

## **Nursing sciences (6 ECTS)**

- ***General nursing (3 ECTS)***

Development of the health concept in the holistic view of human being. The professionalization process of nursing, the knowledge in the field and the reference values. Formative and professional evolution: analysis of the main rules that control the formation and the professional practice of nursing. Definition of science and discipline applied to nursing. Definition and features of conceptual model, theory and classification. Phenomena of interest in nursing and main conceptual models and theories of nursing: Nightingale, Henderson, Roper, Orem, Roy, Zanolli, Peplau and Leininger. Taxonomies and classification systems: Gordon, taxonomy II, NANDA. The main integration areas among health professions: classes of the nursing and midwifery professions, rehabilitation professions, technical professions and prevention professions.

- ***Clinical methodology in nursing (1 ECTS)***

Definition and description of the different phases of the nursing process. Instrumentation and methodology required for: assessment, planning, implementation and evaluation. Evaluation of the quality of nursing care: appropriateness, effectiveness and efficiency. Nursing records for taking charge of patients. Definition and description of the different phases in diagnostic-therapeutic-care pathways. Commitment to offer updated and validated nursing acts; construction of standard nursing care plans. Guidelines for clinical care pathways. Procedures, protocols and operative instructions.

- ***Deontology (1 ECTS)***

Definition of ethics, morals, bioethics, deontology: community and specificity. The moral maturity of the professional as a condition for the declension of ethics: the process of moral development according to Kohlberg. The development of knowledge and cognitive maturity.

Historical development of deontology in nursing: at international level (FEPI, ICN); at Italian level: deontological codes of 1960, 1977, 1999 and 2009. Comparative analysis of the codes with special regard to declared values, professional secrecy and conscientious clause.

Nursing deontology today: definition, features and implications. Declension of the ethical rules in different nurse settings: typical cases.

- ***General psychology (1 ECTS)***

The organization of the psychological knowledge: psychology as a natural science, psychology as a behavioral science, psychology as a science of the relation subject/world, psychology as a science of the construction of reality. Psychology and biology: adaptation (evolution, health/disease). Representations of the subject in psychology and biology. The passive, active and autonomous subject/organism.

## **Biomolecular sciences (5 ECTS)**

### • ***Biochemistry (3 ECTS)***

Physical measurements. International system of units. Properties of the matter. Homogeneous and heterogeneous systems. Atomic structure. Atomic number, mass number and isotopes. Atomic mass. Mole concept. The periodic table of the elements. Groups and periods. Metals and nonmetals. Electronegativity. Ionic bond and ionic compounds. Covalent bond. Molecules. Lewis structural formulas. Basis of molecular geometry. Resonance. Intermolecular interactions. Hydrogen bond. Physical states of the matter. Changes of state. Gases. Equation of state for an ideal gas. Partial pressures in a gas mixture. Liquids. Vapor pressure of a liquid. Dynamic equilibria and Le Châtelier principle. Oxidation number. Nomenclature of important classes of chemical compounds. Chemical equations. Redox reactions. Spontaneous changes. Rates of reactions. Catalysis. Chemical equilibrium and equilibrium constant. Solutions. Solubility. Solution concentration. Colligative properties of solutions: osmosis and osmotic pressure. Brønsted-Lowry concept of acids and bases. Acid-base reactions: salts. Water ionic-product. pH and pOH. Acids and bases in aqueous solution. Buffer solutions and physiological buffers. Organic compounds: functional groups, nomenclature, main properties and reactions. Hydrocarbons. Structural isomerism. Stereoisomerism. Alcohols. Phenols. Aldehydes and ketones. Amines. Carboxylic acids and their derivatives.

Structure and function of carbohydrates: monosaccharides and their derivatives, oligosaccharides, polysaccharides. Mucopolysaccharides, proteoglycans and glycoproteins. Structure and function of lipids: fatty acids, acylglycerols, glycerophospholipids; sphingolipids; cholesterol and steroids; eicosanoids. Lipophilic vitamins. Lipid transport in blood: lipoproteins. Structure of amino acids. Peptide bond. Structure and function of proteins. Haemoglobin. Collagen. Enzyme catalysis. Enzyme activity. Enzyme inhibition. Allosteric and covalent regulation of enzyme activity. Coenzymes. Hydrophilic vitamins. Isoenzymes. Catabolism and anabolism. Metabolic pathways. Principles of bioenergetics: coupled reactions and role of ATP. Regulation of metabolism. Description of the main metabolic pathways: glycolysis, gluconeogenesis, phosphopentose pathway, glycogen metabolism, regulation of glycemia;  $\beta$ -oxidation and synthesis of fatty acids, biosynthesis of cholesterol, physiologic role of ketone bodies; catabolism of amino acids, urea biosynthesis; Krebs cycle. Respiratory chain. Oxidative phosphorylation. Mechanism of action of hormones.

### • ***Experimental biology (1 ECTS)***

Living organisms. Prokaryotes. Eukaryotes. General description and characteristics of living organisms. Concept of evolution. Organization levels of living organisms. Principle of classification of living organisms. Prokaryotic cell: structure and characteristics. Bacterial wall. Comparison with eukaryotic cell. Autotrophs and heterotrophs. Aerobic and anaerobic organisms. Structure and functions of biological membranes. Fluid mosaic model of biological membranes made up of a fluid lipid bilayer and associated proteins. Transport across the membrane: passive diffusion and facilitated diffusion. Passive transport and primary and secondary active transport. Viruses. Structure and classification on the basis of capsid, genetic information, host cell type. Viral infection mechanism of prokaryotic and eukaryotic host cell. Retroviruses. Molecular basis of heredity. DNA is the genetic material. DNA structure: double helix of Watson and Crick, chemical-physical properties. Genetic value of DNA. Molecular mechanism of DNA replication and repair. DNA replication is semi-conservative (Meselson and Stahl experiment). DNA replication of Prokaryotes and Eukaryotes is the result of the cooperation of diverse proteins. Genetic information flux: the expression of genetic information through transcription and translation. Transcription is

the synthesis of RNA from a DNA template. RNAs: mRNA, rRNA, tRNA. RNA polymerase. Post-transcriptional modifications of eukaryotic mRNA, rRNA, tRNA. Splicing mechanism of primary transcripts. Genetic code: general characteristics, properties and its biological implication. Translation is the synthesis of a protein from a mRNA template. Amino acid activation and role of the amino acyl-tRNA synthetase. tRNA structure. Prokaryotic and eukaryotic ribosomes: structure and role in translation. Translation includes initiation, elongation and termination. Hints of post-translational modifications of proteins. Cell cycle is a sequence of cell growth and division, description and significance of the diverse phases. Mitosis and meiosis. Biotechnology. Recombinant DNA technology. DNA cloning and its applications. In vitro DNA amplification: PCR.

- ***Genetics (1 ECTS)***

Description and analysis of normal human karyotype. Chromosomal aberrations: 1) Numerical disorders: aneuploidy and polyploidy. Errors in cell division following mitosis or meiosis. 2) Structural abnormalities: deletions, duplications. Pericentric and paracentric inversions. Reciprocal and Robertsonian translocations. Isochromosomes. Ring chromosomes. 3) Mosaicism.

Gene mutations. Mendel's laws. Transmission of monofactorial traits: autosomic, X-linked. Reduced penetrance, variable expression, genetic heterogeneity. Mitochondrial inheritance. Genealogic trees: representation and analysis.

## Morphological and functional sciences (9 ECTS)

- ***Histology (1 ECTS)***

The eukaryotic cell, with regard to human organism. Cell membrane, cytoplasm, nucleus. Mitosis, chromosomes. Apoptosis. The tissues of the human body. Stem cells, progenitor cells, terminally differentiated cells. Classification of epithelial tissues; surface epithelia; main features of exocrine glands and of endocrine tissues. Extracellular matrix; classification of connective tissues. Cells of connective tissue proper; cartilage; bone, including principles of bone formation, remodeling and renewal. Blood cells and platelets; main features of hematopoiesis. Smooth muscle tissue; striated muscle tissue, skeletal and cardiac. Nerve tissue: neurons (soma, dendrites, axon, synapses); main features of neuroglia; nerve fibers (myelinated and non-myelinated); main features of motor end plate and of peripheral nerve receptors. Tissues of the chorionic villi.

- ***Human anatomy (4 ECTS)***

**Introduction to human anatomy.** Levels of structural organization: organs and systems. Anatomical nomenclature; anatomical position and directional terms, body planes and sections, body cavities and membranes.

**Skeletal system.** Bones and joints: classification. Morphology of the human skeleton. The axial skeleton (skull, vertebral column, thoracic cage). The appendicular skeleton (pectoral girdle, upper limb, pelvic girdle, lower limb).

**The muscular system.** Naming skeletal muscles. Major skeletal muscles of the body.

**The cardiovascular system.** Heart. Blood vessels.

**The lymphatic system.** Lymphatic vessels. Lymph Nodes. Spleen. Thymus. Tonsils.

**The respiratory system.** Nose and paranasal sinus. Pharynx. Larynx. Trachea and bronchi. Lungs and pleurae.

**The digestive system.** Oral cavity and related structures (mouth, salivary glands, teeth, tongue). Pharynx. Esophagus. Stomach. Small and large intestines. Liver, biliary ducts and gallbladder. Pancreas. Peritoneum.

**The urinary system.** Kidneys. Ureters. Urinary bladder. Male and female urethra.

**The reproductive system.** Testes and epididymes. Ductus deferens. Spermatic cord. Scrotum, penis. Prostate and seminal vesicles. Ovaries. Uterine tubes. Uterus. Vagina. Female external organs.

**The endocrine system.** Adeno and neurohypophysis, hypothalamus. Pineal gland. Thyroid gland. Parathyroid glands. Pancreatic islets. Suprarenal glands. Diffuse neuroendocrine system.

**The nervous system.** Overview and organization. Spinal medulla. Brain. Meninges. Basic motor pathways. Basic sensory pathways. Peripheral apparatus of the special senses. Peripheral nervous system: cranial nerves, spinal nerves, autonomic nervous system.

**The integumental system.** Skin, epidermis, dermis. Appendages of the skin: nails, hair and hair follicles, sebaceous glands, sweat glands. Breasts.

- **Physics (1 ECTS)**

**Introduction to mechanics.** Principles of kinematics: definition of velocity and acceleration. Dynamics: the force concept. The three laws of motion. Examples of forces. Potential energy, kinetic energy, mechanical energy: definitions and examples.

**Principles of hydrostatics and hydrodynamics.** Hydrostatic pressure. Buoyancy: Archimede's principle. The model of ideal fluid. Fluid flow and mass conservation principle. The energy conservation principle: relation between fluid pressure, velocity, piezometric height. The viscous fluid model. Flow rate dependence on geometrical factors and viscosity.

**Principles of thermodynamics.** Thermodynamic systems. Macroscopic and microscopic, extensive and intensive physical quantities in thermodynamics. Pressure, work, energy. The ideal gas model. Equation of state. Thermodynamic coordinates. Phase diagrams. Phase transitions. Heat. The first law of thermodynamics.

**Principles of electrostatics and electric currents.** The electric charge. The Coulomb's law. Definition of the electric field produced by a system of charges. Electrostatic potential energy. Electric potential. Definition of electric current. The Ohm's law. Electric conductors and insulators. Examples.

- **Physiology (3 ECTS)**

### **Electrical properties of the cell membrane**

Membrane potential. Selective membrane permeability. Intracellular and extracellular ionic concentrations. The resting membrane potential. Ion channels. Active and passive ion currents. Sodium-potassium ATPase. Subthreshold graded potentials. Depolarization and hyperpolarization. Spatial and temporal summation. Action potential. Characteristics. Ion movements. Refractory period. Conduction in myelinated and amyelinated fibres. Classification of nervous fibres.

### **Cell-to-cell Communication**

General properties of synaptic transmission. Electrical synapses. Chemical synapses. Excitatory and inhibitory postsynaptic potentials. Neurotransmitters and neurotransmitter actions. The neuromuscular junction: structure and function; acetylcholine release and postsynaptic action.

### **Neurophysiology**

Sensory systems. Sensory receptors. Sensory transduction, receptor potential, stimulus intensity effect, adaptation. Signal coding. Somatic and visceral sensation – Peripheral mechanisms: receptors and afferent fibres for mechanic, proprioceptive, thermal and pain sensation. Central pathways of pain perception. Referred pain. Somatosensory cortex. Motor systems. Spinal reflexes: definition and general properties. Muscular somatic reflexes: afferent and efferent fibres in reflex arcs. Muscle spindle reflex. Golgi tendon organ reflex. Defensive reflex. Autonomic nervous system. Functional organization. Sympathetic and parasympathetic nervous systems.

### **Muscle physiology**

Skeletal muscle. Functional organization. Structure and mechanism of the contraction. Sliding filament theory. Crossbridge cycles. Excitation-contraction coupling. Mechanics of muscle

contraction. Twitch and tetanus. Isometric and isotonic contractions. Force-velocity relation. Length-tension relation. Fast and slow muscle fibres. Motor unit. Smooth muscle. Functional organization. Excitation-contraction coupling. Regulation of the electrical and contractile activity. Cardiac muscle. Functional organization. Similarities and differences compared to the skeletal muscle.

### **Cardiovascular system**

Heart. Cardiac conduction system and contractile myocardium. Excitation-contraction coupling. Cardiac electrophysiology – Myocardial action potentials. Pacemakers and electrical conduction, refractory period. The electrocardiogram. Contractility and cardiac cycle. Cardiac output. Regulation of the stroke volume and heart rate. Role of the autonomic nervous system. Frank-Starling law of the heart. Circulation. Characteristics and function of the blood vessels. Pressure, volume, flow, and resistance. Poiseuille's law. Systolic, diastolic and mean arterial blood pressure. Measurement of arterial blood pressure. Distribution of blood to the tissues and resistance in the arterioles. Exchange at the capillaries. Regulation of blood pressure.

### **Respiratory system**

Mechanical aspects of respiration – lung volumes and capacities. The spirometry. Respiratory muscles. Elastic properties of the lungs, intrapleural pressure, pressure-volume curve, surfactant. Elastic properties of the chest wall. Gas exchange – partial pressures of gases in the inspired and alveolar air. Pulmonary and alveolar ventilation. Gas transport in the blood. Alveolar ventilation/perfusion relationship. Nervous control of respiration.

### **Urinary system**

Nephron. Glomerular filtration and glomerular filtration rate. Tubular reabsorption and secretion. Water and electrolyte reabsorption. Antidiuretic hormone and aldosterone effects. Excretion. Urination. Use of renal clearance for kidney efficiency determination.

### **Digestive system**

General physiologic functions. Regulation of intestinal motility. Secretion. Cephalic, gastric, intestinal phases. Digestion and absorption.

### **Female reproductive system**

Physiologic adaptation during pregnancy, labor and birth process. Regulation of uterine smooth muscle contractility.

## Clinical propaedeutics (7 ECTS)

### • *Pathophysiology (3 ECTS)*

Define disease and its related terms: etiology and pathogenesis. Principal causes of disease, host response and factors predisposing to disease. Cellular pathology: cell injury, morphological and biochemical changes of injured cells, hypoxia, necrosis and apoptosis. Inflammatory process, repair and regeneration. Acute inflammation: mechanisms of vascular changes, chemical and cellular, chemotaxis, phagocytosis, functions and types of inflammatory exudates, general aspects of chronic inflammation and granulomatous inflammation, wound healings, healing of bone and peripheral nervous system, failure to heal by either systemic or local factors, hypertrophic scars and keloids. The systemic effects of inflammation, e.g. acute-phase reaction: the acute-phase proteins, stimulation of leukocyte production, ESV, metabolic and hormonal changes. Fever: pyrogens and types of fever. Immunobiology and immunopathology: humoral and cell-mediated immunity, definition of antigen, the MHC system, active and passive immunization, tolerance, pathogenesis of autoimmune diseases, transplants, GVHD, hypersensitivity reactions (anaphylactic, antibody-dependent cytotoxicity, immune complex-mediated, cell-mediated). General pathology of the circulation: local and general edema; local ischaemia: thrombosis, embolism, atherosclerosis; general ischemia: disseminated intravascular coagulation, shock. General pathology of red blood cell disorders: anaemia, blood grouping and their adverse reactions. Hyperplasia, hypertrophy, atrophy, metaplasia and dysplasia. General Pathology of tumors: causes of cancer, classification of tumors, tumor progression and metastatic dissemination, local effects, paraneoplastic syndromes and “tumor cachexia”. General pathology of chemical equilibrium: disturbances in water and electrolyte balance and in acid-base balance. General pathology of diabetes and gout.

### • *Microbiology (2 ECTS)*

Characteristics of the main infection agents. Vital associations: commensalism, mutualism, parasitism. Associated microbial flora. General information on infectious diseases: infective relationship, infection and disease, endogenous and exogenous infections, opportunistic infections.

**Immunology** - The concept of innate immunity and acquired immunity. Role of immune responses in different infections. The survival of infectious agents to the mechanisms of immunity. Principles of microbiological diagnostics.

**Bacteriology** - The bacterial cell: structure and basic functions. Gram-negative and gram positive. The spore. Bacteria cultivation: growth and development of bacterial populations. Elements of bacterial genetics: mutations and mechanisms of genetic recombination. Principles of pathogenicity and virulence. The bacterial toxins: exotoxins and endotoxins. Mode of action of main antibacterial drugs. Resistance to chemotherapeutics and antibiotics. Examples of bacteria of medical interest and associated diseases.

**Virology** - Nature, methods of study and classification of viruses. Composition and architecture of the viral particle. Cultivation. Virus-cell relationships: productive infection, transforming infection. Virus-host relationships: acute, persistent, latent, slow. Pathogenetic mechanisms in viral infections. Notes of immunoprophylaxis and antiviral chemotherapy. Examples of viruses of medical interest and associated diseases.

**Mycology** - Habitat and morphology of fungi (yeasts, mycelial fungi). Structure of the fungal cell. Fungal diseases: fungi, mycotoxicosis, mycosis. Examples of fungi of medical interest and associated diseases.

**Parasitology** - The protozoan cell: morphology and structure. Main features of Helminths and Arthropods. Examples of parasites of medical interest and associated diseases.

- ***Clinical biochemistry (1 ECTS)***

Laboratory medicine: definition and aims. Measurements. Analytical and biological variability. Quality control. Reference ranges. Glycidic metabolism. Plasmatic proteins. Plasmatic lipids and lipoproteins. Non proteic nitrogenous compounds (urea, ammonia, uric acid, bilirubin). Clinical enzymology. Hormones in clinical biochemistry. Circulating tumor markers. Electrolyte and iron balance.

- ***Clinical pathology (1 ECTS)***

Clinical pathology: definition. First-level analysis. Urinalysis: macroscopic, microscopic, physicochemical, analysis of urinary cast and microbiological culture. Examination of feces: macroscopic and microscopic features, chemical analysis. Complete blood count: differential diagnosis between anaemias. Erythrocyte sedimentation rate (ESR). Automation. Point of care testing: analysis at the patient bed in different scenarios, such as primary care, emergency room, intensive care. Instrumentation. Feasible tests. Benefits and disadvantages of point of care testing. First-level diagnostics in specialized fields: haemostasis and related diseases, autoimmune diseases. Outlines of liver and kidney diseases. Outlines of familial hemoglobinopathies.



## **Implementation of health and safety (4 ECTS)**

- ***Hygiene and public health (2 ECTS)***

Definition of epidemiology, hygiene and public health. The concept of health and its evolution during years. Concepts of etiologic agent and risk factor. Natural history of diseases and prophylaxis interventions: primary, secondary and tertiary prevention. Data sources in epidemiology. Collection, elaboration and graphic representation of data. Ratios, proportions and rates. Incident and prevalent morbidity. Mortality: mortality for causes, age and gender. The concept of lethality. Endemic and epidemic distributions. Epidemic models. Fundamentals on descriptive, analytical and experimental epidemiological studies.

- ***Security on work place (1 ECTS)***

Principal norms regarding hygiene and safety on work's place. Environmental and biologic monitoring. Professional risks regarding nurse work: biologic risk, chemical risk, physical risk, manual lifting workload.

- ***Nursing in public health (1 ECTS)***

Public health: analysis of national and regional legislation about the system of services and professional skills. Specific nursing skills in different areas of public health: levels of integration, tools and organisational models. Methodologies for health education: approach to the individual, to the group and the family; the concept of empowerment, methods (information campaigns, conferences, group works, delivery of educational material etc.) and aids (flyers, brochures, posters etc.)

## **Helping relationship and adaptation (5 ECTS)**

- ***Cultural anthropology (1 ECTS)***

Anthropology and culture. Synergic effect due to quantitative and qualitative methodologies; main goals of qualitative methodologies. Narrative medicine and narration of disease. Anthropology in health: fields of application, theoretical and methodological proposals; the critical-explanatory approach. The use of narration in medical anthropology research and its possible use in nursing. The hospital as a place. The ritual of passage and the role of food (in particular, birth, death, and disease). Health, migrations and inequalities. Care access.

- ***Clinical psychology (2 ECTS)***

Understanding of clinical psychology implies understanding of general psychology. Continuity between these disciplines. Concept of “project of psychology” and definition of the representations of the subject (passive, active, autonomous), exploring the consequences in the processes of psychological knowledge and intervention. Analysis of the clinical relationship as a result of a build-up process involving crucial technical elements: the definition of the context into which the knowledge develops, the presence in the field of the intervening, the setting definition, the analysis of the request, the role and use of emotions. The discussion about normal and pathologic precedes the discussion on the observation and evaluation of adaptive processes.

The renewal of the concept of autonomy allows to propose the processes of changing (goals of the clinical care intervention) in the form of adaptations for searching possible development in the presence of constraints.

- ***Care relationship (1 ECTS)***

The experience of disease for the patient, his family and community under different context. The adaptive processes of the person and his family experiencing disease, mourning and death. Principle and basic elements of the nurse-client relationship. The visual behavior. Paralanguage. The use of time and outward appearance. The physical contact. Therapeutic touch. Narrative nursing as a methodology for understanding the patient. Principles of the nurse-client communication. Application of the main communicative techniques in different care contexts where the relationship develops. The relationship in a trans-cultural context. The care relationship with the “tough patient”. Basics of counseling. Self-help and mutual-help. The management of relationships in the assistance team. The communication in the assistance team. The management of emotions by the nurse. A disease linked to care relationship: the “burnout”.

- ***History of medicine and nursing (1 ECTS)***

Introduction. Materials and methods. The historical sources. The classical world. The Hippocratic devolution and the development of the “scientific medicine”. The origin of Western medical ethics. Middle Age and Renaissance. The origin of the concept of *Hospitalitas*. Well being and Health care. Art and Anatomy. The Modern Age. From measurement to experiment. The grounds of diagnosis. Henry Dunant and Florence Nightingale. The biomedical devolution of the XX.th century. Evolution of the concept of assistance and nursing.