

III year (1st-2nd semester)	Scientific Field	<b>GENERAL PATHOLOGY AND PATHOPHYSIOLOGY</b>	TUTOR	ECTS
BEI R. COORDINATOR	MED/04	General Pathology 1	Manzari Vittorio	2
	MED/04	General Pathology 1	Bei Roberto	5
	MED/04	General Pathology 2	Donadel Giulia	2
	MED/04	General Pathology 2	Bei Roberto	2
	MED/04	General Pathology 2	Palumbo Camilla	2
	MED/46	Laboratory Techniques in Medicine	Manzari Vittorio	1
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#### SPECIFIC AIMS

This discipline studies the causes and mechanisms of diseases. The course program provides students with opportunities to elucidate the mechanisms and origins of human diseases at fundamental levels emphasizing systemic processes based on molecular and cellular pathologic events.

#### PROGRAM

#### GENERAL PATOLOGY

Genetic disorders. Infectious diseases. Environmental pathology. Cellular adaptations, cell injury, and cell death. Subcellular responses to injury. General features of inflammation. Tissue renewal and repair. Regeneration, healing, and fibrosis. Thermoregulation. Neoplasia.

<b>TOPICS GENETIC DISORDERS</b>	Mutations, mendelian disorders, disorders with multifactorial inheritance, normal karyotype, cytogenetic disorders, single-gene disorders with non-classic inheritance. Diagnosis of genetic diseases.
<b>TOPICS INFECTIOUS DISEASES</b>	General principles of microbial pathogenesis. Viral infections. Bacterial infections. Fungal infections. Parasitic infections.
<b>TOPICS ENVIRONMENTAL PATHOLOGY</b>	Recognition of occupational and environmental diseases. Mechanisms of toxicity. Phase I reactions. Common environmental and occupational exposures. Personal exposures: tobacco use, alcohol abuse, therapeutic drugs, outdoor air pollution, industrial exposures, agricultural hazards, natural toxins. Radiation injury: ionizing radiation, ultraviolet radiation. Physical environment: mechanical force, thermal injuries (hyperthermia. Hypothermia). Electrical injuries. Decompression (caisson) disease.
<b>TOPICS CELLULAR ADAPTATIONS, CELL INJURY, AND CELL DEATH</b>	Cellular responses to stress and noxious stimuli. Cellular adaptations of growth and differentiation: hyperplasia, hypertrophy, atrophy, metaplasia. Overview of cell injury and cell death: causes of cell injury. Mechanisms of cell injury. Reversible and irreversible cell injury. Morphology of cell injury and necrosis. Examples of cell injury and necrosis: ischemic and hypoxic injury, ischemia-reperfusion injury, chemical injury. Apoptosis: causes of apoptosis, morphology, biochemical features of apoptosis, mechanisms of apoptosis, examples of apoptosis.
<b>TOPICS SUBCELLULAR RESPONSES TO INJURY</b>	Lysosomal catabolism (heterophagy, autophagy); hypertrophy of smooth endoplasmic reticulum; mitochondrial alterations; cytoskeletal abnormalities. Intracellular accumulations: lipids, proteins, hyaline change, glycogen, pigments (exogenous pigments, endogenous pigments); pathologic calcification (dystrophic calcification and metastatic calcification). Theosaurismosis. Cellular aging: structural and biochemical changes with cellular aging, replicative senescence, genes that influence the aging process, accumulation of metabolic and genetic damage. Amyloidosis
<b>TOPICS GENERAL FEATURES OF INFLAMMATION</b>	<b>ACUTE INFLAMMATION:</b> Historical highlights, stimuli for acute inflammation; vascular changes (changes in vascular flow and caliber, vascular leakage); cellular events: leukocyte extravasation (leukocyte adhesion and transmigration) and phagocytosis. Adhesion molecules involved in the inflammatory response. Chemotaxis. Defects in leukocyte functions. 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, neuropeptides. Disorders of the complement system. Outcomes of acute inflammation. Morphologic patterns of acute inflammation. <b>CHRONIC INFLAMMATION:</b>

causes of chronic inflammation, morphologic features, mononuclear cell infiltration, cells in chronic inflammation.

Granulomatous inflammation, lymphatics in inflammation.

Systemic effects of inflammation, consequences of defective or excessive inflammation.

#### TOPICS TISSUE RENEWAL AND REPAIR. REGENERATION, HEALING, AND FIBROSIS

Definitions. Control of normal cell proliferation and tissue growth. Mechanisms of tissue regeneration. Extracellular matrix and cell-matrix interactions. Repair by healing. Scar formation and fibrosis. Cutaneous wound healing, fibrosis. Overview of repair responses after injury and inflammation

#### TOPICS THERMOREGULATION

Neurophysiology of thermoregulation. Body's thermoregulatory set-point. Pirogens. Fever. Types of fevers.

#### TOPICS NEOPLASIA

Definitions. Nomenclature of tumors. Biology of tumor growth: benign and malignant neoplasms. Differentiation and anaplasia, rates of growth, cancer stem cells and cancer cell lineages.

Epidemiology: cancer incidence, geographic and environmental factors, genetic predisposition to cancer, chronic inflammation and cancer, precancerous conditions.

Molecular basis of cancer: essential alterations for malignant transformation, the normal cell cycle, self-sufficiency in growth signals: oncogenes. Insensitivity to growth inhibitory signals: tumor suppressor genes. Retinoblastoma as a paradigm for the two-hit hypothesis of oncogenesis. Selected tumor suppressor genes involved in human neoplasms. p53: guardian of the genome. Evasion of apoptosis. DNA repair defects and genomic instability in cancer cells. Limitless replicative potential: telomerase. Development of sustained angiogenesis. Invasion and metastasis. Stromal microenvironment and carcinogenesis. Dysregulation of cancer-associated genes.

Molecular basis of multistep carcinogenesis gatekeeper and caretaker genes. Tumor progression and heterogeneity. Carcinogenic agents and their cellular interactions: chemical carcinogenesis, metabolic activation of carcinogens. Molecular targets of chemical carcinogens. Major chemical carcinogens. Radiation carcinogenesis: ultraviolet rays, ionizing radiation. Microbial carcinogenesis: oncogenic DNA viruses, oncogenic RNA viruses. Host defense against tumors: tumor immunity, tumor antigens, antitumor effector mechanisms. Immune surveillance. Effects of tumors on the host local and hormonal effects.

<b>PROGRAM PATHOPHYSIOLOGY</b>	Hemodynamic disorders, thromboembolic disease, and shock. Heart pathophysiology. Hypertension, Atherosclerosis. Red blood cell disorders. Bleeding Disorders. Diseases of white blood cells. Lung pathophysiology. Gastrointestinal tract pathophysiology. Technical Sciences of Laboratory Medicine.
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<b>TOPICS HEMODYNAMIC DISORDERS, THROMBOEMBOLIC DISEASE, AND SHOCK</b>	Edema. Hyperemia and congestion. Hemorrhage. Hemostasis and Thrombosis. Embolism. Infarction. Shock.
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<b>TOPICS HEART PATHOPHYSIOLOGY</b>	Heart failure, cardiac hypertrophy: pathophysiology and progression to failure. Ischemic heart disease. Angina pectoris. Myocardial infarction.
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<b>TOPICS HYPERTENSION, ATHEROSCLEROSIS</b>	Risk factors for atherosclerosis, pathogenesis.
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<b>TOPICS RED BLOOD CELL DISORDERS</b>	Anemia, Classification of Anemia, Acute Blood Loss Anemia, Decreased Red Blood Cell Production, Ineffective Red Cell Production, Hemolytic Anemias.
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<b>TOPICS BLEEDING DISORDERS</b>	Hemorrhagic diatheses. Hemostatic Disorders of Blood Vessels, Platelet Disorders Coagulopathies, Hypercoagulability
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TOPICS  
DISEASES OF WHITE  
BLOOD CELLS

Leukopenia. Neoplastic proliferations of white cells.

TOPICS  
LUNG  
PATHOPHYSIOLOGY

Atelectasis. Obstructive pulmonary diseases.

TOPICS  
GASTROINTESTINAL  
TRACT AND KIDNEY  
PATHOPHYSIOLOGY

LIVER PATHOPHYSIOLOGY: general features of hepatic diseases. Patterns of hepatic injury. Hepatic failure. Cirrhosis. Portal hypertension. Bilirubin and bile formation. Causes and classification of jaundice. Hereditary hyperbilirubinemias. Cholestasis. Viral hepatitis. Ascites.

KIDNEY PATHOPHYSIOLOGY: acute renal failure, chronic renal failure and uremia endocrine system pathophysiology: pituitary gland, thyroid gland, parathyroid glands, endocrine pancreas (diabetes mellitus and pancreatic endocrine tumors), adrenal glands.

TOPICS  
TECHNICAL SCIENCES  
OF LABORATORY  
MEDICINE

Technical Sciences of Laboratory Medicine. Diagnostic approach in laboratory. General examples of research techniques applied to diseases diagnosis.



## TEXTBOOKS

- Robbins & Cotran, Pathologic Basis of Disease.
- Rubin's Pathology: Clinicopathologic Foundations of Medicine.

## EXAM METHOD

Oral exam.

## EXAM COMMISSION

The Coordinator, full Professors of the disciplines, Professors of similar disciplines, Specialists of the subject, compose the exam Commission of the Integrated Course.

Bei Roberto, President
Manzari Vittorio
Donadel Giulia
Palumbo Camilla

## CONTACTS

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PREREQUISITES: Previous knowledge and competence in the following subjects:

Human Anatomy 1, Human Anatomy 2, Histology and Embryology, Physiology and Pathophysiology, Biology and Genetics, Biochemistry and Molecular Biology.

The specific learning outcomes of the program are coherent with the general provisions of the Bologna Process and the specific provisions of EC Directive 2005/36/EC. They lie within the European Qualifications Framework (Dublin Descriptors) as follows:

### 1. Knowledge and Understanding

- Assess the physiologic principles, which govern the function of the main body systems and the alterations induced by functional and structural abnormalities.
- Describe the main aspects of general pathology and explain the pathophysiologic mechanisms underlying the concept of benign and malignant disorders as well as reversible and irreversible cellular damage.

- Demonstrate knowledge about the mechanism of cell cycle maintenance and regulation: factors affecting it and their consequences.
- Understand the core principles of acute and chronic inflammation in relation to the molecular, systemic and clinical aspects.
- Relate the general principles, terminology, and modes of spreading of disease to the study of Systemic Pathology and the ways in which pathology contributes to the understanding of patient presentation in a clinical setting.
- Focus on each organ and describe the pathogenesis of the main disease.
- Correlate basic disease states studied at a cellular and gross anatomical level with the overt clinical signs and symptoms seen in those disorders.
- Learn to interpret appropriate laboratory and diagnostic studies.

## 2. **Applying Knowledge and Understanding**

- Apply the diagnostic procedure in pathology, through introduction of the differential diagnostic methods at the clinical level.
- Apply a basic understanding of histopathology and morbid anatomy to the examination of microscopic sections and gross specimens, respectively, displaying pathological processes.
- Provide a differential diagnosis based on specific clinical data, providing a comprehensive explanation of the underlying reasoning.
- Learn the practical aspects of the pathologic diagnostic instruments, when to use them and how to perform them.

## 3. **Making Judgements**

- Recognize the importance of an in-depth knowledge of the topics consistent with a proper medical education.
- Identify the fundamental role of a proper theoretical knowledge of the subject in the clinical practice.

## 4. **Communication Skills**

- Present the topics orally in an organized and consistent manner.
- Use of proper scientific language coherent with the topic of discussion.

## 5. **Learning Skills**

- Identify the possible use of the acknowledged skills in the future career.
- Assess the importance of the acquired knowledge in the overall medical education process.