FACULTY OF MEDICINE

STUDY PROGRAM 0912.1 MEDICINE

DISCIPLINE OF MICROBIOLOGY AND IMMUNOLOGY

DEPARTAMENT OF PREVENTIVE MEDICINE

APPROVED
at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum Faculty of Medicine
Minutes No. 1 of 16.09.21
Chairman PhD, associate professor
Suman Serghei _____

APPROVED
at the Council meeting of the Faculty of Medicine
Minutes No. 1 of 21.09.21
Dean of Faculty of Medicine
PhD, associate professor
Placinta Gheorghe _____

APPROVED
at the meeting of the Discipline of microbiology and immunology
Minutes No. 2 of 14.09.2021
Head of Discipline, PhD, Professor, academician
Rudic Valeriu _____

SYLLABUS

Discipline: **CLINICAL MICROBIOLOGY**

Integrated studies

Type of course: **Optional course**

Curriculum developed by the team of authors:

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I. INTRODUCTION

General presentation of the discipline: place and role of the discipline in the formation of the specific competences of the professional/speciality training program

The Clinical Microbiology course aims at deepening the knowledge in the area of clinical competencies, being closely linked to the fundamental subjects. Teaching the main compartments of the subject is recommended to be done in complex with other related subject.

The goal of the module is to deepen the competencies regarding the role of the pathogen, potentially pathogen microflora, and the pathogenic factors in triggering specific and non-specific infections in patients, the role of clinical specimens and optimal harvesting, transportation, labeling, storage, reception, identification and documentation methods for each, including requirements for high infection risk clinical specimens antibiotic therapy problems and monitoring of antimicrobial therapy.

Learning the principles of diagnostic methods prescription, reading and correct interpretation of bacteriologic and immunologic laboratory investigation data, in-hospital anti-epidemic regime monitoring, acquiring knowledge on health assistance associated infections, knowing the principles of laboratory diagnostic of infectious suppurative processes, bacteremia, septicemia and septicopyemia, as well as other infectious pathologies.

The Clinical Microbiology course is aiming at helping future medical doctors to know the relationship between microorganism → macroorganism → microbiologic techniques → result according to current professional requirements.

Mission of the curriculum (aim) in professional training

The Clinical Microbiology subject has the role to teach the students to find the way through theoretical questions and practical skills, with the help of which they will be able to use the following in their medical practice: medical research, the role of pathogenic and conditionally pathogenic microorganisms in triggering the infectious process, practical skills in the laboratory diagnosis and interpretation of results. The second objective ensures the understanding of interaction mechanisms between the microorganism and host.

- Language of the course English.
- Beneficiaries: students of the II-year, faculty Medicine 2.

II. MANAGEMENT OF THE DISCIPLINE

Code of discipline		**S.07.A.065.2**	
Name of the discipline		**Clinical microbiology**	
Persons in charge of the discipline		PhD, Profesor, academician V. Rudic	
Year	**IV**	Semester	**VII**
Numărul de ore total, inclusiv: **30**			
Lectures	**10**	Practical/laboratory hours	**10**
Seminars	**-**	Self-training	**10**
Form of assessment	**E**	Number of credits	**1**

III. TRAINING AIMS WITHIN THE DISCIPLINE

At the end of the study of the discipline the student will be able:

To know:

- The theoretical basis of clinical microbiology.
- The pathogenicity of bacteria and to understand the role of pathogenic factors in the pathogenesis of infectious diseases.
- Techniques and methodology of basic diagnosis in clinical microbiology.
- To interpret the results for both clinical and infection control purposes.

To implement:

- Abilities to respect the rules/requirements of the anti-epidemic regime and the safety technique in the microbiological laboratories.
- Dexterity in collecting samples to be analyzed for microbiological investigations.
- Ability to complete laboratory reports for microbiological testing.
- Ability to interpret the results of microbiological testing.
- Ability to use information technologies (use of computer, evaluation of the advantages and disadvantages of informational systems, basic knowledge in the need of data protection).

To integrate:

- Microbiological knowledge gained in the context of the future profession;
- To understand the interconnection between microbiology and other related disciplines;
- To implement the gained knowledge in the research activity;
- Critical and reliable use of scientific information obtained using the new information and communication technologies.

IV. PROVISIONAL TERMS AND CONDITIONS

At the level of bachelor medical studies cycle, integrating the clinical microbiology module aims to ensure the appropriate representation of what microorganisms are, as well as what their relationship with their human host and the abiotic environment they live in.

For a good learning a clinical microbiology, the conceptual methodological and factual support through the important contribution of biochemistry, genetics, cellular and molecular biology, physiology, morpho pathology, epidemiology, infectious diseases, pharmacology.

V. THEMES AND ESTIMATE ALLOCATION OF HOURS

Lectures, practical hours/ laboratory hours/seminars and self-training

No. d/o	THEME	Number of hours		
		Lectures	Practical hours	Self-training
1.	Definition of clinical microbiology. Methods of study. Clinical laboratory information flow. Management of clinical laboratories and quality control.	1	1	2
2.	Normal human microbiota. Dysbiosis.	2	1	1
3.	Microbiology and laboratory diagnosis of upper and lower respiratory tract infections.	1	1	1
4.	Microbiology and laboratory diagnosis of urinary tract infections.	1	1	1
5.	Microbiology and laboratory diagnosis of bacterial infections in gastro-duodenal pathology.	1	1	1
6.	Microbiology and laboratory diagnosis of systemic infection.	1	1	1

No. d/o	THEME	Number of hours		
		Lectures	Practical hours	Self-training
7.	Testing the cerebrospinal fluid in the diagnosis of central nervous system infections.	1	1	1
8.	Microbiology and laboratory diagnosis of healthcare associated infections (nosocomial).	1	1	1
9.	Antibiotic therapy in non-specific infections.	1	2	1
Total 240		**10**	**10**	**10**

VI. REFERENCE OBJECTIVES OF CONTENT UNITS

Objectives	Content units
Theme 1. Definition of clinical microbiology. Methods of study used in clinical microbiology. Management of clinical laboratories and quality control.	
• to define the basic concept of clinical microbiology. • to know the methods of studying clinical microbiology. • to show skills in the information flow from the clinical to laboratory. • to apply the basic criteria in standardization and quality control in laboratory medicine.	Clinical microbiology as a definition. Clinical microbiology methods. Performance of laboratory tests. Basic rules of harvesting the samples for microbiological examination. Criteria and procedures for quality control of laboratory investigations. Performance control of laboratory apparatus and equipment.
Theme 2. Human microbiota. Dysbiosis.	
• to define to define concepts of human microbiota. • to know the main microorganisms that colonize the human body. • to know the physiological role of indigenous microbiota. • To show ability to analyze and evaluate the results obtained in the study of human microbiota.to apply • to integrate the knowledge gained in drawing up practical recommendations for improving of dysbiosis state	Human microbial colonization. The indigenous microbiota. The microbiota of the skin. Microbiota of conjunctiva. Microbiota of superior aerodigestive pathways. Gut microbiota. Genito-urinary tract microbiota. The physiological role of indigenous microflora. Dysbiosis
Theme 3. Microbiology and laboratory diagnosis of upper and lower respiratory tract infections.	

Objectives	Content units
• to know the microbiological conditions of the respiratory tract. • to know the nosologically entities and pathogenetic conditions of the respiratory tract (RT) • to know the etiological spectrum of respiratory tract infections. • to possess knowledge in harvesting, transport, and preservation of • specimens to be examined (tested) • to integrate theoretical knowledge into the interpretation of laboratory results.	Nosologically entities and pathological conditions of the respiratory tract. Pharyngitis, Sinusitis, Laryngitis, Epiglottis. The etiological spectrum. Harvesting and transport of samples to be analyzed. Laboratory diagnosis. Bacteriological confirmation.
Theme 4. Microbiology and laboratory diagnosis of urinary tract infections.	
• to know the nosologically entities and pathogenetic conditions of the urinary tract (UTIs). • to know the etiological spectrum in UTIs. • apply knowledge in sampling, transportation, and preservation of the samples to be analyzed. • to integrate theoretical knowledge into • interpretation of laboratory results.	Nosologically entities and pathological conditions of the urinary tract. Pyuria and bacteriuria. Harvesting and transportation of specimens to be analyzed. Cytological and bacteriological examination of urine. Quantitative uroculture. Identification of isolates and communication of results. Differentiation of bladder bacteriuria from renal bacteriuria.
Theme 5. Microbiology and laboratory diagnosis of bacterial infections in gastro-duodenal pathology.	
• to know the microbiological condition of the stomach and duodenum • to know the interaction between host and pathogen in helicobacteriosis. • to apply knowledge in the harvesting, transportation and preservation of specimens to be analyzed(tested). • to integrate the theoretical knowledge into the interpretation of laboratory results.	The microbiological condition. Clinical-epidemiological considerations. Pathogenesis of gastroduodenal diseases associated with gastritis causes by *H. pylori.* Harvesting, transportation and preservation of samples to be analyzed. Laboratory diagnosis of *H. pylori* infection.
Theme 6. Microbiology and laboratory diagnosis of generalized infection.	
• to know etiopathogenesis and clinical conditions in the etiological investigation of the main infectious syndromes. • to prescribe (indicate) hemocultures • to integrate theoretical knowledge into the interpretation of laboratory results. • to know the specificity of hemocultures under particular bacterial conditions.	Blood culture in the diagnosis of infection. Performing of hemocultures. Indications. Required materials. Harvesting of blood. Rules. Incubation and examination of hemocultures. Interpretation of results. Differentiation of contaminants. Catheter bacteriemia. Quantitative hemoculture. Particularities of hemocultures in endocarditis.
Theme 7. Examination of the cerebrospinal fluid in the diagnosis of central nervous system infections.	
• to know techniques of harvesting and	Etiopathogenic considerations.

Objectives	Content units
transportation of cerebro-spinal fluid specimen • to acquire the macroscopic examination, quantitative and qualitative cytology, microscopy. • to implement the theoretical knowledge in reading the antibiogram.	Harvesting and transportation of samples to be analyzed. Examination of biological samples: macroscopic exam, quantitative and qualitative cytology, bacterioscopy, rapid methods. Cultivation. Antibiotic susceptibility testing. Communication of results.
Theme 8. Microbiology and laboratory diagnosis of healthcare associated infections.	
• to know the standard case definition of healthcare associated infections. • to know general considerations and investigative techniques in healthcare associated infections. • to integrate theoretical knowledge into the interpretation of laboratory results.	The Concept of Surveillance and Control of Health-Related Infections (IAAM) within Healthcare Institutions. Microbiology of healthcare associated infections. Harvesting of specimens for the microbiological exam. Argumentation and interpretation of laboratory results.
Theme 9. Antibiotic therapy in non-specific infections.	
• to know the antibiotics used in medical practice and their mechanisms of action. • to know standardization elements of laboratory techniques for the orientation and monitoring of antimicrobial therapy. • to know the mechanisms of antimicrobial resistance. • to integrate theoretical knowledge into the monitoring of antimicrobial therapy.	Elements of standardization of laboratory techniques for the guidance and monitoring of antimicrobial therapy Qualitative and quantitative tests to determine antimicrobial susceptibility. Tests for monitoring of antimicrobial therapy.

VII. PROFESSIONAL (specific (SC)) and TRANSVERSAL (TC) COMPETENCES AND STUDY OUTCOMES

- **Professional (specific) (SC) competences**
- CP1. Responsible execution of professional tasks with the application of the values and norms of professional ethics, as well as the provisions of the legislation in force.
- CP2. Adequate knowledge of the sciences about the structure of the human body, physiological functions and behavior of it in various physiological and pathological conditions, as well as the relationships between health, physical and social environment.
- CP3. Resolving clinical situations by developing a plan for diagnosis, treatment and rehabilitation in various pathological situations and selecting appropriate therapeutic procedures for them, including providing emergency medical care.
- CP4. Carrying out scientific research in the field of health and other branches of science.

- **Transversal competences (TC)**
- CT1. Autonomy and responsibility in the activity.

Study outcomes

At the end of the course the student will be able to:

- To have basic skills in applying of principles and methods for solving well-defined situation problems, typical for clinical microbiology;

- To know the role of management of clinical microbiology, microbiological methods of study of non-specific infections.
- To know the techniques of harvesting, transportation, preservation and labeling of biological samples to be analyzed.
- To use the knowledge of laboratory diagnosis of non-specific infections for correct interpretation of the results of the investigations.
- To apply the knowledge regarding methods for determining the sensitivity of microorganisms to antibiotics and the mechanisms of resistance in the formulation of the treatment scheme.

I. STUDENT'S SELF-TRAINING

No.	Expected product	Implementation strategies	Assessment criteria	Implementation terms
1.	Work with information sources:	Reading the lecture or the material from the manual for the topic carefully. Read questions from the topic, which require a reflection on the subject. To be familiarized? with the list of additional information sources on the topic. Select the source of additional information for that theme. Reading the text entirely, carefully and writing the essential of content. Formulation of generalizations and conclusions regarding the importance of the subject.	Ability to extract the essentials; interpretative skills; the volume of work	Throughout the module
1.	The work with online materials	Studying on-line materials from informational sources, expressing your own opinions through forum and chat	Number and duration of access to online sources, analysis of material	Throughout the module
2.	Report	Analysis of relevant sources on the topic of the report. Analysis, systematization and synthesis of information on the proposed topic. Composition of the report in accordance with the requirements and presentation to the department.	Quality of systematization and analysis of informational material obtained through own activity. Concordance of the information with the proposed theme	Throughout the module

II. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-ASSESSMENT

- ***Teaching and learning methods used***

Exposure, interactive lecture, heuristic conversation, brainstorming, team work, individual study, working with manual and scientific text, debate, solving of problem, interactive listening.

- ***Applied teaching strategies/technologies*** *(specific to the discipline)*
- ***Methods of assessment*** *(including the method of final mark calculation)*

Current: front and / or individual control via

- (a) tests,

- (b) control questions

Final: Exam

The final grade will consist of the average score of 1 control tests and the grade from the individual work assessment (share 0.5) and final test (computer testing) (share 0.5).

The final note will consist of the result of the synthesis of the selected/presented material, verbal communication with the attested/not certified.

Method of mark rounding at different assessment stages

Intermediate marks scale (annual average, marks from the examination stages)	National Assessment System	ECTS Equivalent
1,00-3,00	**2**	**F**
3,01-4,99	**4**	**FX**
5,00	**5**	**E**
5,01-5,50	**5,5**	
5,51-6,0	**6**	
6,01-6,50	**6,5**	**D**
6,51-7,00	**7**	
7,01-7,50	**7,5**	**C**
7,51-8,00	**8**	
8,01-8,50	**8,5**	**B**
8,51-8,00	**9**	
9,01-9,50	**9,5**	**A**
9,51-10,0	**10**	

The average annual mark and the marks of all stages of final examination (computer assisted, test, oral) - are expressed in numbers according to the mark scale (according to the table), and the final mark obtained is expressed in number with two decimals, which is transferred to student's record-book. *Absence on examination without good reason is recorded as "absent" and is equivalent to 0 (zero). The student has the right to have two re-examinations.*

III. RECOMMENDED LITERATURE:

A. Mandatory:

1. Kenneth J. Ryan, Sherris Medical Microbiology, Seventh Edition, 2018.
2. Jawetz, Melnick, Adelberg's Medical Microbiology 28th Edition, 2020.
3. Guidelines, recommendations, and methodical indications.
4. Materials of theoretical courses.

B. Additional:

1. Bergey's Manual of determinative bacteriology (ninth edition), 2011.
2. Jawetz, Melnick, & Adelberg's. Medical Microbiology. Twenty-Second Edition, 2011.
3. Junie M. Microbiologie clinică: Bacteriologie şi virusologie medicală. Cluj-Napoca. Cluj-Napoca: Editura Medicală Universitară "Iuliu Haţieganu", 2017, 238 p.
4. Buiuc D., Neguţ M. Tratat de microbiologie clinică. Ed. a 3-a, rev. şi ad. Bucureşti: Editura Medicală, 2017, 1250 p.