GENERAL INFORMATION		
Course name	**Medical Pathology**	
Course director	**Assoc. Prof. Milanka Mrčela, MD, PhD**	
Assistants	Assoc. Prof. Ksenija Marjanović, MD, PhD	
Study program	**Integrated undergraduate and graduate university study program Medical Studies in German**	
Course status	Mandatory	
Year, semester	2nd year, 4th semester	
Credits allocated and form of instruction	ECTS student workload	**9**
	Number of teaching hours (L+S+E)	**150** (50+50+50)

COURSE DESCRIPTION

Course objectives

General pathology: Processes of adaptation, cell damage and cell death, acute and chronic inflammation, reparation, regeneration and healing, hemodynamic disorders, genetic disorders, immune system disorders, neoplasms and environmental pathology.
Pathology of organs and organ systems: Pathology of the cardiovascular system, respiratory system, hematopoietic system, digestive system, liver, pancreas, kidneys, male and female reproductive system, breast, endocrine system, skin, bones and joints, peripheral nerves, muscles and central nervous system.

Course requirements

Completed courses: Histology, Medical biology

Learning outcomes relevant to the study program

1.1., 1.2., 2.1., 3.1., 3.3., 4.2.

Expected learning outcomes

Knowledge

1. Enumerate the groups of pathological processes, describe their etiopathogenetic mechanisms, list their most important morphological features and link them to the elements of the clinical picture
2. Within the framework of some organ systems, list the most important pathological entities, link them to the general features of pathological processes, describe their morphological features specific to some organ systems and be able to apply this knowledge to individual clinical examples
3. List and describe individual methods of morphological diagnosis and their clinical use
4. List and describe the signs of death
5. Describe the most significant features of individual stages of autopsy

Skills

1. Recognize and describe macroscopic changes in some tissues and organs and, based on this, determine the differential diagnosis of possible diseases
2. Present the adopted technique of microscopic examination of pathohistological slides
3. Recognize some basic staining techniques (HE, PAS, Mallory, Giemsa, Sudan III, immunohistochemistry)

4. Make a diagnosis on typical examples of pathological processes in the field of general and organic pathology based on the practical use of theoretical knowledge

Course content

Homeostasis. Reversible cell damage. Cellular adaptation. Irreversible cell damage. Excessive accumulation of metabolites and other substances. Excessive accumulation of metabolites and other substances, such as pigments, fats, proteins and carbohydrates. Types and pathogenic mechanisms of lime deposition. Definition of apoptosis and the role of apoptosis in certain tissues. Necrosis. Morphological forms of aging. Fatty metamorphosis of the liver. Caseous necrosis in the lymph node. Enzymatic necrosis of fatty tissue of the pancreas. Types of inflammation. Cells in an inflammatory reaction. Chemical mediators of inflammation. Function of mediators or chemical mediators of inflammation (e.g. histamines, cytokines, growth factors, coagulation system, etc.).

Acute inflammation. Leukocyte function disorders. Outcome of acute inflammation. Acute pneumonia. Fibrinous inflammation of the wall of the artery in the kidney. Myocardial abscess. Granulations. *Chronic inflammation.* Morphological forms of acute and chronic inflammation. Systemic signs of inflammation. Inflammatory nasal polyp. Granulomatous inflammation in the lungs. Chronic inflammation of the salivary gland. Nonspecific follicular lymphadenitis.

Basics of the immune system. Immune mechanisms of tissue damage. Transplantation reaction. Main diseases in immunopathology (systemic lupus erythematosus, rheumatoid arthritis, polyarteritis nodosa, Wegener's granulomatosis, scleroderma, dermatomyositis, polymyositis, chronic thyroiditis, glomerulonephritis, etc.).

Autoimmune diseases. Immunodeficiency conditions. Amyloidosis. Pathogenesis of AIDS and enumerate the most important complications of this disease. Inherited and acquired immunodeficiency syndromes.

Embolism. Infarction. Shock. Embolism and enumerate the types of embolism. Definition of infarction, pathogenesis and morphological changes.

Edema. Dehydration. Hyperemia and congestion. Bleeding. Hemostasis and thrombosis. Distribution of body fluids and factors that determine their distribution. Pathogenesis of edema, its possible morphological changes and clinical features. Dehydration, mechanisms of occurrence and possible consequences. Hyperemia and congestion and their pathogenesis, morphology and clinical features. Normal homeostasis. Thrombosis and etiopathogenesis. Pulmonary edema. Thrombosis. Pulmonary hemorrhagic infarction. Acute tubular necrosis.

Classification of neoplasms. Pathohistological characteristics of neoplasms. Principles of nomenclature and classification of neoplasms based on macroscopic and histopathological images. Typical characteristics of benign and malignant neoplasms, the way of growth and types of tumor metastasis. Principles on which the clinical and histological grading of neoplasms is based.

Biology of tumor growth. Epidemiology of neoplasms. Genetic inheritance and the impact of genetic inheritance of gender, age and diet on the development of neoplasms. Metaplasia. Dysplasia. Carcinoma in situ. Invasive cancer. Carcinogenesis and carcinogens. Tumor immunity. Clinical features. Laboratory diagnosis of neoplasms. Well-differentiated carcinoma. Poorly differentiated carcinoma. Lymphangitic spread of the tumor. Metastasis in the lymph node.

*Basics of teratology. Errors of morphogenesis. Chromosomal anomalies. Genetic disorders***.** Developmental (congenital) defects and their importance during childbirth. Basics of teratology and errors of morphogenesis. Structure of chromosomal abnormalities based on chromosomal translocation, deletion and inversion. Syndromes as a consequence of sex chromosome disorders.

Disorders with multifactorial inheritance. Diseases in newborns and children. Intrauterine growth restriction and organ immaturity. Hyaline membrane disease in newborns and causes of birth asphyxia.

Diseases of addiction. Heavy metal poisoning. Natural poisons. Food and diseases caused by poor nutrition. Fibroma. Cystic fibrosis of the pancreas. Gout. Hyaline membranes in the lungs.

Vitamins. Minerals. Damage by physical agents. Diseases caused by imbalanced nutrition. Physical damage caused by physical factors such as hyperthermia, hypothermia, mechanical trauma, radiation, electric current, polytrauma. Renal actinomycosis. Pneumocystis pneumonia. Esophageal moniliasis. Cat scratch disease.

Special pathology Arteriosclerosis. Hypertension and hypertensive vascular disease. Inflammatory diseases of blood vessels. Atherosclerosis. Medial calcific sclerosis and arteriolosclerosis. Hypertonia and hypertonic vascular disease. Vasculitis.

Aneurysms. Venous diseases. Diseases of lymphatic vessels. Tumors of blood and lymphatic vessels. Angioplasty and blood vessel replacement. Aneurysms and formation mechanisms. Venous diseases (varicose veins, phlebothrombosis, thrombophlebitis), superior or inferior vena cava syndrome and hepatic vein thrombosis). Diseases of lymphatic vessels. - Tumors of blood and lymphatic vessels. Pathological changes that occur due to therapeutic procedures in blood vessel diseases. Early atherosclerosis. Late atherosclerosis. Hemangioma. Lymphangioma.

Left–sided and right–sided heart failure – etiology, pathogenesis, pathology and clinical picture. Congenital heart defects. Hypertensive heart disease. Pulmonary heart disease. Recent myocardial infarction. Myocardial scar. Acute rheumatic endocarditis. Bacterial endocarditis.

*Ischemic heart disease. Diseases of the endocardium and valves***.** Myocardial infarction. Diseases of the endocardium.
Rheumatic heart diseases. Fibrinoproductive pericarditis. Endocardial fibroelastosis. Myocarditis. Myxoma of the heart. *Primary myocardial diseases. Pericardial diseases. Heart tumors. Heart transplant.* Etiopathogenesis and description of the basic forms of myocarditis. Etiology and classification of cardiomyopathy. Heart tumors. Heart transplant, the most common causes and morphological changes in the transplanted heart.

Pulmonary atelectasis. Vascular and circulatory pulmonary diseases. Obstructive pulmonary diseases. Pneumonia. Restrictive lung diseases. Autoimmune diseases. Congenital pulmonary anomalies. Atelectasis. Upper respiratory tract infections. Pulmonary edema. Pulmonary hypertension. Pneumonia.

Lung tumors. Diseases of the pulmonary pleura. Diseases of the mediastinum. Diseases of the nose and paranasal sinuses. Diseases of the pharynx, larynx and trachea. Interstitial pneumonia.

Normal hematopoietic and lymphatic system. Non-Hodgkin's lymphoma. Hodgkin's

lymphoma. Langerhans cell histiocytosis.

Anemia. Red blood cell disorders. Polycythemia. *Bleeding disorders.* White blood cell disorders. *Malignant disorders of white blood cells*. Lymphadenitis. Lymphadenopathy. Splenomegaly.

Mouth and pharynx. Salivary glands. Esophagus. Developmental disorders of the lip, jaw and pharynx. Inflammations of the mouth and pharynx. Neoplasms of the mouth and pharynx. Congenital anomalies, injuries and inflammations of the esophagus. Neoplasms of the esophagus.

Stomach and duodenum. Appendix. Developmental disorders of the digestive system. Gastritis. Inflammation and neoplasms of the stomach. Inflammation and neoplasms of the appendix.

Small and large intestine. Peritoneum. Intestinal position disorders. Congenital vascular malformations. Infectious and inflammatory bowel diseases. Malabsorption syndrome with special emphasis on celiac disease. Neoplasms of the small intestine. Large intestine carcinoma. Neuroendocrine neoplasms of the intestine, carcinoid syndrome. Mesenchymal neoplasms of the intestine. Peritonitis. Neoplasms of the peritoneum.

Clinical evaluation of the liver and liver diseases. Vascular liver diseases. Inflammatory liver diseases and hepatitis. Toxic liver damage. Immune-mediated liver diseases. Cirrhosis of the liver. Liver tumors. Gallbladder and bile duct diseases. Gallbladder neoplasms and extrahepatic bile duct cancer.

Inflammatory diseases of the pancreas (acute and chronic pancreatitis). Diabetes. Neoplasms of the exocrine and endocrine portion.

Normal kidney. Glomerular diseases. Developmental disorders of the kidney. Tubulointerstitial diseases and kidney inflammation. Blood vessel disorders of the kidneys. Kidney neoplasms. Urolithiasis. Diseases of the ureter, urinary bladder and urethra. Urinary tract infections. Neoplasms of the urinary system.

Male reproductive system diseases. Cryptorchidism. Disorders that can lead to the formation of scrotal masses. Disorders of penis development and their consequences. The most common circulatory disorders of the scrotum. Causes of male infertility and pathological changes in testis in different forms of infertility. Testicular neoplasms. Benign prostatic hyperplasia. Prostate cancer.

Diseases of the vulva, vagina and cervix of uterus. Congenital and developmental disorders of the female reproductive system. Inflammatory diseases of the female reproductive system. Atrophic and hyperplastic diseases of the endometrium. Intraepithelial neoplasia of the vulva, vagina and cervix. Malignant neoplasms of the vulva, vagina and cervix.

Diseases of the body of uterus and fallopian tubes. Endometriosis. Endometrial neoplasms. Uterine leiomyoma and leiomyosarcoma. Endometrial stromal tumors and malignant mixed mesodermal tumors.

Ovarian diseases and neoplasms. Gestational trophoblastic disease. Non-neoplastic and functional ovarian cysts. Ovarian neoplasms. Histological differences between the so-called borderline malignant and malignant ovarian neoplasms. Morphological changes in the placenta in case of pregnancy complications.

Breast diseases. Basic developmental disorders of the breast. – Mastitis, abscess, duct

ectasia and breast fat necrosis. Fibrocystic changes and proliferation of the breast epithelium.
Molecular pathology in the development of malignant neoplasms of the breast. Benign breast tumors. Gynecomastia.

Pituitary gland and thyroid diseases. The most important pituitary gland disorders and the most important syndromes that can develop in these conditions. Hyperthyroidism and hypothyroidism. Thyroiditis. Thyroid neoplasms.
Diseases of the parathyroid and adrenal gland. Multiple endocrine neoplasia. Hyperparathyroidism. Hyperfunction of the three zones of the adrenal cortex. Hypoadrenalism.
Tumors of the cortex and adrenal medulla. Multiple endocrine neoplasia syndromes.

Basic pathological skin changes. Congenital, infectious, immune and idiopathic skin conditions. Skin and skin adnexa neoplasms.

Bone and joint diseases. Disorders of bone development. Osteomyelitis. Osteoporosis. Rickets and osteomalacia. Renal osteodystrophy and the impact of hyperparathyroidism on the skeletal system. Paget's disease of bone. Callus formation and bone fracture healing disorders. Bone-forming neoplasms. Cartilage-forming neoplasms. Osteoarthritis. Rheumatoid arthritis. Gout. Tumor-like conditions and joint tumors. *Soft tissue tumors. Peripheral nerve and skeletal muscle diseases.* Benign and malignant tumors. Neuropathies. Myopathies. Peripheral nerve tumors.

Introduction and general pathology of the central nervous system. Cerebrovascular diseases.
Increased intracranial pressure. Hydrocephalus. Ischemic brain disease. Hypertonic brain disease. *Developmental disorders, Trauma, Neoplasms of the central nervous system.* Infectious diseases. Demyelinating diseases. Neurodegenerative diseases. Toxic and metabolic disorders.

Methods in pathology. Autopsy. Basic autopsy techniques and autopsy report.

Form of instruction	☒lectures ☒seminars and workshops ☒exercises ☐distance learning ☐field course	☐individual assignments ☐multimedia and Internet ☐laboratory ☐mentoring activities ☐other

Student obligations

A student must attend at least 70% of all forms of instruction (exercises, seminars and lectures), take partial exams after each seminar session, pass the laboratory part of the exam, the final written exam and the oral exam. Students, whose absence from seminars and/or exercises is excused, must catch up with the lessons they missed by taking an exam.

Monitoring student learning

Attendance	x	Active participation	x	Seminar paper		Experimental work	x
Written exam	x	Oral exam		Essay		Research	
Project		Continuous assessment	x	Paper		Practical work	x
Portfolio							

Assessment and evaluation of students during class and on the final exam

Student work will be evaluated during classes and on the final exam. During classes, a student can earn a maximum of 100 points. Students can earn a maximum of 30 points during classes through different types of activities. They can earn a maximum of 40 points on partial exams and a maximum of 30 points on the final exam. A student must achieve more than 60% on the written exam in order to be able to take the oral exam. The final grade represents the sum of the points earned during classes and on the final exam.

Mandatory reading *(at the time of submission of study program proposal)*

1. Ursus-Nikolaus Riede, Martin Werner. Allgemeine und Spezielle Pathologie (Springer-Lehrbuch) (German Edition) 2. Auflage. 2017

Additional reading *(at the time of submission of study program proposal)*

1. Kumar, Abbas, Aster. Robbins Basic Pathology. 10th ed. Saunders Company, Philadelphia, 2018

The number of copies of mandatory reading in proportion to the number of students currently taking this course

Title	*Number of copies*	*Number of students*
Ursus-Nikolaus Riede, Martin Werner. Allgemeine und Spezielle Pathologie (Springer-Lehrbuch) (German Edition) 2. Auflage. 2017	A purchased license for online textbooks shall be used https://bfdproxy48.bfd-online.de/login.htm?back=http%3a%2f%2fpartner.bfd-online.info.bfdproxy48.bfd-online.de%2fameos%2fbfdAboGateway%3faboId%3d264117 Access will be granted to all students enrolled in the study program	

Quality monitoring methods ensuring the acquisition of knowledge upon completion, skills and competences

An anonymous, quantitative, standardized student survey on the quality of the organization and conduction of classes, the course content and the work of professors conducted by the Quality Assurance Office of the Faculty of Medicine Osijek and a unified university student survey conducted by the Quality Assurance Center of the Josip Juraj Strossmayer University of Osijek.