STUDY COURSE: *MEDICINA E CHIRURGIA - BEMC*
ACADEMIC YEAR*: 2024/2025*
INTEGRATED COURSE*: PATHOLOGY AND IMMUNOLOGY*
ACADEMIC SUBJECT: - *PATHOLOGY (4CFU)*
- *IMMUNOLOGY (3CFU)*

Main information on teaching	
Academic year	*3rd year*
Lesson periods	*1st semester 3rd year*
European Credit Transfer and Accumulation System (ETCS):	*7 CFU*
SSD	*MED/04*
Language	*English*
Attendance	*Obligatory (please see art. 4.4 of the Teaching Regulations A.A. 2023/2024, available on the website of the Degree Programme)*

Professor in charge	
Name and Surname	Prof. Antonio Mazzocca Prof. Stefano Castellani Prof. Dragana Nikolic
E-mail address	Prof. Antonio Mazzocca (antonio.mazzocca@uniba.it) Prof. Stefano Castellani (stefano.castellani@uniba.it) Prof. Dragana Nikolic (dragana.nikolic@uniba.it)
Telephone	Prof. Antonio Mazzocca (+390805593593 interno 3593) Prof. Stefano Castellani Prof. Dragana Nikolic (+390805593593 interno 3593)
Department and address	**Prof. Antonio Mazzocca** *Interdisciplinary Department of Medicine,* *University of Bari School of Medicine,* *Piazza G. Cesare, 11, Bari* *Padiglione Morgagni, 2nd floor* **Prof. Stefano Castellani** *Department of Precision and Regenerative Medicine and Ionian Area, University of Bari School of Medicine,* *Piazza G. Cesare, 11, Bari* Palazzina Istituti Biologici, 2nd floor **Prof. Dragana Nikolic** *Interdisciplinary Department of Medicine,* *University of Bari School of Medicine,* *Piazza G. Cesare, 11, Bari* *Padiglione Morgagni, 2nd floor*
Virtual headquarters	http://www.antoniomazzocca.com/ https://www.uniba.it/it/docenti/castellani-stefano

	https://persone.ict.uniba.it/rubrica/dragana.nikolic
Tutoring	All teachers are available to receive students at any time (compatible with other academic commitments) and by appointment (please request an appointment via email).

Work schedule			
Hours			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours / Self-study hours
Es. 84	*84*		
CFU/ETCS			
7	*7*		

Learning Objectives	The training activity aims to study the structural and functional changes that underlie diseases, delving into the role of the immune system. It also provides methodological standards for the rational handling of clinical problems in diagnostic, therapeutic and preventive approaches. Specifically, the educational objectives relate to understanding the general mechanisms of damage to the organism and inflammatory response; understanding the basic principles of immune response; understanding the general pathogenetic and pathophysiological mechanisms of diseases; and understanding the molecular basis of oncology.
Course prerequisites	In order to understand most of the topics covered in the course, students must have a basic knowledge of biology, anatomy, and physiology.

Teaching strategy	Frontal lesson

Expected learning outcomes ***Dublin Descriptor (DD=*** ***DD1* Knowledge and understanding**	The student will have to demonstrate a mastery of basic knowledge relating to the general mechanisms of damage to the organism, and the inflammatory response; the basic principles of the immune response; to the general etio-pathogenetic mechanisms of diseases and to understand the molecular and pathophysiological mechanisms of diseases, including the molecular basis of oncology. - ***Dublin Descriptor 1****: At the end of the course, students:* ○ will be able to explain the concepts of health, disease, homeostasis, etiology and pathogenesis, intrinsic and extrinsic causes of diseases; ○ will be able to describe and interpret the basic pathogenetic mechanisms (adaptations, damage and cell death) that occur at the level of cells and tissues and thus cause various diseases; ○ will explain the main molecular mechanisms of damage, with particular reference to the inflammatory process (local and systemic) and the healing and repair mechanisms; ○ will know the main causes of tumors and the main pathogenetic mechanisms involved, including interactions with the immune system and the mechanisms underlying tumor progression, angiogenesis and metastatic spread, proposing a cellular and molecular vision of oncology; ○ will know and understand the relevant aspects of hepatic, renal, endocrine and blood pathophysiology and important pathological conditions such as diabetes and atherosclerosis;

	○ will know and understand the processes and mechanisms that underlie the body's defense responses and alterations of the immune system with particular interest in hypersensitivity reactions, autoimmune diseases and immunodeficiencies.
***DD2* Applying knowledge and understanding**	**- *Dublin Descriptor 2*:** Upon completion of the course, students: ○ will recognize and identify the role of correct basic theoretical knowledge of the subject in clinical practice; ○ will be able to apply the basic knowledge acquired to new or unfamiliar topics, inserted in broader (or interdisciplinary) contexts connected to General Pathology and Immunology; ○ will have the ability to understand and be able to resolve clinical problems from a preventive-diagnostic-therapeutic point of view, which will be presented and addressed in the subsequent phases of the training course.
***DD3-5* Soft skills**	- ***Dublin Descriptor 3***: • *Making judgements* *By the end of the course, students must be able to* ○ integrate the knowledge acquired in General Pathology and Immunology about the mechanisms underlying organ/systemic diseases, and the immune response; ○ rework the study material (slides, notes taken in class, recommended texts) to identify the key concepts; ○ formulate personal judgments, develop hypotheses, collect and critically evaluate data to solve analytical and complex problems (problem solving) on new or unfamiliar topics, inserted in broader (or interdisciplinary) contexts connected to Pathology and Immunology (in particular, inflammation, alterations in the immune response). - ***Dublin Descriptor 4***: • *Communication skills* *By the end of the course, students must be able to* ○ clearly and effectively express and communicate the knowledge acquired using correct specialist language, as well as knowing how to interface with non-specialist interlocutors. - ***Dublin Descriptor 5***: • *Learning skills - Ability to learn autonomously* *By the end of the course, students must be able to* ○ study independently as well as independently consult bibliographic sources (research skills) in the biomedical field (scientific texts and publications in this disciplinary sector, online resources, etc.), which also means continuous updating in the sector, including participation in initiatives continuous updating in the professional field; ○ recognize the importance of the skills acquired in continuing the study and subsequent clinical activities, as well as their possible applications in a future career.
Syllabus (Contents)	GENERAL PATHOLOGY 1. Etiology and pathogenesis · Aspects of a disease process 2. Cellular adaptations · Cell homeostasis, Hypertrophy, Hyperplasia, Atrophy, Metaplasia

	3. Injury and Cell Death · Reversible injury · Cell death: Necrosis, Apoptosis, Necroptosis, Pyroptosis, Autophagy and Autosis 4. Intracellular Accumulations · Lipids: Steatosis (Steps in LDL trafficking, Fatty change: genetic diseases, metabolic overload, protein deficiency, Alcoholic liver disease, NAFLD, Protein deficient diet (starvation: Marasmus and Kwashiokor), Cholesterol and Cholesterol ester accumulation: Cholesterolosis, Xanthomas, Atherosclerosis · Proteins: UPR, ER stress, α1-antitripsin deficiency (Emphysema), CFTCR deficiency (Cystic Fibrosis) · Lysosomal storage diseases: Glycogenosis, Sphingolipidoses, Sulfatidoses, Mucopolysaccharidoses · Pigments 5. Pathologic Calcifications · Dystrophic Calcification · Metastatic Calcification 6. Cellular Aging Cellular senescence: Telomere attrition, Activation of Tumor Suppressor genes, Calorie Restriction, Insulin and IGF-1 signaling pathway, Sirtuins 7. Extracellular accumulations: Amyloidosis · Systemic (Primary, Secondary, Hemodialysis associated) · Hereditary or familial · Localized: Alzheimer disease 8. Prion disease 9. Inflammation · Recognition and signaling, Inflammasome structure · Reactions of Blood Vessels in Acute Inflammation, types of exudate · Cellular Events in Acute Inflammation: Vascular permeability increase, Leukocyte adhesion molecule, leukocyte extravasation, signal transduction of chemiotaxis process, phagocytosis, NETs · Plasma Protein-Derived (Complement System, and Coagulation factor activation), Cellular- Derived Mediators of Inflammation (Vasoactive amines, Lysosomal enzymes, Prostaglandins, Leukotrienes and Lipoxins, PAF, Cytokines, NO · Systemic Effects of Inflammation, Acute phase proteins, Systemic inflammatory response syndrome, mechanism of fever. · Repair mechanisms: Tissue Renewal, Regeneration, Fibrosis and Scar, Involvement of Growth factors and extracellular matrix components, Angiogenesis, Wound healing process · Chronic Inflammation: causes and morphologic features, macrophages involvement and granulomatous inflammation 10. Hemostasis · Platelets in Hemostasis · Primary Hemostasis · The Coagulation Factors · The Clotting Mechanism · Control Mechanisms of Coagulation · Fibrinolysis, Control mechanisms of untimely fibrinolysis 11. Notes on Haemostasis tests • Primary haemostasis: Platelet count, Bleeding time, Platelet function tests, qualitative and quantitative vWF measurement

	• Coagulation: aPTT, PT, TT, fibrinogen assay, mixing study • Specific assays: Coagulation factors and inhibitor level assays 12. Pathology of Hemostasis • Bleeding disorders: Acute and Chronic Immune thrombocytopenia (ITP), HIV-associated thrombocytopenia, Drug-induced thrombocytopenia, Heparin-Induced thrombocytopenia, Thrombotic microangiopathy (TTP, HUS), Drug related defects and Uremia, Defective platelet function (Bernard-Soulier syndrome, Glanzmann thrombasthenia, Platelet secretion disorders), vWF disease (Type 1, 2 and 3), Clotting factor abnormalities: Hemophilia A, Hemophilia B. • Disseminated Intravascular Coagulation • Thrombosis • Embolism • Infarction • Shock 13. NEOPLASIA Nomenclature of Tumors: Benign and Malignant Tumors. Characteristics of Benign and Malignant Neoplasms: Differentiation and Anaplasia, Rate of Neoplastic Growth, Tumor cell motility, Invasion and tissue infiltration. Epidemiology: Cancer Incidence, Geographic and Environmental Variables, Age, Heredity, Acquired Predisposing Conditions. Interactions between Environmental and Inherited Factors. Fundamental Principles of Cancer Biology and Hallmarks of Cancer: Self-sufficiency in growth signals, Insensitivity to anti-growth signals, Evasion of Programmed Cell Death (Apoptosis), Limitless replicative potential, Sustained angiogenesis, Tissue invasion and metastasis; Deregulated metabolism, Evasion of Host Defense and Immune Escape Mechanisms, Genome instability, Inflammation and Cancer and the functional relationship between inflammation and cancer development. Carcinogenesis: initiation and neoplastic progression. Molecular and cellular basis of multistep carcinogenesis. Chemical, Physical, Viral and Microbial carcinogenesis. Genetic Lesions in Cancer: Types of Genetic Lesions in Cancer. Chromosomal Abnormalities in Cancer. Genetic and Epigenetic alterations in Cancer. Theories of Cancer Origin: Somatic Mutation Theory (SMT), Tissue Organization Field Theory (TOFT) of cancer, Evolutionary Theories of Cancer. Reductionist and Systemic approach to Cancer. Host Defense Against Tumors: Tumor Immunity, Tumor Antigens, Antitumor Effector Mechanisms, Immune Surveillance and Immune Evasion by Tumors. Clinical Aspects of Neoplasia: Effects of Tumor on Host, Grading and Staging of Cancer, Laboratory Diagnosis of Cancer. Tumor Markers and Molecular Profiles of Tumors. 14. GENERAL PRINCIPLES OF PATHOPHYSIOLOGY Energy Metabolism: Defects in Carbohydrates (i.e. diabetic ketoacidosis, hyperosmolar coma, and hypoglycemia) and Mitochondrial Energy Metabolism (i.e. defects of pyruvate dehydrogenase complex, defects in post-respiratory chain enzymes, defects in transport mechanisms of the mitochondrial inner or outer membrane, deficiency of cofactors and deficiency of heat-shock proteins) Cellular Environment, Fluids and Electrolytes: Homeostasis, Intracellular/Interstitial, Osmosis versus Diffusion, Osmolarity, Acidosis. Perfusion: Hypoxia, Ischemia, Hepatic perfusion disorders. 15. PATHOPHYSIOLOGY OF THE LIVER AND BILIARY TRACT Clinical Syndromes of the Liver: Hepatic Failure, Jaundice and Cholestasis, Hepatic Encephalopathy, Cirrhosis, Portal Hypertension, Portosystemic Shunt.

	Drug- or Toxin-Induced Liver Disease: Drug-induced liver injury (DILI) and Toxin-induced parenchymal and vascular liver damage, Hepatotoxicity from asymptomatic elevation of liver enzymes to fulminant hepatic failure, Adverse hepatic reactions. Acute and Chronic Hepatitis: Viral Hepatitis, Other Viral Infections of the Liver, Autoimmune Hepatitis, Drug/Toxin-Mediated Injury Mimicking Hepatitis. Alcoholic and Nonalcoholic Fatty Liver Disease: Alcoholic Liver Disease, Nonalcoholic Fatty Liver Disease (NAFLD), Drug/Toxin-Mediated Injury with Steatosis. Cholestatic Liver Diseases: Neonatal Cholestasis, Cholestasis of Sepsis, Primary Biliary Cirrhosis, Primary Sclerosing Cholangitis, Drug/Toxin-Induced Cholestasis. Inherited Metabolic Diseases: Hemochromatosis, Wilson Disease, α1-Antitrypsin Deficiency. Circulatory Disorders: Impaired Blood Flow into the Liver, Impaired Blood Flow Through the Liver, Hepatic Vein Outflow Obstruction. Other Inflammatory and Infectious Diseases: Liver Abscesses, Granulomatous Disease. Tumors and Hepatic Nodules: Benign Tumors, Precursor Lesions of Hepatocellular Carcinoma, Hepatocellular Carcinomas. Gallbladder Diseases: Cholelithiasis (Gallstones), Cholecystitis. Disorders of Extrahepatic Bile Ducts: Choledocholithiasis and Cholangitis, Secondary Biliary, Cirrhosis, Biliary Atresia. Tumors: Carcinoma of the Gallbladder, Cholangiocarcinomas. 16. PATHOPHYSIOLOGY OF THE GASTROINTESTINAL TRACT Overview of Gastrointestinal Function and Regulation of the Digestive System. Gastrointestinal (GI) diseases and common classes of symptoms and signs: abdominal or chest pain; altered ingestion of food (e.g. resulting from nausea, vomiting, dysphagia [difficulty swallowing], odynophagia [painful swallowing], or anorexia [lack of appetite]); altered bowel movements (i.e. diarrhea, constipation); and GI tract bleeding. Overview of Gastrointestinal Motility and Gastrointestinal Electrolyte and Fluid Secretion: Digestion and Absorption, Normal and Disordered Swallowing, Functional Bowel Disorders. General etiology of GI Disorders: Peptic Ulcer Disease, Small Bowel Disorders, The Mucosal Immune System and Inflammatory Bowel Disease. Pathophysiology of Abdominal Pain and Pain Syndromes. Overview of Infectious Disorders of the Gastrointestinal Tract. Overview of Neoplasms of the Gastrointestinal Tract: Pathogenesis of Gastrointestinal Cancers. 17. PATHOPHYSIOLOGY OF ANEMIA Definition and Pathophysiologic Classification of Anemias: Anemia caused by decreased production of Red Blood Cells (RBCs) and Anemia caused by increased destruction or loss of RBCs, Normochromic, normocytic anaemia, Megaloblastic anaemia and miscellaneous deficiency anaemias. Iron metabolism and its disorders, Disorders of the synthesis or function of haemoglobin. Anaemias resulting from defective maturation of RBCs. Haemolytic anaemia: congenital and acquired. Disorders of the red cell membrane. Erythrocyte enzymopathies: Glucose-6-phosphate dehydrogenase (G6PD) deficiency. 18. PATHOPHYSIOLOGY AND CLASSIFICATION OF KIDNEY DISEASES Overview of Renal Pathophysiology and Clinical Manifestations of Kidney Diseases. Pathogenic Mechanisms of Glomerular and Tubulointerstitial impairment. Acute

	Kidney Injury and main features of Chronic Kidney Diseases. 19. ENDOCRINE PATHOPHYSIOLOGY Pituitary Gland: Hyperpituitarism and Hypopituitarism. Thyroid Gland: Hyperthyroidism and Hypothyroidism. Parathyroid Glands: Hyperparathyroidism (Primary and Secondary Hyperparathyroidism) and Hypoparathyroidism. Pseudohypoparathyroidism. The Endocrine Pancreas: Glucose Homeostasis and Regulation of Insulin Release. Insulin Action and Insulin Signaling Pathways. Pathogenesis of Type 1 Diabetes Mellitus (Genetic Susceptibility, Environmental Factors, Mechanisms of β Cell Destruction). Pathogenesis of Type 2 Diabetes Mellitus (Genetic Factors, Environmental Factors, Metabolic Defects in Diabetes). Adrenal Glands: Hyperfunction (Hyperadrenalism), Hypercortisolism (Cushing Syndrome), Primary Hyperaldosteronism, Adrenogenital Syndromes, Insufficiency. Multiple Endocrine Neoplasia Syndromes (MEN). IMMUNOLOGY General organisation of Immune system: Innate and adaptive immunity. Organisation of secondary lymphoid organs. Innate immune response: Natural barriers, Neutrophils, monocytes/macrophages, Dendritic cells, Natural killer cells; Toll-like receptors, Nod-like receptors, Phagocytosis and killing, Respiratory burst, Reactive oxygen species, Nitric oxide; Extracellular traps of neutrophils, Macrophages polarization, Complement system. Ontogenesis of T lymphocytes, TCR rearrangement, Antigen Presenting cells; MHC molecules and antigen processing and presentation, co-stimulatory molecules; positive and negative selection. Ontogenesis of B lymphocytes, Antibody: structure and function, Class switching, Somatic hypermutation; Interaction between T and B lymphocytes. Adaptive immune response: Cell-mediated immune response: T helper (Th1, Th2, T regulatory and Th17cells), T cytotoxic cells, Cytokines and chemokines; Central and peripheral tolerance; T cytoxic cells; Innate lymphoid cells, Superantigens. Humoral Immune response; Different subclasses of antibodies. Role of immunological memory. Mucosal Immunology; Peyer's Patches, Inflammatory bowel disease, Intestinal microbiota. Primary immunodeficiency: defects in phagocytic cells: Cronic granulomatous disease, leukocyte adhesion deficiencies, Chediak-Higashi syndrome; Severe combined immunodeficiencies; Wiskott-Aldrich syndrome, Di George syndrome, MHC class I and MHC class I immunodeficiencies; Bruton disease; Hyper IgM syndrome, Hyper IgE syndrome; IgA deficiency; IgG deficiencies; Complement factors deficiencies; HIV-1 infection. Evasion of the immune response by bacteria and viruses. Hypersensitivity reactions. Sef-tolerance and autoimmune diseases. Transplant immunology.
Books and bibliography	ROBBINS AND COTRAN: "Pathologic Basis of Diseases", 10th ed. EDRA Eds. MC CANCE AND HUETHER: "The Biologic bases for Disease in Adults and Children", 7th ed. ELSEVIER Abbas, Lichtman and Pillai: "Cellular and Molecular Immunology". Eds. Elsevier or Weaver and Murphy. "Janeway's Immunobiology"
Notes on bibliography	For specific insights, we recommend the proper use of bibliographic/scientific resources (any medical student general pathology/immunology textbook (as long as it is up-to-date) and electronic resources (e.g., scientific publications on PubMed,

	Scopus).
Teaching/Learning Materials	At the end of the course, teachers will provide teaching materials to students.

Assessment and feedback	
Methods of assessment	The exam will be in the form of an oral exam.
Evaluation criteria	The exam consists of an oral dissertation aimed to assess theoretical knowledge of the topics reported in the syllabus and covered in the completion of the course. **Learning evaluation criteria.** The questions of the oral interview exam are aimed at ascertaining the student's level of knowledge and understanding of the topics covered during the lectures and classroom exercises.
Criteria for assessment and attribution of the final mark	**Learning measurement criteria.** The final grade is a full grade of thirty out of thirty (30/30). When the grade is greater than or equal to 18, the exam is deemed to have been passed. The highest honors grade (30/30 Honors; Magna Cum Laude) will be awarded. **The criteria for awarding the final grade.** The oral exam consists of questions on the topics covered in the course; each answer will be assessed for correctness, elaboration and ability to explain the topic covered in the question. Magna cum laude is awarded when a student demonstrates complete mastery of the subject during the interview.
Additional information	
	None