



Degree Programme in Degree Course in Medicine and Surgery in English site in Rome

Academic Year 2026 / 2027

INTEGRATED COURSE (I.C.): General Pathology

NUMBER OF CFU (ECTS credits): 8

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

COORDINATOR OF THE I.C.: Gabriella D'Orazi

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MODULE 1: General Pathology

NUMBER OF CFU (ECTS credits): 6

SSD (Academic Discipline Code): MEDS-02/A

LECTURER: **Gabriella D'Orazi** (3 CFU)

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MODULE 2: Laboratory Medicine Technical Sciences

NUMBER OF CFU (ECTS credits): 2

SSD (Academic Discipline Code): MEDS-26/A

LECTURER: **Emiliano Fabiani**

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PREREQUISITE COURSES

None required.

PREREQUISITES

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

LEARNING OBJECTIVES

The General Pathology Course 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).

EXPECTED LEARNING OUTCOMES

By the end of the course, students will know/be able to:

DD 1: Knowledge and understanding

- 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.

DD 2: Applying knowledge and understanding

- 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.

DD3: Making judgements

- 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).

DD4: Communication skills

- 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.

DD5: Learning skills

- 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.

SYLLABUS**Syllabus MODULE 1: GENERAL PATHOLOGY (MEDS-02/A) (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 mechanisms of cellular injury by physical agents: radiation, radiation classification (exciting and ionizing), ultraviolet radiation.
- The pathogenic mechanisms of cellular injury by chemical agents: direct and indirect damage, examples of chemical agents.
- The pathogenic mechanisms of cellular injury by hypoxia /types of hypoxia), and ischemia.
- The pathogenic mechanisms of genetic disorders: examples of mutations, mendelian disorders, multifactorial disorders (inherited and acquired), normal karyotype, cytogenetic disorders, and malformation diseases.
- The pathogenic mechanisms of cellular injury by environmental agents: 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.
- Nutritional disorders: obesity and thinness. Vitamins deficit.
- Molecular mechanisms of 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 angioflogosis):** historical evidence, stimuli for acute inflammation. Activation of inflammation: PAMPS and DAMPS.
- Vascular changes (changes in vascular calibre and flow and vascular leakage); exudate formation (types of exudates). Cellular events: leukocyte diapedesis (leukocyte adhesion and transmigration),

chemotaxis and phagocytosis. Mechanisms of pathogens killing.

- 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. Coagulation proteins.
- 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 centre 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.

Syllabus MODULE 2: LABORATORY MEDICINE TECHNICAL SCIENCES (MEDS-26A) (2 ECTS)

- 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 course consists of **80 hours of classroom-based teaching with 2-3 hours classes and 2.5 hours of practical exercises for each CFU (ECTS credits).**

The 80 hours are structured as follows:

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

In addition to the scheduled lectures, the course provides students with continuous support from the instructors, both during class sessions and during designated office hours. A variety of teaching and learning resources will be employed throughout the course, including PowerPoint presentations incorporating explanatory diagrams, illustrations, images, and videos related to the topics covered in the syllabus. These materials are intended to support and facilitate students' independent study and learning.

In order to achieve the intended learning objectives, practical examples, presented in the form of clinical cases, will be discussed to stimulate students' active participation and foster critical thinking and discussion on the topics addressed. At the beginning of each lecture, the learning objectives and expected learning outcomes will be clearly outlined. To support students in achieving these expected learning outcomes, the instructor will conclude each lecture with a summary of the key concepts and main points discussed.

COURSE GRADE DETERMINATION

The examination for the integrated course consists of a written and an oral examination.

The written examination consists of 40–60 multiple-choice questions, each with a single correct answer (SBA, Single Best Answer). The grade will be expressed on a scale of 30, and students must achieve a score equivalent to at least 18/30 in the written examination in order to be admitted to the oral examination. No penalties will be applied for unanswered or incorrect answers.

During the oral examination, students will be asked to discuss the topics covered in the syllabus, demonstrating the knowledge and skills described in the intended learning outcomes. In particular, students' reasoning skills, autonomy of judgment, and communication skills will be assessed in accordance with the Dublin Descriptors.

The final grade will be expressed on a scale of 30.

The examination for the integrated course is a single, comprehensive examination; students are not permitted to take the examination separately for individual modules.

The examination will be assessed according to the following criteria:

Fail	Significant gaps and/or inaccuracies in knowledge and understanding of the topics; limited analytical and synthesis skills; argumentation absent or frequently incorrect.
18–20	Barely sufficient knowledge and understanding of the topics, with possible imperfections; sufficient analytical, synthesis, and judgement skills.
21–23	Routine knowledge of the topics; correct analytical and synthesis skills with coherent logical argumentation.
24–26	Fair knowledge and understanding of the topics; good analytical and synthesis skills; rigorously expressed argumentation.
27–29	Complete knowledge of the topics; considerable analytical and synthesis skills; good independent judgement.
30–30L	Excellent level of knowledge and understanding. Considerable analytical, synthesis, and independent judgement skills. Original argumentation expressed with full command of specialized terminology.

OPTIONAL ACTIVITIES

Instructors may recommend useful websites or scientific literature to support students' learning and practice. For consultations, clarification, or tutoring, instructors are available to students by appointment arranged via email.

READING MATERIALS

Texts MODULE 1 GENERAL PATHOLOGY MODULE

- 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.

Texts MODULE 2. 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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