Degree in Biomedical Laboratory Techniques

Integrated course: General and Clinical Pathology

SSD Integrated course**: MED/04, MED/05, MED/46**
CFU: **7**
Course coordinator: **Monica Benvenuto** e-mail**: monica.benvenuto@unicamillus.org**

MODULE: **General and cellular pathology**
SSD: **MED/04**
CFU: **2**
Teacher: **Monica Benvenuto** e-mail: **monica.benvenuto@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
Although there are no preparatory courses, basic knowledge of cellular biology, histology, biochemistry, physiology (in particular the physiology of the bone marrow) and anatomy is required.

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.

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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**:

- Cellular pathology: Cellular stress. Cellular adaptations of growth and differentiation: hyperplasia, hypertrophy, atrophy, metaplasia. Cell death: necrosis, apoptosis
- Inflammation: Definition of Inflammation. Acute inflammation. Chemical mediators of inflammation. Cells involved in inflammation. Chemotaxis and phagocytosis. Exudation: different types of exudate. Distinctive features between acute and chronic inflammation. Chronic inflammation. Granulomas
- Tissue renewal and repair. Regeneration, healing, and fibrosis
- Changes in thermogenesis: The organism's general response to heat and cold. Causes of fever. Course and types of fever. Hypothermia and hyperthermia
- Oncology: Nomenclature of tumors. Biology of tumor growth: benign and malignant neoplasms. Molecular basis of cancer. Metastasis.

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 exam of the Integrated course of General and Clinical Pathology consists of a test of GENERAL AND CELLULAR PATHOLOGY, a test of CLINICAL PATHOLOGY AND IMMUNOHEMATOLOGY, and one of TECHNICAL SCIENCES OF BIOMEDICAL LABORATORY, whose marks form an integral part of the integrated teaching evaluation.

The student can take the test of GENERAL AND CELLULAR PATHOLOGY, CLINICAL PATHOLOGY AND IMMUNOHEMATOLOGY or TECHNICAL SCIENCES OF BIOMEDICAL LABORATORY in a single session or in different sessions of the current academic year according to the methods listed below.

The judgment will be expressed in a mark out of thirty, obtained from the weighted average according to the CFU between the marks of the individual modules.

- For the module General and Cellular pathology (MED/04), the exam consists of an oral test. The student will have to answer questions in order to demonstrate the acquisition of the knowledge and skills described in the educational objectives.
  The exam mark, expressed in 30/30, is established according to the following criteria:
  - Not allow to pass the test: important shortcomings and/or inaccuracy in the knowledge and understanding of the topics; limited analysis and synthesis skills, frequent generalizations
  - 18-20: Just enough knowledge and understanding of the topics
  - 21-23: Knowledge and discreet understanding of the topics
  - 24-26: Good knowledge and understanding of the topics
  - 27-29: Full knowledge and understanding of the topics
  - 30-30L: Excellent level of knowledge and understanding of the topics.

  In the evaluation, knowledge and understanding skills have a weight equal to 40%, applied knowledge and understanding skills of 40% and autonomy of judgment of 20%.

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- For the module Clinical Pathology and Immunohematology (MED/05), the evaluation of learning will be assessed through an write examination and will be expressed in 30/30 divided as follows: 10/30 points for the personal elaboration ; 20/30 points for the oral examination. The evaluation will take into account:
    - Knowledge and skills acquired during the course
    - Active participation during lectures, clinical case simulations and cooperative learning done in the classroom
    - Ability to re-elaborate the acquired knowledge in a personal and critical way
    - Expressive properties of use, in particular, of specialized terminology

  In the evaluation, knowledge and understanding skills have a weight equal to 50%, applied knowledge and understanding skills of 20% and autonomy of judgment of 30%.

- For the module Technical Sciences of Laboratory Medicine (MED/46), the test will include 20 multiple choice questions and an open question, in order to assess the student's knowledge of the topics covered during the lessons. Each correct answer of the multiple choice section will be evaluated with a score of 1, while the open question will have a maximum score of 10, based on the capacity in argumentation, synthesis and use of a clear and appropriate language.
  In the evaluation, knowledge and understanding skills have a weight equal to 40%, applied knowledge and understanding skills of 40% and autonomy of judgment of 20%.

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:

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