UNICAMILLUS

Degree in Biomedical Laboratory Techniques

Integrated course: General and Clinical Pathology

SSD Integrated course**: MED/04, MED/05, MED/46**
CFU: **7**
Course coordinator: **Federica Wolf** e-mail**: federica.wolf@unicamillus.org**

MODULE: **General and cellular pathology**
SSD: **MED/04**
CFU: **2**
Teacher: **Federica Wolf/Elena toniuato** e-mail: **federica.wolf@unicamillus.org**

e-mail: **elena.toniato@unicamillus.org**

MODULE: **Clinical pathology and immunohematology**
SSD: **MED/05**
CFU: **1**
Teacher: **Luca Moriconi** e-mail**: luca.moriconi@unicamillus.org**

MODULE: **Clinical pathology and immunohematology**
SSD: **MED/05**
CFU: **2**
Teacher: **Anna Claudia Romeo** e-mail**: annaclaudia.romeo@unicamillus.org**

MODULE: **Technical sciences of laboratory medicine**
SSD: **MED/46**
CFU: **2**
Teacher: **Maria Domenica Divona** e-mail**: mariadomenica.divona@unicamillus.org**

ATTENDANCE MODE: MANDATORY WITH AT LEAST 75% OF FREQUENCY OF THE INTEGRATED COURSE

PREREQUISITES

Basic knowledge of biochemistry, biology, molecular biology and genetics

LEARNING OBJECTIVES

The course of General and Clinical Pathology aims to provide students with the notions of general pathology and clinical pathology, also in the field of laboratory diagnosis. The student must learn the molecular mechanisms of cell damage, the response of the cell and the organism to damage, the molecular basis of the neoplastic transformation and progression, and some of the main disease markers that can be measured in a clinical laboratory. In addition, the student has to know the main techniques of molecular biology, flow cytometry and cytogenetics for the diagnosis and monitoring of blood diseases and the role of laboratory activities for an integrated clinical management of the hematological patient.

These objectives will be achieved through lectures designed to facilitate learning and improve the ability to address and resolve the main questions of general, cellular and clinical pathology and the diagnostic questions from the oncohematology laboratory, which the student will have to face during his future activity.

LEARNING OUTCOMES

The expected learning outcomes are consistent with the general provisions of the Bologna Process and the specific provisions of Directive 2005/36/EC. They are found within the European Qualifications Framework (Dublin descriptors) as follows:

Knowledge and understanding
At the end of the course, the student will have to:

- Know, understand and explain the molecular mechanisms of cell damage, cell response (cellular stress, necrosis, apoptosis) and organism response to the damage (inflammation), and the molecular basis of neoplastic transformation
- Know and explain the meaning of values under or over the reference range
- Know and explain clinical scenarios where each laboratory test is indicated
- Know and explain laboratory tests used for renal, liver and thyroid function
- Know and explain laboratory tests used in monitoring pregnancy
- Know and explain the examination of urine specimen
- Know and explain laboratory tests for patient with Diabetes Mellitus
- Know and explain laboratory tests used in disorders of lipids, coagulation, and thrombophilias
- Know and explain laboratory tests in autoimmune diseases, anemia, and hematological malignancies
- Know and explain tumor markers
- Know and understand the importance and value of the techniques applied in order to provide a precise diagnosis, necessary for the clinician to set the correct therapeutic treatment
- Know and explain the main diagnostic approaches in oncohematology
- Know and explain the pre-analytical phase in the oncohematology laboratory
- Know and explain the various nucleic acid extraction techniques
- Know and explain the separation techniques of mononuclear cells
- Know and explain the techniques for cytogenetic analysis
- Know and explain the standard and innovative methodologies for the rapid diagnosis of acute Leukemia
- Know and explain the principles of PCR-Realtime, types of probes used
- Know and explain the advantages and pitfalls of diagnostic methodologies in oncohematology.

Applying knowledge and understanding
At the end of the course, the student will be able to:

- Use the acquired knowledge for an in-depth study of aspects relating to the specific field in which the student will devote himself to his professional activity
- Apply his/her knowledge to analyze and understand the alterations of the cellular mechanisms underlying the human pathologies
- Cooperate with other healthcare providers in making decisions regarding diagnosis, treatment, and monitoring patient's conditions using laboratory testings in order to

improve clinical outcomes at a greatly reduced costs

Communication skills
At the end of the course, the student must be able to:

- Use specific scientific terminology appropriately
- Communicate information, ideas, problems and solutions to expert and others interlocutors, in relation to the molecular mechanisms of cellular damage, of neoplastic transformation and of diseases based on inflammatory disorders.
- Use scientific terminology, specific for the laboratory context and in the field of clinical research. The lessons in the classroom will be interactive, so as to develop a suitable communicative ability of the student.

Making Judgements
At the end of the course the student must be able to:

- Make general assessments related to the topics covered
- Use the acquired knowledge to identify and explain the molecular mechanisms that lead to a disease. The acquisition of autonomy of judgement will be acquired through the analysis of examples of damage and human diseases
- Achieve autonomy in the evaluation and interpretation of the data by applying the various techniques according to the different pathology.

These expected learning outcomes are measurable with the final evaluation

COURSE SYLLABUS

MED/04 **General and Cellular Pathology**:
Classification of diseases on an etiopathogenetic basis, extrinsic agents (physical, chemical, biological) and intrinsic agents (genetic and malformative diseases). Multifactorial diseases. Basic concepts of cellular pathology: death from necrosis and apoptosis.
Innate immunity: acute and chronic inflammation, vascular events, exudates, outcomes. Chronic interstitial and granulomatous inflammation. Repair.
Basic concepts of health and disease, approach to the patient, disease classification criteria of interest to the general pathology.
Adaptations: hypertrophy, hyperplasia, metaplasia, dysplasia, neoplasia.
Tumors: biological and clinical classification criteria. Biological characteristics of tumors: proliferation, invasion, angiogenesis. Metastatization, metastasis sites. Cancerogenesis, oncogenes and tumor suppressors, concept of tumor marker.

MED/05 **Clinical Pathology and Immunohematology** :

- Interpretation of laboratory tests
- Renal function tests
- Examination of Urine
- Liver function tests
- Laboratory tests in Diabetes Mellitus
- Thyroid function tests
- Laboratory tests in disorders of lipids
- Laboratory tests in Pregnancy
- Laboratory tests in bleeding disorders and thrombophilia
- Laboratory tests in autoimmune disease
- Laboratory tests in anemia and hematological malignancies

- Practical blood transfusion
- Tumor markers.

MED/46 **Technical Sciences of Laboratory Medicine**:

- Introduction to Integrated Onco-hematological diagnostics: Flow cytometric techniques, Molecular biology, Conventional cytogenetics,Fluorescent in situ hybridization (FISH)
- Separation of mononuclear cells from bone marrow aspirate and peripheral blood (Ficoll)
- Count of cells with counting chambers
- Nucleic acid extraction techniques (automatic extractors, home made techniques)
- RT-PCR: basic principles and technical aspects
- Application of PCR in oncohematology
- PCR real-time: basic principles and technical aspects
- Application of real-time PCR in monitoring the minimal residual disease
- Q-LAMP : basic principles and technical aspects
- Application of Q-LAMP in the rapid diagnosis of Acute Promyelocytic Leukemia
- Eletrroforetic techniques : agarose gel electrophoresis, capillary electrophoresis
- Case-report in the validation of the analytical data.

COURSE STRUCTURE

MED/04 : The module is structured in 20 hours of frontal teaching, divided into lessons of 2 or 3 hours according to the academic calendar. During the lessons will be shown slides containing topics of the program that will allow students to achieve the educational objectives.
MED/05: The module is structured in 30 hours of frontal teaching, divided into lessons of 2 or 3 hours according to the academic calendar. The lectures will include theoretical lessons, presentation and interactive discussion of clinical scenarios, cooperative learning.
MED/46 : The module is structured in 20 hours of frontal teaching, divided into lessons of 2 or 3 hours according to the academic calendar. The lectures will include theoretical lessons with interaction and video projections on the topics covered. At the beginning of each lesson there will be a summary of the previous lesson in order to verify the correct understanding by the students.

COURSE GRADE DETERMINATION

The integrated teaching exam consists of an oral and write exam, during which the commission will assess the student's ability to apply the knowledge learned and will ensure that the skills are adequate to solve the problems that arise in the specific disciplinary field and taking I also take into account the objectives of the teaching. The exam can be passed with a grade of 18/30. The student's learning ability, judgment ability and communication skills will be assessed. In the evaluation, knowledge and understanding have a weight of 50%, knowledge and understanding of 20% and autonomy of judgment of 30%

The student can take the exam in a single session in the recovery session (September / January), while the exam can be taken in two separate sessions in the ordinary sessions (February / July)

The assessments can be carried out both in progress and at the end of the integrated course. The methodology will be communicated at the beginning of the lessons together with the bibliography and / or teaching materials necessary for the preparation for the final evaluation.

• Oral exam: It will focus on questions concerning the study programs. It will evaluate the student's ability to have acquired the knowledge related to the contents of the courses and their integrations, and will ascertain the appropriate use of terminology.
• Written test: It will focus on the programmed topics of the courses that make up the integrated course.

The exam will be assessed according to the following criteria:

Not suitable: Poor or lacking knowledge and understanding of the topics; limited capacity for analysis and synthesis, frequent generalizations of the requested contents; inability to use technical language.
18-20: Just enough knowledge and understanding of the topics, with obvious imperfections; just sufficient capacity for analysis, synthesis and autonomy of judgment; poor ability to use technical language.
21-23: Sufficient knowledge and understanding of the topics; sufficient ability to analyze and synthesize with the ability to reason with logic and coherence the required contents; sufficient ability to use technical language.
24-26: Fair knowledge and understanding of the topics; discrete ability to analyze and synthesize with the ability to rigorously argue the required contents; good ability to use technical language.
27-29: Good knowledge and understanding of the required contents; good ability to analyze and synthesize with the ability to rigorously argue the required contents; good ability to use technical language.
30-30L: Excellent level of knowledge and understanding of the required content with an excellent ability to analyze and synthesize with the ability to argue the required content in a rigorous, innovative and original way; excellent ability to use technical language.

OPTIONAL ACTIVITIES

MED/04 and MED/05: Not planned.
MED/46: In addition to the teaching activity, it will be given to the student the opportunity to participate in any ECM courses relevant to the covered topics. The ECM topics will be not subject of examination. It is mandatory a frequency of 100% to achieve proficiency.

READING MATERIALS

MED/04 General and cellular pathology:
-Slides and didactic materials provided by the teacher
-Textbook: Ivan Damjanov MD PhD, Pathology for the Health Professions, 5th Edition, Elsevier; ISBN: 9780323357210; 2016.

MED/05 Clinical pathology and immunohematology:
-Teaching material provided by the teacher
-Textbooks :
-Kawthalkar, Shirish M., M.D., *Essentials of Clinical Pathology*, Jaypee Brothers Medical Pub; 2nd edition (31 July 2018); ISBN-13: 978-9386150691
-Daniel D. Mais, *Quick Compendium of Clinical Pathology*, ASCP Press; 4th Revised edition (30 December 2018); ISBN-13: 978-0891896678.

MED/46 Technical sciences of laboratory medicine :
-Didactic materials provided by the teacher.

COURSE COORDINATOR AVAILABILITY

Office hours by appointment, by e-mail:
Prof. Monica Benvenuto
e-mail: monica.benvenuto@unicamillus.org