ASSESSMENT METHODS AND CRITERIA

4.1 Ways of verifying learning outcomes

| Effect code | Assessment methods of learning outcomes (e.g. colloquium, oral exam, written exam, project, report, observation during classes) | Form of didactic classes (w, ćw, sem,) |
|-------------|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| LO_01-09 | TEST, REPORT, OBSERVATION DURING CLASSES, WRITTEN EXAM. | L., C., SEM. |
| LO_10 | PRACTICAL EXAM, OBSERVATION DURING CLASSES. | C. |
| LO_11-19 | KOŁOKWIUM, SPRAWOZDANIE, OBSERWACJA W TRAKCJE ĆWICZEŃ, EGZAMIN PRAKTYCZNY, EGZAMIN PISEMNY. | L, CL., SEM. |

4.2 Conditions for passing the course (assessment criteria)

General conditions:

1. The basis for obtaining credit is attendance at classes, seminars and lectures. Zaliczenie ćwiczeń – zdanie wszystkich kolokwium pisemnych, testowych oraz kolokwium praktycznego na ocenę pozytywną.
2. Pozytywna ocena ze sprawozdań laboratoryjnych.
3. Passing the seminars - passing the tests with a positive mark.
4. Completion of the course - receiving a positive grade for the FINAL EXAM. Passing the test exam with a minimum of sufficient. A student who obtained at least 60% of the points receives a positive mark on the test.
5. **CLASSES, SEMINARS.**

The final grade for laboratory exercises is the average of grades from all tests after completed thematic blocks, practical test and positive reports from exercises. The final grade for laboratory exercises is the average of grades from all tests after completed thematic blocks, practical test and positive reports from exercises. Students are informed about the content of the exercises 2 weeks before the start of the laboratory classes.

The final grade for the seminar is the average of grades from all tests after the finished thematic blocks carried out as part of the seminar.

Detailed conditions for obtaining a credit for laboratory classes, seminars and subjects:

1. Presentation of reports on the practical part of the exercises within the deadline within 5 working days after the end of the exercises - the reports must be submitted once (all exercise groups leave the report at the Microbiology Department at one time). Positive for the report (+), negative for the report (-). In the event of a negative grade, the student is required to make corrections and submit a corrected report during the following exercises.
2. The condition for completing the entire semester of laboratory classes is obtaining positive marks from all reports and tests.
3. Obligatory attendance at all classes. In the case of unexcused absences from the laboratory exercises, they should be made up for with another exercise group.
4. The student must absolutely agree in advance with the teacher on the possibility of doing homework in another group (too large group of students in the class is unacceptable)!
5. Two unexcused absences do not allow the student to the examination session!
6. The student has the right to one resit date for each of the tests planned in the semester.
7. During classes and seminars, it is allowed to check the students' preparation in writing or orally in relation to the substantive content of the classes carried out unannounced. In this case, the student receives a grade on a scale (2.0 - 5.0), which is taken into the mean of the final grade.
8. If the student fails the tests for individual thematic blocks, the final grade is issued from the test for the entire semester covering all thematic blocks carried out as part of exercises and / or seminars in a given semester.
9. If the student receives an unsatisfactory grade, the student has the right to apply to the authorities of the Institute of Medical Sciences for an examination before an examination board.

Exam:

1. Test exam with closed, single and multiple choice questions.
2. The student is entitled to two exam dates: the first term - basic and the second resit.
3. Unauthorized absence from the exam results in receiving a failing grade.
4. the final grade for the subject is the grade for the exam. Rating range: 2.0 - 5.0

Assessment criteria for passing the course:

1. **Very good grade (5.0)** - knowledge of the content of education at the level **93%-100%**.
2. **Assessment plus good (4.5)** - knowledge of the content of education at the level **85%-92%**.
3. **Good (4.0)** - knowledge of the content of education at the level **77%-84%**.
4. **Grade plus satisfactory (3.5)** - knowledge of the content of education at the level **69%-76%**.
5. **Sufficient grade (3.0)** - knowledge of the content of education at the level **60%-68%**.

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| 6. Poor grade (2.0) - knowledge of the content of education below 60%. |
| Skills Assessment: |
| <p>Very good grade (5.0) - the student actively participates in the classes, recognizes and correctly uses microbiological issues in relation to the functioning of the human body. Can precisely apply microbiological diagnostics techniques and interpret the obtained results.</p> <p>Grade plus good (4.5) - the student actively participates in the classes, with a little help from the teacher, he or she deals with microbiological issues in relation to the functioning of the human body. He uses microbiological diagnostics techniques very well and interprets the obtained results on his own.</p> <p>Good grade (4.0) - the student actively participates in the classes, with minor corrections by the teacher, making small mistakes and uses microbiological issues in relation to the functioning of the human body. He uses the techniques of microbiological diagnostics well and interprets the obtained results in a satisfactory manner.</p> <p>Grade plus sufficient (3.5) - the student participates in the classes, with numerous corrections and teacher's instructions, he uses microbiological issues in relation to the functioning of the human body. He often makes mistakes when using the techniques of laboratory microbiological diagnostics. The student needs help in interpreting the results obtained.</p> <p>Grade sufficient (3.0) - the student participates poorly in the classes, with numerous corrections and teacher's instructions, he uses microbiological issues in relation to the functioning of the human body. He often makes mistakes when using the techniques of laboratory microbiological diagnostics. Interpretation of the obtained results causes many problems for the student.</p> <p>Poor grade (2.0) - the student passively participates in classes, makes gross errors in the diagnosis and proper handling of microbiological issues in relation to the functioning of the human body. He is unable to use the techniques of laboratory diagnostics, repeatedly committing numerous mistakes. He cannot interpret the obtained results.</p> <p>Assessment of social competences:</p> <ul style="list-style-type: none"> - continuous assessment by the teacher (observation) - discussion during classes - opinions of patients and colleagues |

5. TOTAL STUDENT'S WORK INPUT REQUIRED TO ACHIEVE THE INTENDED EFFECTS IN HOURS AND ECTS CREDITS

| Forma aktywności | Average number of hours per hour of activity completion |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Contact hours resulting from the study schedule | 95 |
| Others with the participation of an academic teacher (participation in consultations, examination) | 5 |
| Non-contact hours - student's own work (preparation for classes, examinations, writing a paper, etc.) | 150 |
| Total number of hours | 250 |
| TOTAL NUMBER OF ECTS CREDITS | 9 |

** It should be taken into account that 1 ECTS point corresponds to 25-30 hours of total student workload.*

6. PROFESSIONAL TRAINING WITHIN THE COURSE

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| hours | - |
| rules and forms of internships | - |

7. LITERATURE

Obligatory:

1. **JAWETZ MELNICK & ADELBERGS MEDICAL MICROBIOLOGY, 28TH EDITION. MCGRAW-HILL MEDICAL 2019. ISBN: 978-1260012026**

Optional:

1. **PATRICK R. MURRAY, KEN S. ROSENTHAL, MICHAEL A. PFALLER. MEDICAL MICROBIOLOGY, 9TH ED. ELSEVIER 2020. ISBN: 978-0323673228**

Acceptance by the Head of the Unit or an authorized person

dr hab. n. med. Anna Żaczek, prof. UR