

Course title	Basic patient's care
Number of credits	0,5 ECTS
Teaching methods	10 lectures, 10 seminars
Course objectives	Basic directions in human nutrition- preparing of diet for various proposes; information of role of vitamins and minerals in health state and disorders; differences in nutrition in children and elders; care of patients after surgery, trauma, in circulatory and respiratory insufficiency; special considerations for care of surgical and problematic wounds
Course contents	<ul style="list-style-type: none"> • basic nutrients- proteins, fats, carbohydrates- their role in metabolism, caloric intake in health state and various disorders, BMI calculation for women and men • vitamins- types, role in prophylaxis, deficiencies and disorders • minerals- micro- and macronutrients, trace elements, role in health state, deficiencies • diet trends- definition and types of diets, role of diet in prevention and treatment of various disorders • nutrition of children and elder people in prevention and therapy - special considerations • disturbances of nutrition- etiology and complications of obesity, osteoporosis, diabetes, anemia, anorexia and bulimia • skin problems and types of wounds, care of patient's with special kind of wounds, treatment of rash, purulent wounds, problems in wound healing • infection- etiology, types, laboratory tests and parameters, care and treatment of patient with infection • patient's care after surgical operation- types of surgery (urgent, elective), special consideration for wound care • respiratory and circulatory insufficiency- parameters, clinical examinations, monitoring of life functions, special consideration for care

Course title	Basic statistics
Number of credits	7 ECTS
Teaching methods	55 seminars
Course objectives	Understand the role of statistical methods in bio-medical sciences. Develop skills in descriptive statistics as a tool of summarizing and presenting research outcomes. Understand the concept of probability in frequentist and Bayesian approaches. Learn the idea of parameter estimation, the concept of confidence interval and methods of statistical hypothesis testing. Understand similarities between statistical and diagnostic tests. Learn the methods of assessing statistical association between variables and causal relationship inference.
Course contents	<ol style="list-style-type: none"> 1. Variability in biomedical sciences. Types of variables: numerical (continuous and discrete), nominal, ordinal – examples. 2. Descriptive statistics: parametric and non-parametric characterization of central tendency and dispersion. A concept of norm in medical sciences. 3. Methods of data presentation: histogram, construction of class intervals, calculation of a mean from histogram. Box-plot–its construction and meaning, concept of outliers. 4. Notion of probability in frequentist and Bayesian frameworks, rules of calculating probabilities. Bayes formula and its applications. 5. Diagnostic tests in Bayesian framework – sensitivity, specificity, positive and negative predictive power as conditional probabilities. 6. Basic probability distributions: binomial, Poisson, Gaussian and log-normal – their properties and applications. 7. Parameter estimation from a sample, confidence intervals. 8. Statistical inference – hypothesis testing, significance level, type I and II errors, statistical power of a test. Similarity to diagnostic tests. 9. Inference based on normal distribution – standard normal distribution and z-score concept. 10. Comparing two (or more) groups: Student's t-test for mean, chi-square test for proportions, idea of the analysis of variance (ANOVA). 11. Statistical associations between variables – idea and interpretative issues. Correlation coefficient, determination coefficient, Student's t and Fisher's z – tests for correlation coefficients. 12. Linear regression for one independent variable – relation between regression and correlation coefficients. Generalization to multivariate case.

Course title	Biochemistry with elements of chemistry I
Number of credits	4 ECTS
Teaching methods	15 lectures, 15 seminars
Course objectives	<p>Student should be able:</p> <ol style="list-style-type: none"> 1. To describe basic chemical definitions: proton, electron, neutron, Avogadro number, valence electrons, atomic number, mass number, Hund's Rule, Pauli exclusion principle, ground state electronic configuration, noble gas configuration, octet rule 2. To give examples of metals with different types of lattice structures 3. To describe similarities and differences in the solid state structures 4. To sketch graphs for the radial distribution functions of the 1s, 2s..atomic orbitals, what do these graphs mean 5. To draw the shapes of orbitals 6. To solve calculation problems with molar and percentage concentration
Course contents	<p>I. Fundamental concepts</p> <ol style="list-style-type: none"> 1. Introduction to chemistry 2. Molecules ions, and chemical formulas 3. Chemical reactions 4. Reactions in aqueous solution <p>II. Atomic and molecular structure</p> <ol style="list-style-type: none"> 1. The structure of atoms 2. The periodic table and periodic trends 3. Structure and bonding <p>III. The states of matter</p> <ol style="list-style-type: none"> 1. Gases 2. Liquids 3. Solids 4. Solutions <p>IV. Chemistry of the elements</p> <ol style="list-style-type: none"> 1. Periodic trends and the s-block elements 2. The p-block elements 3. The d-block elements

Course title	Biochemistry with elements of chemistry II
Number of credits	5 ECTS
Teaching methods	40 seminars
Course objectives	<p>Student should be able:</p> <ol style="list-style-type: none"> 1. To state what is meant by a hydrocarbon and to classify the different types of such compounds 2. To distinguish between cyclic and acyclic compounds 3. To identify functional groups given the structural formula of a compound 4. To discuss constitutional isomerism among hydrocarbons 5. To discuss typical reactions of hydrocarbons 6. To name aromatic compounds, and write specific reactions 7. To draw the functional groups of an aldehyde, ketone, carboxylic acid, ester, amide, amine
Course contents	<p>I. Organic compounds</p> <ol style="list-style-type: none"> 1. Functional groups and classes of organic compounds 2. Isomers of organic compounds 3. Common classes of organic reactions <ol style="list-style-type: none"> a. substitution b. addition c. elimination d. nitration 4. Common classes of organic compounds <ol style="list-style-type: none"> a. Alkanes, alkenes, alkynes b. Arenes c. Alcohols and ethers d. Aldehydes and ketones e. Carboxylic acids f. Amines, amides

Course title	General biology – cell biology
Number of credits	3 ECTS
Teaching methods	25 seminars
Course objectives	Detailed knowledge of cell structure, their function. Cell cycle and apoptosis. Organization of genetic material and its utilization.
Course contents	<p>Prokaryotic and Eukaryotic Cells – the Structural and Functional Comparative Analysis</p> <p>The Membrane, Its Structure and Functions</p> <p>General structure of biomembranes, with special regard to their functional asymmetry; membrane proteins, and glycolipids; functional specialization of plasma membrane; permeability of the lipid bilayer; major types of the membrane transport – uniport, symport and antiport systems; ion channels and membrane potential; active ion transport ($\text{Na}^+\text{+K}^+$ ATPase) and the ionic basis of membrane excitability; cotransport catalysed by symporters and antiporters; osmosis, water channels and the regulation of cell volume; congenital dysfunctions of ion channels (mucoviscidosis, long QT syndrome).</p> <p>Intracellular Compartments, Vesicular Traffic</p> <p>The transport of molecules into and out of the nucleus; the transport of proteins into mitochondria and chloroplasts; the endoplasmic reticulum, the transport from endoplasmic reticulum through the Golgi apparatus; the Golgi apparatus, transport from the Golgi apparatus to lysosomes and to the cell surface; lysosomes and lysosomal (storage) diseases (mucopolysaccharidosis), peroxysomes and peroxysomal diseases (Zellweger syndrome, neonatal adrenoleukodystrophy = NALD, X-linked adrenoleukodystrophy = XALD).</p> <p>The Mitochondrion</p> <p>Structural organization; Krebs cycle, the respiratory chain and ATP synthesis, aminoacid degradation, elongation of short chain lipid acids, autonomic mitochondria processes; the mitochondrial genome; the difference in the pattern of inheritance between mitochondrial and nuclear Genes, mitochondrial inheritance, mitochondrial Eve and Out-of-Africa Theory, human mitochondrial diseases (Kearns-Sayre syndrome, congenital spastic paraplegia, Leber’s congenital amaurosis (<i>atrophia optica hereditaria</i>) = Leber’s hereditary ophthalmic neuropathy, LHON).</p> <p>The Chloroplast</p> <p>Structural organization; the light-driven production of ATP and NADPH and the conversion of CO_2 to carbohydrates (the Calvin cycle), ATP synthesis by cyclic phosphorylation without making NADPH, other biosyntheses carried out by chloroplasts; the chloroplast genome.</p> <p>Cell Communication – Cell Signaling</p> <p>Ways of the cell-cell communication, signal transduction pathways, second messengers and the intracellular signal transduction; slow and rapid target cell adaptation/desensitization - drug/stimulant dependence, clinical aspects of mutation in the gene Ret (coding the receptor tyrosine kinase necessary for development of cells building the neural tube): Hirschprung’s disease (<i>megacolon congenitum</i>) multiple endocrine neoplasia syndromes (MENs).</p> <p>The Cell-Division Cycle</p> <p>The mechanics of cell division (mitosis and cytokinesis), control of the cell-division cycle (cell-cycle checkpoints, cyclins and cyclin-dependent kinases); programmed cell death (apoptosis) – extrinsic and intrinsic pathways; necrosis; the p53 dependent process of competition between apoptosis and neoplasia; progeria (premature senility syndrome); the molecular basis of cancer (retinoblastoma).</p> <p>The Cytoskeleton</p> <p>Intermediate filaments, microtubules, cilia and centrioles, actin filaments, actin-binding proteins.</p> <p>Cells in Their Social Context</p> <p>Cell junctions; cell adhesion, β catenin molecules and the relationship between cell adhesion and transcription; the extracellular matrix (ECM), integrins; disorders of the cell-cell adhesion (celiac disease, Kallman’s syndrome, desmosomes and dermatological diseases – pemphigus); collagens and human diseases (osteogenesis imperfecta, Ehlers-Danlos syndrome, Goodpasteur’s syndrome, Glanzmann’s thrombasthenia; dysfunctional dystrophin molecules and muscular dystrophies).</p> <p>The Cell Nucleus, Organization of Genetic Information</p> <p>Structural organization; chromatin and its packing within the nucleus, chromosomes – the global structure and replication; karyotype, basic chromosomal abnormalities (Down syndrome, Edwards syndrome, Patau syndrome, triple-X syndrome, Klinefelter</p>

	<p>syndrome, XYY syndrome); physical and chemical properties of DNA: molecular structure, base pairing, DNA strand polarity, sense and antisense, single-stranded DNA, the Watson-Crick model of DNA structure; from gene to protein: the genetic code, non-coding DNA, chemical structure of RNA, biological roles of RNAs, double-stranded RNA, RNA-world hypothesis, RNA secondary structures.</p> <p>Basic Genetic Mechanisms</p> <p>DNA replication, DNA repair, genetic recombination, genetic of bacteria and viruses (bacterial genomes, gene expression in bacteria, mutations in the bacteria genome, bacterial gene transfer, viral genomes).</p> <p>Expression of Genetic Information</p> <p>Transcription, post-transcriptional modifications, translation, post-translational modifications, the regulation of gene expression.</p> <p>Recombinant DNA Technology</p> <p>The fragmentation, separation, and sequencing of DNA molecules, nucleic acid hybridization, DNA cloning, DNA engineering.</p> <p>Genetic Basis of Development</p> <p><i>Caenorhabditis elegans</i>: developmental control genes; <i>Drosophila melanogaster</i>: genetic control of sex determination, hierarchy of genes regulating the pattern formation; animal stem cells, genetic control of cell and tissue differentiation</p> <p>Differentiated Cells and the Maintenance of Tissues</p> <p>Tissues with permanent cells, renewal by simple duplication, renewal by pluripotent stem cells, the connective tissue cell family.</p> <p>The Origin of Life</p> <p>The molecular evolution: the origin of simple organic molecules, the origin of complex chemical systems, proteins and RNAs as catalysts, self-replicating molecules, information flow from polynucleotides to polypeptides; from molecules to the first cell; life forms in extra terrestrial space.</p>
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Course title	General biology
Number of credits	9 ECTS
Teaching methods	68 seminars
Course objectives	Derivation of organs and systems in animals and in human. Detailed knowledge of cell structure, their function. Cell cycle and apoptosis. Organization of genetic material and its utilization.
Course contents	<p>1. Man and His Environment: Biological Hazards of Natural Environment</p> <p>Introduction to ecology:</p> <p>ecology as the science: basic laws and terminology; biotic and abiotic components of the environment; abiotic factors of the biosphere; bioms; population ecology: characteristics of population: density, dispersion and its patterns, demography: age structure, birth rate, death rate, generation time, sex ratio, population growth models, population limiting factors: density dependant factors, density independant factors, human population growth; ecosystems: trophic relationships in ecosystems, production, consumption, decomposition – primary productivity, secondary productivity, ecological efficiency, cycling of chemical elements in ecosystems – water, carbon, nitrogen, phosphorus, human impacts on ecosystems – disrupting chemical cycles throughout biosphere, accelerated eutrophication of lakes, greenhouse effect, toxins concentration, depletion of atmospheric ozone; community ecology: definition of the community, interspecific interactions within the community – predation, parasitism, interspecific competition, symbiosis, interspecific interactions and community structure, the ecological succession; anthropopression, insects and mollusks as vectors of infectious diseases.</p> <p>A. Toxic Mushrooms and Plants:</p> <p>review of toxic mushrooms: sweat mushroom (<i>Clitocybe</i> sp.), smoothcap mushroom (<i>Psilocibe</i> sp.), deathcap (<i>Amanita phalloides</i>), fly agaric (<i>A. muscaria</i>), panthercap (<i>A. pantherina</i>), fool's mushroom (<i>A. virosa</i>), autumn skullcap (<i>Galerina autumnalis</i>), early false morel (<i>Gyromitra</i> sp.), sorrel webcap mushroom (<i>Corthinarius</i> sp.), psychotropic mushrooms (<i>Panaeolus</i> sp., <i>Inocybe</i> sp.); biochemical and pharmacological characteristics of mushroom toxins: gastrointestinal irritants, muscarine, isoxazole derivatives, amanitin, gyromitrin, orellanine, psilocibin, psilocin, and other indole derivatives, miscellaneous and unknown mushroom toxins; review of major toxic plants: potatoe (<i>Solanum tuberosum</i>), tobacco (<i>Nicotiana tabacum</i>), Christmas rose (<i>Helleborus niger</i>), foxglove (<i>Digitalis purpurea</i>), lily-of the-valley (<i>Convallaria maialis</i>), castor bean (<i>Ricinus communis</i>), flamingo lily (<i>Anthurium andreanum</i>), marijuana (<i>Canabis sativa</i>), English yew (<i>Taxus baccata</i>), cypress</p>

spurge (*Euphorbia cyparissias*), English ivy (*Hedera helix*), opium poppy (*Papaver somniferum*), autumn crocus (*Colchicum autumnale*), *Atropa Belladonna*, *Scopolia Carniolica*; biochemical and pharmacological characteristics of plant toxins: glycosides – carcinogenic glycosides, carboxyatractylosides, cardiac glycosides, coumarins, glucosinolates, isoflavones, ranunculins, saponins, vicine/covicine, alkaloids – indole alkaloids, piperidine, polycyclic diterpenes, pyridine, pyrrolizidine, steroids, mycotoxins – aflatoxins; symptoms of poisoning with toxins produced by mushrooms and plants and first aid.

B. Venomous Animals:

review of major venomous animals: coelenterates (*Coelenterata*) – blue bottle (*Physalia* sp.), arthropods (*Arthropoda*) – the black widow (*Latrodectus mactans*), scorpions (*Scorpionoidea*), scolopendra (*Scolopendra gigantea*), wasps (*Vespidae*), honeybee (*Apis mellifera*), Spanish fly (*Lytta vesicatoria*), molluscs (*Mollusca*) – cone shell (*Conus* sp.), octopuses (*Octopus* sp.), fishes (*Pisces*) – stone fish, puffer fish, sea scorpion and other representants of the family *Scorpaenidae*, amphibians (*Amphibia*) – dart frogs of the family *Dendrobatidae*, reptilians (*Reptilia*) – boomslang (*Dispholidus typus*), sea snakes (*Hydrophiyidae*), colubrids (*Colubridae*), cobras (*Naja* spp.), mambas (*Dendroaspis* spp.), coral snakes (*Micrurus* spp.), taipan (*Oxyuranus*), eyelash vipers (*Bothriopsis*), Gaboon vipers (*Bitis*), true vipers (*Vipera* spp.), common adder (*Vipera berus*); symptoms of poisoning with toxins produced by venomous animals and first aid.

C. Allergic Animals:

definition and general aspects of allergy; animal allergens nomenclature; food products of an animal origin and allergy – honey, milk, eggs, fish, pork, beef meat; other animal allergens – feathers, dander, hairs; indoor and outdoor allergens; review of major allergic animals: allergenic arthropods – mites, cat fleas, cockroaches, mosquitoes, house flies, nonbiting midges, flour beetles, rice weevils, stinking insects, silkworms; cats and dogs, rodents, horses, cows, birds.

2. Microscopic Structure of the Living Organism

A. The Cell and Its Functions:

prokaryotic and eukaryotic cells; cell membrane; mitochondrion; endoplasmic reticulum; Golgi apparatus; GERL; lysosomes; peroxysomes; cytoskeleton; plastids; cell wall in plants and bacteria; vacuoles; centrioles; ribosomes; nucleus: nuclear membrane, chromatin, nucleolus; the cell cycle.

B. Plant Tissues:

fundamental tissue system: epidermis - velamen, trichomes, lithocysts, stomatal complexes; parenchyma – chlorenchyma, aerenchyma, storage parenchyma; collenchyma – angular, tangential, annular; sclerenchyma – sclereids and fibers; fascicular tissue system: xylem – tracheids and vessel members; phloem – sieve cells, sieve tubes and companion cells; vascular bundles; lateral meristems: vascular cambium and process of secondary growth of roots and stems; cork cambium; secretory/excretory systems: resin ducts and laticifers.

C. Animal Tissues:

muscle tissue: skeletal muscles, cardiac muscle, smooth muscle; epithelial tissue: simple epithelium, stratified epithelium, glandular epithelium; connective tissues: classification and characterization of connective tissues, cells of the connective tissue, fibers of the connective tissue; nervous tissue: morphologic classification of neurons, neuroglia.

3. Biology of Development

A. Reproduction:

asexual reproduction – definition, mechanisms, parthenogenesis; germ cells and fertilization - evolutionary aspects of the sexual reproduction; spermatogenesis, structure of the sperm cell; oogenesis; vitellogenesis; types of egg cells; egg membranes; the regulation of gonad functions; reproductive anatomy of human male and female, menstrual cycle of human female; menopause, fecundation; sperm penetration through the egg cell membranes; the acrosomal reaction; egg reaction to the contact with a sperm – the reception hillock, mechanism of the egg cell activation; blocks for polyspermy; parthenogenesis; incorrect fertilization.

B. General embryology:

blastulation: patterns of cleavage; types of blastulas; embryo metabolism during blastulation; mechanisms of blastulation; evolution of blastulation; gastrulation: patterns of gastrulation; embryo metabolism during gastrulation; mechanisms of the embryonal development during gastrulation; evolution of gastrulation; early stages of organogenesis: neurulation and origin of primary axial organs, differentiation of somites and origin of the coeloma; ectodermal organs, mesodermal organs, endodermal

organs, origin of primordial germ cells, mechanisms of organogenesis; prostome and deuterostome animals.

C. Regeneration:

animals undergoing regeneration: *Hydra*, planarians, newts, salamanders; types of regeneration: by differentiation – urodeles, with the use of stem cells – flatworms, *Hydra*; human stem cells: embryonic and adult stem cells; stem cells as tools for repair of the human body – future of stem cells in medicine.

D. Introduction to human embryology:

first stages of the zygote development: blastulation and implantation, embryo development from the epiblast, origin of the embryonic mesoderm; origin of the notochord; extraembryonic membranes and placenta, branchial splits, branchial arches; clinical aspects.

E. Fetal and Neonatal Biology:

prenatal age: post-menstrual interval, gestational age, assessment of prenatal age - early development (cleavage, gastrulation) – 0 – 3 weeks, period of embryonic organogenesis – 4 - 8 weeks, fetal period – 9 – 38 - 42 weeks, short review of morphogenesis and dysmorphogenesis (reminder), fetal period and birth; growth and form of the fetus; fetal physiology: circulation, fetal lungs and respiratory system, fetal movements and sensations, fetal digestive tract, fetal kidney function, endocrine function in the fetus; parturition; adaptation to postnatal life: circulatory changes at birth, lung breathing in the perinatal period; categories of birth defects: category – isolated defect, multiple defects, mechanism – intrinsic, extrinsic, cause - etiology (multifactorial, mendelian, chromosomal).

F. Biology of Aging:

what is aging? aging versus senescing; why do we age? how do we age? alterations in proteins and lipids, alterations in DNA: nuclear DNA – epigenetic events, mutational events, telomeric DNA, mitochondrial DNA – oxygen free radicals, germline mutations; progeroid syndromes of humans, death – morbidity and mortality due to genetic disease.

4. Animal Structure and Function

A. Nutrition: Functional Anatomy of the Alimentary System:

an outline of anatomy and physiology of the alimentary system; macroscopic and microscopic structure of selected organs of the alimentary system: salivary glands, stomach, small and large intestines, liver, pancreas; gastrointestinal disorders: peptic ulcer, disorders of the large intestine – constipation, diarrhoea.

B. Reproduction: Functional Anatomy of the Reproductive System:

an outline of anatomy and physiology of the reproductive system; macroscopic and microscopic structure of selected organs of the reproductive system: testis, epididymis, vas deferens, prostate gland, penis, ovary and development of the graafian follicle, fallopian tube, uterus – with regard to a phase of the menstrual cycle; structure and function of the reproductive system in the light of comparative anatomy and physiology; pregnancy - mechanism of fertilization; transport of the fertilized ovum through the fallopian tube into the cavity of the uterus; development of the blastocyst and its implantation; anatomy and physiology of the placenta, with regard to its hormonal activity; development and functions of pregnancy membranes in the human embryo; metabolism of a pregnant woman; parturition and its mechanisms; microscopic structure of selected fetal organs: placenta, umbilical cord.

C. Water Balance and Waste Disposal: Functional Anatomy of the Excretory System:

an outline of anatomy and physiology of the excretory system; macroscopic and microscopic structure of selected organs of the excretory system: kidney, urinary bladder, ureter; structure and function of the excretory system in the light of comparative anatomy and physiology – protonephridia, metanephridia, Malpighian tubules, gills as organs of nitrogen excretion and ionic regulation, evolution of the vertebrate kidney – *pronephros*, *mesonephros*, *metanephros*; kidney diseases: chronic and acute kidney failure.

D. Circulation: Functional Anatomy of the Cardio-Vasculatory System:

an outline of anatomy and physiology of the cardio-vasculatory system; macroscopic and microscopic structure of selected organs of the cardio-vasculatory system: heart, arteries, veins, capillaries; structure and function of the cardio-vasculatory system in the light of comparative anatomy and physiology with special regard to the evolution of the heart; cardiac and coronary blood abnormalities (ischemic heart disease, hypertension).

E. Gas Exchange: Functional Anatomy of the Respiratory System:

an outline of anatomy and physiology of the respiratory system; macroscopic and microscopic structure of selected organs of the respiratory system: lung, trachea;

	<p>structure and function of the respiratory system in the light of comparative anatomy and physiology – gills and external body surfaces, tracheal systems, lungs; pulmonary abnormalities: chronic pulmonary emphysema, pneumonia, asthma, tuberculosis.</p> <p>F. Systems of Internal Communication and Regulation: Functional Anatomy Nervous and Hormonal Systems:</p> <p>an outline of anatomy and physiology of the nervous system; macroscopic and microscopic structure of selected organs of the nervous system: spinal cord, brain, peripheral nerves, ganglia of the autonomic nervous system; comparative anatomy of the nervous system; an outline of anatomy and physiology of the hormonal system; macroscopic and microscopic structure of selected organs of the hormonal system: hypophysis, thyroid gland, adrenal gland; structure and function of the hormonal system in the light of comparative anatomy and physiology; somatic sensations (headache), hormonal disorders (diabetes mellitus, Graves' disease, hypothyroidism, endemic goiter, tetany, Addison's disease, Cushing's syndrome, Conn's syndrome).</p> <p>G. Sensory Mechanisms: Functional Anatomy of Sensory Organs:</p> <p>an outline of anatomy and physiology of the major receptors; macroscopic and microscopic structure of selected receptors: the visual apparatus, the auditory apparatus, the olfactory apparatus; abnormalities in the eye optics, hearing abnormalities.</p> <p>H. Introduction to Immunology</p> <p>the immune system and interactions in immune responses (antigens, lymphocytes, antibodies, specific and nonspecific reactions; organs of the immune system: primary organs – bone marrow and thymus, secondary organs – spleen and lymph node), molecules of the immune system (immunoglobulins, generation of antigen-binding diversity among immunoglobulins, antigen-antibody complexes, CD molecules, complement, monoclonal antibodies, the Major Histocompatibility Complex), lymphocytes (clones and subclones of lymphocytes, T-cell receptors, differentiation and maturation of stimulated cells, circulation of lymphocytes; nonspecific immunity, interferons, macrophages, granulocytes, monokines), presentation of antigens (antigen presenting cells, macrophages, B-lymphocytes, monocytes; cytokines; immunologic memory; anti-infectious immunity – immune responses against bacteria and viruses), hypersensitivity (allergic reactions, mechanisms of allergy, allergenic factors, allergen nomenclature, allergic diseases), immunotherapy (is it effective? indications and contraindications for immunotherapy, possible modes of action, technique and safety).</p>
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Course title	General physics I
Number of credits	5 ECTS
Teaching methods	35 seminars
Course objectives	<ol style="list-style-type: none"> 1. Reason effectively, think critically, and solve problems. 2. Communicate effectively and apply the basic concepts of physics in speech and writing. 3. Identify and solve problems through scientific inquiry 4. Select and properly use appropriate laboratory technology, equipment and materials, including measuring and sensing medical devices 5. Understand and apply relationships between science, medicine and technology in processing and interpreting experimental data
Course contents	<ol style="list-style-type: none"> <u>1. HISTORY AND BASIC CONCEPTS IN MECHANICS</u> short history of mechanics; basic definitions (speed and velocity, acceleration, force, pressure, mass, weight, linear momentum, Newton's laws of motion, radian, angular velocity, angular acceleration, relations between angular and linear motion, moment of inertia, torque, Newton's laws of angular motion, angular momentum, work, energy, heat, power); units and conversions <u>2. DESCRIPTION AND CAUSES OF MOTION</u> velocity and acceleration; acceleration of gravity; motion units; constant acceleration; graphical description of motion; Newton's laws; forces as vectors; force of gravity; mass; weight; density; phenomenon of weightless, equilibrium and torques, circular motion <u>3. WORK AND ENERGY</u> work; energy; conservation of energy; power; principles of machines <u>4. BIOMECHANICS (PART I): STATIC FORCES, FRICTION, TRANSLATIONAL MOTION</u> equilibrium and stability; equilibrium considerations for human body; stability of human body under action of an external force; skeletal muscles; levers; elbow and hip joint; spine; standing tip-toe on one foot; dynamic; aspects of posture; friction at hip joint, vertical jump; effect of gravity on vertical jump; running high jump; motion through air; energy consumed in physical activity

	<p><u>5. BIOMECHANICS (PART II): ANGULAR MOTION, ELASTICITY AND STRENGTH OF MATERIALS, INSECT FLIGHT</u> forces on curved path; pendulum; walking; physical pendulum; speed and energy of walking; longitudinal stretch and compression; bone fracture (energy considerations); impulsive forces; fracture due to a fall (impulsive force considerations); whiplash injury; hovering flight; wing muscles; power required for hovering; kinetic energy of wing; elasticity of wings</p> <p><u>6. PROPERTIES OF LIQUIDS AND GASES</u> liquid state; pressure in liquids, Pascal's principle; Buoyant force and Archimedes principle; nature and laws of ideal gas; Boyle's law; Charles law; constant volume processes</p> <p><u>7. THE MOTION OF FLUIDS IN BIOLOGY AND MEDICINE: PRESSURE AND CIRCULATORY SYSTEM</u> Bernoulli's equation; viscosity and Poiseuille's law; turbulent flow; circulation of blood; blood pressure; control of blood flow; energetics of blood flow; types of pumps; heart as force pump; power produced by heart; blood pressure measurement techniques</p> <p><u>8. KINETIC THEORY AND MOLECULAR PHENOMENA RELATED TO BIOLOGICAL PROCESSES</u> kinetic theory of matter; molecules; diffusion; osmosis; dialysis; transport across living membranes; laws of gas transport; cohesion and adhesion; surface tension; capillary action; viscosity; adsorption and absorption; respiratory system</p> <p><u>9. HEAT</u> heat and laws of thermodynamics; methods for temperature measurement; internal energy; effects of heat; energy requirement of people; thermoregulation; heat transfer; convection; radiation; evaporation; heat application in medicine</p> <p><u>10. THERMODYNAMICS</u> first law of thermodynamics, second law of thermodynamics, thermal engines</p>
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Course title	General physics II
Number of credits	5 ECTS
Teaching methods	45 seminars
Course objectives	<ol style="list-style-type: none"> 1. Reason effectively, think critically, and solve problems. 2. Communicate effectively and apply the basic concepts of physics in speech and writing. 3. Identify and solve problems through scientific inquiry 4. Select and properly use appropriate laboratory technology, equipment and materials, including measuring and sensing medical devices 5. Understand and apply relationships between science, medicine and technology in processing and interpreting experimental data
Course contents	<p><u>1. HISTORY AND BASIC CONCEPTS IN ELECTRICITY AND MAGNETICS</u> short history of electricity and magnetism; basic definitions (electric charge, electric field, voltage, electric current, resistor, capacitor, inductor)</p> <p><u>2. ELECTRICITY</u> electrical nature of matter; behavior of electric charges; flow of electric charge; electric fields and voltages; magnets and magnetic fields; electromagnets; interaction between electricity and magnetism</p> <p><u>3. BASICS OF MAGNETISM</u> magnetic field strength, magnetic induction, hysteresis</p> <p><u>4. ACOUSTICS: WAVES AND SOUND</u> elasticity; properties of sound; reflection and refraction; interference; diffraction; piezoelectric effect; physics of hearing; decibel scale</p> <p><u>5. SOUNDS IN BIOLOGY AND MEDICINE</u> hearing testing – audiometry; bats and echoes; sounds produced by animals; clinical uses of sound</p> <p><u>6. HISTORY AND BASIC CONCEPTS OF OPTICS</u> short history of optics; basic definitions (geometric optics, Snell's law, converging lenses, diverging lenses, lens immersed in material medium)</p> <p><u>7. OPTICS</u> physics of vision; nature of light; refraction and lenses; image formation by eye; common vision defects; optical instruments; color vision; electromagnetic spectrum of light; quantum theory of light; interaction of electromagnetic waves with matter</p> <p><u>8. LASERS</u> characteristics of lasers; types of lasers; biological effects of laser irradiation, clinical application in surgery, dermatology, gynaecology, orthopaedics, rheumatology, biostimulation</p> <p><u>9. ATOMIC AND NUCLEAR PHYSICS</u> scale mode of atom; nature of nucleus; spectroscopy; quantum mechanics; types of radioactivity; X-rays; radiation therapy; isotopic tracers; atomic theory and life</p>

Course title	Basic philosophy/ history of medicine
Number of credits	6 ECTS
Teaching methods	20 lectures, 20 seminars
Course objectives	Explore the history of Western medicine and its main branches from antiquity to the early 19th century, through a series of lectures that draw in the larger social and cultural context of each period under study. Investigate how medicine, health and illness are perceived. Encourage an understanding of how anatomical concepts of the body structure have shaped medicine. Study the biographies of the most outstanding persons, discoverers and inventors in history of medicine.
Course contents	Introduction to philosophy, the main branches of philosophy. Hippocrates, the father of medical ethics. Hippocratic Oath. Medicine in the Roman Empire. Galen and Galenism. Medicine in the Middle Ages; monasteries and universities. History of anatomy; ancient and medieval studies, early modern discoveries, anatomy and pathology in XIX century. Development of histology, cell biology and microscopic studies. William Harvey and the discovery of the circulation of the blood. Development of experimental physiology. History of surgery and clinical anaesthesia. Development of medical microbiology. History of drug treatment and pharmacology. Advances in diagnostics and clinical imaging.

Course title	Introduction to physiology
Number of credits	6 ECTS
Teaching methods	20 lectures, 28 seminars
Course objectives	The aim of the course is to explain basic issues including: structure and function of human tissues, blood, endocrine system and hormones, heart and cardiovascular system, respiratory system, urinary system, alimentary system and sensory organs. Introduction to Physiology prepares students to Physiology course.
Course contents	Types of human tissues. Structure and functions of the blood. Types, structure and functions of muscles. Signal conductivity. Endocrine system and hormones. Structure and functions of the heart. Functions of the cardiovascular system. Functions of the respiratory system. Functions of the urinary system. Functions of the alimentary system. Functions of sensory organs.

Course title	Methodology of learning
Number of credits	2,5 ECTS
Teaching methods	10 seminars
Course objectives	After the course students will understand the basic mechanisms of motivation. They will be able to develop learning skills, manage time and plan their academic and non-academic activities. They will also be able to make use of selected techniques of memorization as well as manage stress and learn more effectively.
Course contents	Introduction and general motivation; Theory of learning, concentration, learning tips; Time management (tools and techniques); Test taking and anxiety; Note taking and textbook reading; Stress management; Healthy decision making.

Course title	Nursing practice
Number of credits	4 ECTS
Teaching methods	120 labs
Course objectives	Preparation for practical work with patients with a particular emphasis on professional ethics, including the need to maintain confidentiality, the epidemiological recommendations for medical staff during the contact with the patient, the principles of subjective and objective examination of the patient, nursing care of patients. During the training process, the student should acquire the following skills: 1. understanding the basic principles of medical ethics, 2. acquisition of knowledge necessary to comply with the principles of epidemiology in health care, 3. ability to make contact with patient and patient's needs assessment in nursing care, 4. general knowledge of types of additional tests and symptomatology of diseases

	<p>5. ability to manage the patients admitted to the ward routinely and learn how to evaluate vital signs and be able to understand a nurse's duty,</p> <p>6. Information about basic directions in nursing and patient's care in health state and various disorders; practical skills in dressing wounds and bandaging of various parts of the body; application of special dressing in treatment of complicated wounds, suturing of wound- various types of sutures, preparing and application of various kinds of injections, administering medicines in adults and children, information of kinds and role of vaccines in prophylaxis; differences in pediatric nursing- special considerations for every group of children,</p> <p>7. Information about various kinds of intravenous infusions-practical skills in preparing and application of intravenous injections and infusions; blood groups – role in transfusion, examination of blood group and Rh factor; technique of collecting venous and blood samples; technique of urinary catheterization; technique of administration of nasogastric tube and care of patients with artificial way of feeding; nursing in airway disturbances; collecting of first aid kit contents for various proposes; rules of first aid in emergency situations; nursing in fever in child and adult.</p>
<p>Course contents</p>	<p>1. Medical knowledge sources (magazines, books, internet). Practical exercises devoted to the use of medical databases</p> <p>2. Rules of keeping medical documentation. Malpractice.</p> <p>3. Types of laboratory tests. Rules of taking blood samples.</p> <p>4. The principles of subjective and objective examination.</p> <p>5. Imaging techniques – USG, CT, MRI.</p> <p>6. Hypertension. Laboratory: rules of taking blood pressure</p> <p>7. CHF. Heart auscultation., puls, oedema.</p> <p>8. Myocardial infarction. Arrhythmias. ECG.</p> <p>9. Obesity – reason, evaluation, consequences.</p> <p>10. Exercise for the prevention of lifestyle diseases. How to plan a training for a healthy person</p> <p>11. Respiratory failure. Interpretation of blood gases. Implementation and evaluation of spirometry.</p> <p>12. Asthma, COPD, pneumonia. X-ray pictures evaluation.</p> <p>13. Basic and advanced life support.</p> <p>14. Diseases of musculoskeletal system – ankylosis spondylitis, rheumatoid arthritis, degenerative joint disease. Physical examination. X-ray pictures evaluation.</p> <p>15. Cancer – risk factors, diagnostic procedures, prevention, screening.</p> <p>15. Diet - definition, types. General characteristics of mediterranean diet. Diet recommendation in weight loss treatment, diabetes, liver disease, cholelithiasis, kidney failure.</p> <p>16. Unconscious patient – diagnostic procedures. Glasgow scale.</p> <p>17. Peptic ulcer disease. IBS.</p> <p>Preparing the patient for endoscopy: colonoscopy. Applying stomach tube. Diseases of the liver, gallbladder and pancreas. Laboratory tests and imaging (ultrasound, CT, ERCP)</p> <p>18. Colon cancer - epidemiology, clinical course, diagnostics, treatment. Case presentation.</p> <p>19. Breast cancer – prevention, clinical symptoms, treatment. Case presentation.</p> <p>20. Prostate cancer - - epidemiology, clinical course, diagnostics, treatment. Case presentation</p> <p>21. Lung cancer - behavior that increase the likelihood of disease. Clinical symptoms, diagnostics, treatment. Harmfulness of smoking</p> <p>22. Chronic kidney failure. Dialysis.</p> <p>23. Diabetes. Types of insulin. Insulin injections.</p> <p>24. Most common endocrine disturbances - hyperthyreosis, hypothyreosis, hypocorticism. Case presentations.</p> <p>25. Diagnostics of selected hematological disturbances. Blood smear, bone marrowbiopsy, trepanobiopsy, examination of lymphnodes.</p> <p>26. Anemia - most common reasons. Anticoagulant therapy.</p> <p>27. The patient in terminal state - making therapeutic decisions</p> <p>28. First aid in different clinical conditions</p> <p>Usage of a stethoscope, taking blood pressure, Taking pulse from peripheral arteries, wound dressing, taking (blood, urine, wound swabs and other biological materials) for laboratory analysis, antiseptic and aseptic definitions and practical implementation. Basic CPR procedures, Medical emergencies, Glasgow consciousness scale</p> <ul style="list-style-type: none"> • rules and regulations of nursing in the world • methods of cleaning, disinfecting- materials and indications

	<ul style="list-style-type: none"> • sterilization- methods and equipment, organization of sterile field in hospital • dressing wounds- materials, technique and kinds of special dressings; surgical sutures- types and care of surgical wounds • bandaging- materials, technique of bandaging of various parts of the body • restraints- materials, indications and technique • pediatric nursing- care of neonates, toddlers, preschoolers and schoolers- main health problems in every group, role of vaccines in prophylaxis • routes of drug administration, various kinds of medicines • applications of various medicines in adults and children- administration of eye drops, nasal drops and medicines to ear canal • injections- types of injections, technique of intramuscular, intradermal and subcutaneous injections, practical application of injections • indications and complication of various types of injections, preparing medications from ampoules and vials- differences of technique and types of medications • intravenous injections and infusions- materials, indications, • preparation and administration • blood transfusion- types, indications and technique; blood groups and their roles in transfusion, early and late complications of transfusion, Rh factor- its role in physiology and pathology • obtaining venous blood samples- technique, indications, types of laboratory tests, role and kinds of anticoagulants in clinical practice • obtaining capillary blood samples- technique, indications, types of laboratory test, gas blood analyze- parameters, role of glucometer in diabetes, types of examination of glucose level • urinary catheterization- indications, technique in women and men, complications of the method, urine sample analyze in acute and chronic urinary disorders, care of the patients with urinary infection • nasogastric tube- equipment, indications, types of enteral feeding in various gastrointestinal disorders, indications for artificial feeding • administering an enema- materials, indications, technique and complications • oxygen therapy- indications, types of equipment, complications, care of the patients with artificial airways • obtaining the body temperature- methods, equipment, care of children and adults in fever; treatment of fever at home • first aid kit- contents, types of kits, preparing of kit for various proposes • main rules of first aid in adults and children, emergency situations in everyday life
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Course title	Physical education
Number of credits	2 ECTS
Teaching methods	60 labs
Course objectives	Improving the overall efficiency of psychomotor Development of efficient coordination, endurance and stamina Improving the efficiency of motor system function Improving the efficiency of cardiovascular function and respiratory
Course contents	1) Development of muscle strength 2) Development of agility 3) Shaping exercises each muscle group

Course title	Polish I
Number of credits	0,5 ECTS
Teaching methods	30 labs
Course objectives	After the course the student is able to: - pronounce Polish sounds - discover „Polish” words in their own language and words from their own language in Polish (internationalisms) - understand and use basic greetings , both formal and informal - introduce themselves - give basic information concerning their location and type and year of their studies in Poland

	<ul style="list-style-type: none"> - understand and use numbers and tell the time - understand the basic interrogative words - name days of the week - name basic food types - communicate in stores
	<p>The course contents comprises:</p> <p>Grammar</p> <ul style="list-style-type: none"> - pronunciation of Polish sounds - nouns and their number and gender - introduction to noun inflection - introduction to verb inflection in the singular and in the plural - adjectives and their adjustment to the noun gender - the basics of Polish sentence structure in the affirmative , negative and interrogative sentences incl. general and specific questions - the Nominative , Locative , and Instrumental cases - basic prepositions and prepositional phrases - cardinal numerals - ordinal numerals and their gender - personal pronouns <p>Lexis concerned with:</p> <ul style="list-style-type: none"> - „international words” and their Polish pronunciation - greetings and „survival Polish” phrases - formal ways of addressing adult people - description of study field, study subjects, students’ countries/nationalities , students’ address and accommodation in Poland - rooms and facilities in the dormitory - types and names of foodstuffs , shopping for food, - days of the week - telling the time including the 12h. and 24 h. clocks

Course title	Polish II
Number of credits	0,5 ECTS
Teaching methods	30 labs
Course objectives	<p>After the course the student is able to:</p> <ul style="list-style-type: none"> - report lodging problems - express likes and dislikes - use numbers to give time - take part in cultural and social events
Course contents	<p>The course contents comprises:</p> <p>Grammar</p> <ul style="list-style-type: none"> - conjugation of verbs in the present tense - Accusative and Genitive cases of nouns - more complex numerals - possessive pronouns, - question words for specific questions <p>Lexis concerned with</p> <ul style="list-style-type: none"> - problems with accommodation - people around us - asking and giving the time - going out: theatres, museums, restaurants, inviting, etc.