

## Degree Course in Medicine and Surgery in English site in Rome - 2025/2026

Integrated Teaching: **General Pathology**

SSD: MEDS-02/A (ex MED/04) and MEDS-26/A (ex MED/46)

ECTS number: **8**

Integrated Teaching Head: Prof. [Gabriella D'Orazi](#): e-mail: [gabriella.dorazi@unicamillus.org](mailto:gabriella.dorazi@unicamillus.org)

MODULE: **General Pathology**, SSD: MEDS-02/A

ECTS number: **6**

Teachers:

- Prof. [Gabriella D'Orazi](#) (3 ECTS) e-mail: [gabriella.dorazi@unicamillus.org](mailto:gabriella.dorazi@unicamillus.org):
- Prof. [Cristina Capuano](#) (2 ECTS) e-mail: [cristina.capuano@unicamillus.org](mailto:cristina.capuano@unicamillus.org)
- Prof. [Davide Gnocchi](#) (1 ECTS) e-mail: [davide.gnocchi@unicamillus.org](mailto:davide.gnocchi@unicamillus.org)

MODULE: **Laboratory Medicine Technical Sciences**, SSD: MEDS-26/A

ECTS number: **2**

Teacher:

- Prof. [Emiliano Fabiani](#) e-mail: [emiliano.fabiani@unicamillus.org](mailto:emiliano.fabiani@unicamillus.org)

### PREREQUISITES

Knowledge and skills in Human Anatomy, Histology and Embryology, Physiology, Biology and Genetics, Biochemistry, and Molecular Biology are required.

### LEARNING OBJECTIVES

The integrated teaching of General Pathology aims to provide the student with the fundamentals for understanding the main disease mechanisms: from genetic-molecular modifications to morpho-functional characteristics, that will outline the pathogenesis of the most relevant diseases. The disease mechanisms represent the foundation for medicine aimed at patient's diagnosis, therapies, and cure. Thus, the integrated teaching represents the transition between the basic and clinical sciences, by using previously acquired notions to delineate the biological-molecular events characterizing diseases. The integrated teaching is structured into two modules:

- **The General Pathology module** will provide the student with the fundamentals for understanding the pathologic events from the cellular pathology (mechanisms of damage response, adaptation, regression, and cell death and relevant disease examples) to the body's defense mechanisms (innate and adaptive immunity, hemostasis). The student should be able to know the basics of general etiology and interpret the etiopathogenetic classification of diseases. The classification and biology of tumors, the molecular basis of neoplastic transformation, and the principles of therapy. The teaching concludes with a description of the pathophysiologic consequences involving the most important systems: circulatory-blood, and metabolic systems.
- **The Laboratory Medicine Technical Sciences module** will provide the student with the knowledge useful in understanding the main laboratory testing systems, and cellular and molecular biology methods, applied to blood pathophysiology (diagnosis and prognostic evaluation of blood diseases).

### 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 integrated teaching, the students should be able to:

- Recognize and independently understand the molecular mechanisms of cell damage as well as the damage responsiveness at both cellular and tissue levels, (cellular stress, adaptation, regression, necrosis, apoptosis); tumor biology and the molecular basis of neoplastic transformation, and the pathogenetic mechanisms of the major human diseases.
- Know the mechanisms and recognize the major pathophysiologic manifestations of the circulatory, hepatobiliary, and metabolic systems.
- Know the principles used for:
  - flow cytometry in the field of hematology
  - evaluation of the diagnostic and prognostic role of gene mutations in the field of onco-hematology.

### **Applying Knowledge and understanding**

At the end of the integrated teaching, the student should demonstrate the capability to apply the acquired knowledge to:

- Analyze and understand the alterations of the cellular, immunological, and genetic mechanisms underlying human pathologies.
- Recognize the main manifestations of the most important pathophysiological events of the major systems: circulatory, hepatobiliary, and metabolic system.
- Recognize the several techniques used in the field of onco-hematology.

### **Communication skills**

At the end of the integrated teaching, the student must be able to:

- Use the scientific terminology as appropriate.
- Communicate information, ideas, problems, and solutions to both specialists, and non-specialist recipients about the mechanisms of cellular damage, neoplastic transformation, and the pathophysiological mechanisms of diseases.

### **Making judgments**

At the end of the integrated teaching, the student must be able to:

- use the acquired knowledge to identify and explain the molecular, immunological, and pathophysiological mechanisms that lead to a disease;
- analyse and correctly evaluate the clinical and experimental data.

The independent judgment will be acquired through the analysis of examples of relevant human pathologies (simple clinical cases).

### **Learning skills**

At the end of the integrated teaching, the student must be able to:

- acquire the appropriate methodology for the studying and updating of the scientific topics;
- improve the competence in general pathology and in laboratory diagnosis by consulting scientific papers and databanks.

These skills will be developed favoring a critical discussion in specific cases.

## **COURSE SYLLABUS**

### **GENERAL PATHOLOGY (MEDS-02/A ex MED/04) (6 ECTS)**

- Health and Diseases: definitions. Concepts of etiology, pathogenesis, and pathophysiology. Etiologically-based classified diseases: intrinsic and extrinsic diseases.



- Cellular adaptations of growth and differentiation: hyperplasia, hypertrophy, atrophy, metaplasia, dysplasia.

### **ETIOLOGY: Causes of cellular damage**

- Pathogenesis of infectious diseases: general features, viral, bacterial fungal, and parasitic infections.
- The pathogenic effect of physical agents: radiation, radiation classification (exciting and ionizing), ultraviolet radiation.
- Chemical agents as causes of cellular damage.
- Cellular injury by lack of oxygen; hypoxia and ischemia.
- Genetic disorders: mutations, mendelian disorders, multifactorial disorders (inherited and acquired), normal karyotype, cytogenetic disorders, and malformation diseases.
- Occupational and environmental diseases: Occupational exposure, air pollution, natural toxins. Mechanisms of toxicity. Lifestyle diseases: tobacco and alcohol. Damage by mechanical agents, temperature (hypothermia, burns), electricity and atmospheric pressure.
- The pathogenic effect of physical agents: radiation, radiation classification (exciting and ionizing), ultraviolet radiation.
- Nutritional alterations: obesity and thinness. Vitamins deficit.
- Aging.

### **CELLULAR PATHOLOGY**

Reversible and irreversible cell injury. Mechanisms of cell damage (mitochondrial damage, membrane damage, DNA damage) and associated pathology (examples). Cellular response to oxidative stress and free radical-based pathologies.

- Irreversible cell damage. Necrosis: morphology, biochemical characteristics and types of necrosis.
- Apoptosis: causes of apoptosis, morphology, biochemical characteristics of apoptosis, mechanisms of apoptosis, examples of apoptosis.
- Other types of cell death: necroptosis, ferroptosis, pyroptosis. Autophagy.

### **INFLAMMATION**

Acute and chronic inflammation: definition and differences.

- **Acute inflammation (or angioedema):** historical evidence, stimuli for acute inflammation. Activation of inflammation: PAMPS and DAMPS.
- Vascular changes (changes in vascular caliber and flow and vascular leakage); exudate formation. Cellular events: leukocyte diapedesis (leukocyte adhesion and transmigration) and phagocytosis. Adhesion molecules, chemotaxis.
- Chemical mediators of inflammation: vasoactive amines, plasma proteins, arachidonic acid metabolites: prostaglandins, leukotrienes, and lipoxins, platelet-activating factor (PAF), cytokines and chemokines, nitric oxide (NO), lysosomal constituents of leukocytes, oxygen-derived free radicals (ROS), neuropeptides. Activation of the complement system.
- Different types of inflammation. Outcomes of acute inflammation. Examples of acute inflammation. Chronicization (abscess, ulcers).
- **Chronic inflammation:** causes of chronic inflammation, morphologic features, mononuclear cell infiltration, cells involved in chronic inflammation. Granulomatous inflammation (granuloma formation, immunological and non-immunological, foreign body granuloma), non-granulomatous inflammation, lymphatics in inflammation. Examples of chronic inflammatory diseases.
- Systemic effects of inflammation: leukocytosis, acute phase proteins, ESR, and fever. Thermoregulation: neurophysiology of thermoregulation. Thermoregulation center of the body. Pyrogens. Fever. Types of fever. Metabolic effects of fever.
- Outcomes of the inflammatory process: Regeneration, repair and fibrosis. Control of normal cell

proliferation and tissue growth. Pathogenesis of healing and fibrosis. Healing by first and by second intention.

## NEOPLASIA

- Tumor definitions and nomenclature. Biology of tumor growth: benign and malignant neoplasms. Differentiation and anaplasia, the growth rate of cancer cells.
- Epidemiology: cancer incidence, geographical and environmental factors, genetic predisposition to cancer, chronic inflammation and cancer, precancerous lesions.
- Molecular basis of neoplastic transformation: alterations essential for malignant transformation, normal cell cycle, self-sufficiency in growth signals: oncogenes. Insensitivity to growth inhibitory signals. Oncosuppressor genes. Retinoblastoma as a paradigm for the two-hit hypothesis of oncosuppressor genes involved in neoplastic transformation. Oncosuppressor genes involved in human neoplasms. p53: guardian of the genome. Evasion of apoptosis. DNA repair defects and genomic instability in cancer cells. Unlimited replicative potential: telomerase. Development of angiogenesis. Invasion and metastasis. Stromal microenvironment and tumor growth. Dysregulation of genes associated with neoplastic transformation.
- Carcinogens and their cellular interactions: chemical carcinogenesis, metabolic activation of carcinogens. Molecular targets of chemical carcinogens. Classification of chemical carcinogens. Radiation carcinogenesis: ultraviolet radiation, ionizing radiation. Microbial carcinogenesis: oncogenic DNA and RNA viruses. Molecular aspects of multistep carcinogenesis.
- Local invasion and metastasis: homing and colonization. Angiogenesis.
- Effects of tumors on host and organism response. Clinical manifestations. Grading and staging of tumors. Tumor markers. Laboratory diagnosis of cancer.

## PRINCIPLES OF PATHOPHYSIOLOGY

- Pathophysiology of the circulatory system: edema, hemorrhage, hemostasis, thrombosis, embolism, infarction, shock.
- Pathophysiology of the hepatobiliary system: liver function and related diseases, jaundice, hepatitis, cholestasis, cirrhosis, portal hypertension, liver failure.
- Pathophysiology of metabolism: type I and type II diabetes, pathogenesis and outcomes. Atherosclerosis: pathogenesis and outcomes.

## LABORATORY MEDICINE TECHNICAL SCIENCES

- Blood sampling and bone marrow aspirate
- CBC (complete blood count) analysis, Principles of Flow Cytometry
- Blood smear on slide, fixation, and staining
- Isolation of mono- and polymorphonuclear cells from blood venous samples
- Isolation of stem cells: culture, amplification and cryopreservation
- Classification of blood diseases: anemias, leukocytosis, leukopenias, thrombocytosis/thrombocytopenias, hematologic diseases, Minimal Residual Disease., myelodysplastic syndromes, Acute myeloid leukemia, myeloproliferative disorders.
- Alterations in karyotype: cytogenetics and FISH (fluorescence in situ hybridization)
- Diagnostic and prognostic role of molecular biology in the field of onco-hematology
- Basic molecular biology techniques: nucleic acid amplification, qualitative (PCR and RT-PCR) and quantitative (Q-PCR and Q-RT-PCR) analyses
- Sanger sequencing, next-generation sequencing (NGS), and personalized medicine: applications, advances, costs, and benefits.

## COURSE STRUCTURE

The integrated teaching comprises 80 hours of lectures. According to the academic calendar, lessons (2 or 3 hours) will be structured as follows:

- 60 hours of lectures for the General Pathology
- 20 hours of lectures for the Laboratory Medicine Technical Sciences

The integrated teaching includes lectures and additional support or explanations by the teachers during office hours. During lectures, slides containing topics from the program will be shown to guide students in their study and learning. To achieve the learning objectives, practical examples (in the form of clinical cases) will be used to stimulate and encourage critical discussion of the topic. At the beginning of each lecture, the learning objectives and learning outcomes will be stated; at the end of the lecture, the lecturer will summarize the key points of the discussed topics to meet the learning outcomes.

### **COURSE GRADE DETERMINATION**

The exam for integrated teaching is structured in a written and oral exam.

**Written test:** 15-30 multiple-choice questions with one correct answer (SBA, Single Best Answer). To attend the oral exam, the student must obtain a score of at least 18/30 in each module to attend the oral exam. No penalty will be assigned to unanswered questions or incorrect answers.

**Oral exam:** the student will be asked to discuss program topics, demonstrating knowledge and skills described in the learning outcomes. Specifically, it will be evaluated reasoning, independent judgment, and communication skills, according to the indications of Dublin descriptors.

The exam includes the entire integrated teaching (both modules) and it is not allowed to sit the exam for an individual module. The grade will be expressed in a mark out of thirty, obtained from the weighted average (according to the ECTS) between the marks of the oral individual modules.

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 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**

Teachers can suggest websites or scientific literature for learning or exercising. Scientific seminars will be organized to introduce and train students on up-to-date topics or on the scientific research methodology.

### **READING MATERIALS**

Students can choose among the following textbooks:

### **GENERAL PATHOLOGY MODULE**



UNICAMILLUS

- Robbins and Cotran. V Kumar, A Abbas JC Aster. Pathologic Basis of Disease, Vol I e II, X Edizione, EDRA Editore, 2021;
- R. Rubin, D.S. Strayer. Clinicopathologic Foundations of Medicine. VI Edizione 2014, Piccin Editore;
- G..M Pontieri, M.A. Russo, L Frati. Patologia Generale e Fisiopatologia Generale, Vol I e II; V Edizione-Piccin;
- L. Altucci, G. Berton, B. Montcharmont, L.A. Stivala. Patologia Generale, Vol I e II; Edizione 2019, IDELSON-GNOCCHI Editore.

### **LABORATORY MEDICINE TECHNICAL SCIENCES MODULE**

- Hematology: pathophysiology, diagnosis and treatment. Sante Tura, Michele Cavo e Pier Luigi Zinzani. Casa editrice Esculapio.
- Hematology For medical Students and General Practitioners. M.T. V oso, N. Giuliani, A. Olivieri, A. Venditti. Idelson-Gnocchi.

The slides shown during the course will be made available to the students and will constitute the reading material of the course

### **FACULTY AVAILABILITY**

Office hours by appointment, and by e-mail

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