

Study plan

Name of study plan: Optics and Optometry - full-time

Faculty/Institute/Others:

Department: Department of Natural Sciences

Branch of study guaranteed by the department: Optics and Optometry

Garantor of the study branch: doc. Ing. Marie Pospíšilová, CSc.

Program of study: Biomedical and Clinical Technology

Type of study: Bachelor full-time

Required credits: 180

Elective courses credits: 0

Sum of credits in the plan: 180

Note on the plan:

Name of the block: Compulsory courses

Minimal number of credits of the block: 172

The role of the block: Z

Code of the group: 17PBO POV 16

Name of the group: Optics and Optometry compulsory course 16

Requirement credits in the group: In this group you have to gain 172 credits

Requirement courses in the group: In this group you have to complete 49 courses

Credits in the group: 172

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
17PBOAF1	Anatomy and Physiology I Radek Matlach Yulia uprová Ivan Dylevský (Gar.)	Z,ZK	5	2P+2S	Z	z
17PBOAF2	Anatomy and Physiology II Radek Matlach Ivan Dylevský Radek Matlach (Gar.)	Z,ZK	5	2P+2S	L	z
17PBOAFPO	Anatomy, Physiology and General and Special Pathology of Eye Ivan Dylevský, Ján Lešták Ivan Dylevský Ivan Dylevský (Gar.)	ZK	2	2P	Z	z
17PBOBP	Bachelor Thesis Ján Lešták, Pavel Studený, Gabriela Mahelková, Petra Srovnalová, Marie Pospíšilová, Šárka Pitrová, Markéta Žáková, Jiří Novák, P emysl Ku era, Miroslav Jelínek	Z	10	8S	L	z
17BOZP	Occupational Safety and Health, Fire Protection and First Aid Petr Kudrna Petr Kudrna Petr Kudrna (Gar.)	Z	0	1P	Z	z
17PBOBZOA	Binocular Vision, Orthoptics Markéta Žáková, P emysl Ku era, Jakub Král, Jakub Hlavá ek, Ond ej Polícar Jakub Král Markéta Žáková (Gar.)	Z,ZK	7	2P+4S	Z	z
17PBOBCHA	Biochemistry Ta ána Jarošíková, Romana Šíroká Ta ána Jarošíková Romana Šíroká (Gar.)	Z,ZK	3	2P+1C	Z	z
17PBOBLG	Biology Veronika Vym talová Ta ána Jarošíková Veronika Vym talová (Gar.)	Z,ZK	5	2P+2L	Z	z
17PBOBT	Spectacles Technology P emysl Ku era, Jiří Michálek, Jakub Král, Martin Otáhal, Richard Baštecký Petr Písa ík Martin Otáhal (Gar.)	Z,ZK	6	2P+4S	Z	z
17PBOCHMO	Chemistry for Optics and Optometry Romana Šíroká Romana Šíroká (Gar.)	Z,ZK	2	2P+1L	L	z
17PBOEVO	Economy and Management Martina Caithamlová Martina Caithamlová (Gar.)	KZ	2	1P+1S	L	z
17PBOFO	Pharmacology of Eye Ján Lešták Ján Lešták Ján Lešták (Gar.)	Z	2	1P	L	z
17PBOFYZ	Physics Jana Urzová, Petr Písa ík, Eva Urbánková, Svitlana Strunina, Jan Mikšovský Petr Písa ík Jana Urzová (Gar.)	Z,ZK	5	2P+2S	Z	z
17PBOGMB	Genetics and Molecular Biology Veronika Vym talová Veronika Vym talová (Gar.)	Z,ZK	5	2P+2L	L	z
17PBOHO	General Histology and Histology of Eye Jiří Uhlík Ta ána Jarošíková Jiří Uhlík (Gar.)	KZ	2	1P+1S	Z	z

17PBOITT	Information Technologies and Telemedicine <i>Lenka Lhotská, Karel Hána Karel Hána Karel Hána (Gar.)</i>	KZ	3	2P+0C	Z	z
17PBOKC1A	Contact Lenses and Practice I. <i>Petra Srovnalová, Markéta Žáková, P emysl Ku era, Ji í Cendelín, Ji í Michálek Markéta Žáková Ji í Michálek (Gar.)</i>	Z,ZK	5	2P+2S	L	z
17PBOKC2A	Contact Lenses and Practice II. <i>Markéta Žáková, P emysl Ku era, Ji í Michálek, Ji í Cendelín Markéta Žáková Ji í Michálek (Gar.)</i>	Z,ZK	5	2P+2S	Z	z
17PBOKC3A	Contact Lenses and Practice III. <i>Markéta Žáková, P emysl Ku era Markéta Žáková Markéta Žáková (Gar.)</i>	KZ	3	2S	L	z
17PBOKRVA	Correction of Refractive Errors <i>Ján Lešták Markéta Žáková Ján Lešták (Gar.)</i>	KZ	2	1P	L	z
17PBOLTR	Medical Terminology <i>Leoš Navrátil Leoš Navrátil Leoš Navrátil (Gar.)</i>	Z	1	1P	Z	z
17PBOMCHA	Macromolecular Chemistry <i>Ji í Michálek Ji í Michálek Ji í Michálek (Gar.)</i>	Z,ZK	2	1P+1S	Z	z
17PBOMAZ	Management and Administration in Healthcare <i>Ji í erný Ji í erný Ji í erný (Gar.)</i>	KZ	2	2P	L	z
17PBOMA1	Mathematics I <i>Jana Urzová, Eva Feuerstein, Tomáš Parkman, Lucie Drbohlavová Petr Písa ík Eva Feuerstein (Gar.)</i>	Z,ZK	5	2P+2C	Z	z
17PBOMA2	Mathematics II <i>Jana Urzová, Eva Feuerstein Petr Písa ík Eva Feuerstein (Gar.)</i>	Z,ZK	5	2P+2C	L	z
17PBOMVV	Methodology of Research <i>Marie Pospíšilová, Petr Písa ík Petr Písa ík Marie Pospíšilová (Gar.)</i>	KZ	2	1P+1C	Z	z
17PBOMI	Microbiology and Immunology <i>Veronika Vym talová Ta ána Jarošíková Veronika Vym talová (Gar.)</i>	KZ	3	1P+1L	L	z
17PBONRA	Clinical Refraction <i>Ji í Novák Ji í Novák Ji í Novák (Gar.)</i>	ZK	2	1P	Z	z
17PBONMP	Proposal and Management of Project <i>Marie Pospíšilová Marie Pospíšilová Marie Pospíšilová (Gar.)</i>	KZ	2	1P+1S	L	z
17PBOOFP	Ophthalmology Instruments <i>Ján Lešták, Ji í Novák, Martin F s Petr Písa ík Ji í Novák (Gar.)</i>	KZ	3	3P	Z	z
17PBOOK1	Ophthalmology - Pathology, Clinic I. <i>Šárka Pitrová, Martin F s Blanka Br nová Šárka Pitrová (Gar.)</i>	Z,ZK	5	2P+2S	Z	z
17PBOOK2	Ophthalmology - Patology, Clinic II. <i>Šárka Pitrová, Martin F s Blanka Br nová Šárka Pitrová (Gar.)</i>	Z,ZK	5	2P+2S	L	z
17PBOOP1	Optical Laboratory I. <i>Jakub Král, Richard Baštecký Petr Písa ík Jakub Král (Gar.)</i>	KZ	2	2L	L	z
17PBOOP2	Optical Laboratory II. <i>Jakub Král, Richard Baštecký Petr Písa ík Jakub Král (Gar.)</i>	KZ	2	2L	L	z
17PBOOF	Physical Optics <i>Marie Pospíšilová, Ji í Novák, Petr Písa ík, Jan Mikšovský Petr Písa ík Marie Pospíšilová (Gar.)</i>	Z,ZK	4	2P+2S	Z	z
17PBOOGB	Geometric and Ophthalmic Optics <i>Ji í Novák, Petr Písa ík Petr Písa ík Ji í Novák (Gar.)</i>	Z,ZK	6	3P+2S	L	z
17PBOOMPA	Practical Exercises in Optometry <i>Markéta Žáková Markéta Žáková Markéta Žáková (Gar.)</i>	KZ	8	6L	L	z
17PBOPZP	Problems of Persons with Visual Impairment <i>Zde ka Va harová, Milan Pešák Milan Pešák Blanka Br nová (Gar.)</i>	KZ	2	1P+1S	Z	z
17PBOPPA	First Aid <i>Pavel Böhm Pavel Böhm Pavel Böhm (Gar.)</i>	KZ	2	1P+1S	L	z
17PBOPSL	Psychology <i>Martina Kusáková Martina Kusáková Martina Kusáková (Gar.)</i>	KZ	2	1P+1S	Z	z
17PBOSOP	Special Visual Aids <i>Zde ka Va harová, Milan Pešák, Blanka Br nová Blanka Br nová Milan Pešák (Gar.)</i>	Z,ZK	3	1P+1S	Z	z
17PBOSTA	Statistics <i>Vladimír Rogalewicz, Hana Schaabová Hana Schaabová Vladimír Rogalewicz (Gar.)</i>	KZ	2	1P+1S	L	z
17PBOSRBA	Strabology <i>Blanka Br nová Blanka Br nová Blanka Br nová (Gar.)</i>	KZ	2	1P+1C	Z	z
17PBOSUR1	Subjective Refraction I. <i>Markéta Žáková, P emysl Ku era, Jakub Král, Petr Písa ík Petr Písa ík Markéta Žáková (Gar.)</i>	Z,ZK	3	2P+2C	Z	z
17PBOSUR2A	Subjective Refraction II. <i>Markéta Žáková, P emysl Ku era, Jakub Král, Ond ej Policar Jakub Král Markéta Žáková (Gar.)</i>	Z,ZK	7	2P+4C	L	z
17PBOTPR	Team Project <i>Ján Lešták, Gabriela Mahelková, Petra Srovnalová, Marie Pospíšilová, Šárka Pitrová, Markéta Žáková, P emysl Ku era, Jana Urzová, Ji í Michálek, Petr Písa ík Marie Pospíšilová (Gar.)</i>	KZ	5	4S	Z	z
17PBOVZF	Diagnostic of Visual Functions <i>Ján Lešták, Markéta Žáková, P emysl Ku era, Jakub Král Blanka Br nová Ján Lešták (Gar.)</i>	KZ	2	1P+1S	Z	z
17PBOZFOA	Foundations of Physiological Optics <i>Ji í Novák Ji í Novák Ji í Novák (Gar.)</i>	ZK	2	2P	L	z

17PBOZPE	Fundamentals of Pedagogy and Education <i>Monika Donevová Monika Donevová Monika Donevová (Gar.)</i>	KZ	2	1P+1C	L	z
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Characteristics of the courses of this group of Study Plan: Code=17PBO POV 16 Name=Optics and Optometry compulsory course 16

17PBOAF1	Anatomy and Physiology I The combined subject of anatomy and physiology is the introductory course of medical subjects for non-medical specialties.				Z,ZK	5
17PBOAF2	Anatomy and Physiology II Anatomy and physiology II links to Anatomy and Physiology I. The subject covers functional aspects of particular organs and their systems.				Z,ZK	5
17PBOAFPO	Anatomy, Physiology and General and Special Pathology of Eye Introduction to pathology: definitions, goals, history, illnesses, symptoms. Etiology and pathogenesis of the disease on the organ, tissue, cellular and molecular level. External factors contributing to the emergence and development of disease. Pathogenic stimuli. Wound healing. Inflammation and tissue damage as a defensive phenomenon. Circulation disorders, atrophy, necrosis, tumors. Specific signs of pathological changes in the central nervous system, the eye, and the optical path.				ZK	2
17PBOBP	Bachelor Thesis Individual student projects at the end of bachelor studies. Topics are selected during the 5th term from a list. Bachelor thesis is defended at the end of the examination period. Bachelor thesis defence is a part of the state exam. Bachelor thesis can be written and defended either Czech or English. Students are supervised by a tutor during the above mentioned process.				Z	10
17BOZP	Occupational Safety and Health, Fire Protection and First Aid				Z	0
17PBOBZOA	Binocular Vision, Orthoptics Binocular vision conditions. Strabismus - extraocular muscles. Movements - conjugate, ductions Psion. Heterophoria, heterotropia. Developments of binocular movement, binocular vision. Sensory ganges in strabismus, diplopia, suppression, amblyopia. Anomalous retinae correspondence, eccentric fixation. Determination of angle of deviation. Goals of treatment. Principles of therapy of strabismus - use of prisms, decentration of glasses. Pleoptics, orthoptics.				Z,ZK	7
17PBOBCHA	Biochemistry Cell compartments structure and functions. Protein structure and function. Enzymes as catalysts. Bioenergetics. Biological oxidation. Biogenic amines. Hormones biochemistry, hormonal regulation. Biologically significant radicals. Metabolism of saccharides, lipids and lipoproteins, amino-acids, proteins, nucleotides and nucleic acids. Regulation of metabolism on a cell and organ level. Biochemistry of the intestinal tract, pancreas, biochemistry of liver and xenobiotics metabolism. Biochemistry of kidneys. Biochemistry of tetrapyrrols and porphyrins. Biochemistry of muscles, bones. Biochemistry of nervous system. Biochemistry of blood, hemocoagulation process and fibrinolysis. Metabolism of body fluids and ions, acidobasic balance.				Z,ZK	3
17PBOBLG	Biology Basic information about the cellular level of organisms - from acellular through prokaryotic to eukaryotic, endosymbiotic hypothesis. Structure and conformation of biopolymers (nucleic acids and proteins). Prokaryotic cells. Eukaryotic cells. Plant and animal cell structure and function. The nucleus, chemistry and structure of chromatin and chromosomes. Cytoplasm. Endomembrane system: endoplasmic reticulum, the Golgi apparatus, lysosomes, microbodies (glyoxisomes, peroxisomes), vacuoles. Semiautonomic organelles: mitochondria, sites of respiration and chloroplasts, sites of photosynthesis. The origin of eukaryotes: endosymbiotic hypothesis. Ribosomes. The cytoskeleton: microtubules, microfilaments. The cell cycle: mitotic (M) phase and interphase (G1, S and G2 phases). The division of cell nucleus - amitosis, mitosis, phases of mitosis, the mitotic spindle; meiosis. The cell division - cytokinesis. Cell differentiation. Cell death. Apoptosis and necrosis. Fundamentals of virology. Viruses - structure, life cycle and molecular biology. Viral genome.				Z,ZK	5
17PBOBT	Spectacles Technology Subject Spectacle Technology introduces students to technology and materials used in the production of glasses and their individual components. Students will learn about the materials used in spectacle optics - their composition, chemical and technological properties, processing characteristics, behavior under various conditions and machining properties. Furthermore, the properties and conditions of technological processes used for processing these materials into different functional parts of spectacles - spectacle lenses and frames. In the practical part of the exercise, students will perform practical glasses production.				Z,ZK	6
17PBOCHMO	Chemistry for Optics and Optometry Students will learn the basic areas of applied chemistry, organic chemistry, polymer chemistry and macromolecular chemistry in biomedical engineering.				Z,ZK	2
17PBOEVO	Economy and Management The subject presents basic economic terms, legal forms of entrepreneurship, founding budget, costs and their structure. Main contents of the subject are the problematics of accounting statements (P&L, balance sheet, cash flow). The subject also deals with competition analysis, financial analysis, product life-cycle, price strategy and the tax system.				KZ	2
17PBOFO	Pharmacology of Eye Pharmacokinetics of drugs into the eye, application of drugs, the therapeutic effect and side effects. The most commonly used drugs.				Z	2
17PBOFYZ	Physics Physics course will allow students to acquire and strengthen knowledge in these branches of physics: mechanics, thermodynamics, electromagnetic field and solid state physics. We focus on solid theoretical bases, but independent work in student labs as well as solving practical examples are also important parts of the course. Through the course we also touch the limits of the classical Physics.				Z,ZK	5
17PBOGMB	Genetics and Molecular Biology General genetics: basic genetic expressions. Genotypes and Phenotypes. Mendel's theory of inheritance. Basis of clinical genetics: heredity of genetic diseases, monogenic autosomal and gonosomal heredity and monogenic autosomal and gonosomal hereditary dominant and recessive disorders, polygenic heredity, examples of hereditary diseases. Mutagenesis: types of mutations and mutations consequences, physical, chemical and biological mutagens. Carcinogenesis, cell cycle regulation, protooncogens, tumor suppressor genes, chromosomal changes in tumors. Clinical cytogenetics. Inborn chromosomal abnormalities numerical and structural, causes of chromosomal abnormalities origin, examples of the most frequent chromosomal abnormalities. Immunogenetics, heredity of blood groups. Prenatal cytogenetic diagnosis - methods, indications, ethic problems in genetics. Molecular cytogenetics, hybridization in situ. Methods in Assisted Reproduction Technology. Molecular biology. Genetic Engineering. DNA cloning. Gene therapy.				Z,ZK	5
17PBOHO	General Histology and Histology of Eye Basics of processing samples for histological examination. Basics of cytology, general histology and microscopic anatomy. Development of eye in human embryo. Histological structure of eye and its accessory structures.				KZ	2
17PBOITT	Information Technologies and Telemedicine Computer history, structure of computers, motherboard, processors, memory, graphical card, computer buses, BIOS, I/O devices, server, desktop, notebook, pocket PC, data storage, mobile devices, memory card, OS, tasks and memory management, printers scanner, multimedial devices, mass data storage, multitasking, multiprocessing, set of instruction, assembler, programming languages, power test, network, LAN, WAN, internet, TCP/IP, HTTP, FTP etc., client-server, gate, router, using IT in medicine and telemedicine.				KZ	3
17PBOKC1A	Contact Lenses and Practice I. Contact lens history and development. Contact lens terminology. Manufacturing methods. Classification of contact lenses and their materials. Material properties. Contact lens designs. Different methods of contact lens wearing and replacement. Contact lens care: composition and principles of action. Indications and contraindications of contact lenses. Spherical soft and rigid lenses. Instrumentation of contact lens practice. Patient history, basic examination and contact lens selection. Instructions regarding handling and contact lens care. Contact lens insertion and removal.				Z,ZK	5
17PBOKC2A	Contact Lenses and Practice II. Toric contact lenses. Bifocal and multifocal lenses and other methods of presbyopic correction. Contact lenses in children. Tinted, cosmetic and prosthetic lenses. Therapeutic use of contact lenses. Special types of contact lenses. Contact lenses wearing under special conditions (sport, challenging occupations and environments, diseases, etc.). Drugs interaction with contact lens wearing. Contact lens complications and their management. Spherical soft and rigid lens fitting. Contact lens fitting in astigmatism and presbyopia. Application of RGP lenses. Basic and specific contact lens care. Follow up examinations of contact lens patients.				Z,ZK	5

17PBOKC3A	Contact Lenses and Practice III.	KZ	3
Contact lens fitting in irregular astigmatism. Contact lens and children. Contact lens fitting after surgical procedures. Refractive surgery and contact lenses. Fitting of tinted, cosmetic and prosthetic lenses. Contact lens complications and their management. Recent advances in contact lenses. Contact lens practice management.			
17PBOKRVA	Correction of Refractive Errors	KZ	2
Subject is focused on theory and practical examination of refractive errors and various possibilities of correction of refractive errors. Optical and surgical correction of refractive errors. Objective methods of refraction. Subjective methods of refraction. Correction of myopia. Correction of hypermetropia. Correction of astigmatism. Correction of presbyopia. Determination of binocular balance. Basic techniques of surgical correction of refractive errors. Refractive surgery. Methods of laser keratorefractive surgery. Implantation of intraocular lenses.			
17PBOLTR	Medical Terminology	Z	1
Attendants are made acquainted with particular terms flowing from latin but also greek expressions during their lectures. Students are continuously informed about terms of whole diagnosis and therapeutical procedures. Education is combined with continuous knowlegde check up through the use of tests.			
17PBOMCHA	Macromolecular Chemistry	Z,ZK	2
Fundamentals of macromolecular chemistry with respect to materials for contact and spectacle lenses. Common types of polymers and their structure elements. Types of polymerization. Copolymerization. Graft and block copolymers. Polymer gels. Rubber elasticity. Hydrogels. Polysiloxans. Siliconhydrogels. Properties of hydrogels. Applications of hydrogels in engineering and medicine. Polymeranalogical reactions. ?Subsidiary? polymers. Polymers for spectacle lenses.			
17PBOMAZ	Management and Administration in Healthcare	KZ	2
17PBOMA1	Mathematics I	Z,ZK	5
The subject is an introduction to differential calculus, linear algebra, and applications in analytical geometry . Differential calculus: intro to sets of numbers (natural, rational, irrational), sequences of real numbers (bounded, unbounded, monotonous, convergent, divergent), real-valued functions of one independent real variable (injective, monotonous, continuous, differentiable), inverse functions, differential of a function, Taylor polynomials, number series. Linear algebra: intro to solving linear algebraic systems of equations (LAES), Gaussian elimination algorithm for solving LAES, intro to vector spaces (linear combination of vectors, linear dependence/independence of a set of vectors, basis and dimension of a vector space), intro to matrix algebra (matrix operations, rank of a matrix, determinant and methods of calculation, matrix inverse, eigenvalues and eigenvectors of a matrix). Conic sections (parabola, circle, ellipse, hyperbola)and quadric surfaces(paraboloid, ellipsoid, hyperboloid).			
17PBOMA2	Mathematics II	Z,ZK	5
The subject is an introduction to integral calculus and integral transforms. Integral calculus: definition of an indefinite integral, properties and methods of integration (integration by substitution, integration by parts, partial fractions), definite integral, properties, Newton-Leibnitz fundamental theorem, simple applications of both indefinite and definite integrals, improper integral, solving differential equations (ODEs) (1st order ODEs with separable variables, linear 1st order homogenous as well as non-homogenous ODEs, 2nd order linear ODEs homogenous and non-homogenous with constant coefficients),intro to multiple integrals, particularly applications of double integral. Integral transforms: Laplace transform - definition and properties, inverse Laplace transform, application of Laplace transform for solving nth order linear ODEs with constant coefficients, Z-transform - definition and properties, inverse Z-transform, application of Z-transform for solving nth order linear difference equations.			
17PBOMVV	Metodology of Research	KZ	2
Science, character of scientific work and its goals. Basic terminology (hypothesis, rule of law, theory, model). Information portfolio, information searching using information technologies. Experiments in medicine. Measurement process and its evaluation. Use of methods of sociology and psychology. Project proposal, structure of scientific work, defense of scientific work. Searching on internet, in library catalogues, and in bibliographic systems. Philosophical aspects of scientific work.			
17PBOMI	Microbiology and Immunology	KZ	3
Microbiology: Organization and function in microbial cell. Procaryotic cell, binary fission. Phylogenetic system of bacteria and archea. Cyanobacteria. Microbial nutrition, microbial growth - life cycle of procaryotic cell, growth curve, kinetics of bacterial growth. Influence of environmental factors on microbial growth - temperature, pH, extreme environment. Antimicrobial, antibacterial agents - antibiotics and mechanisms of their effect, dezinfection and sterilization. Energetic metabolism. Genetics and molecular biology of microorganisms. Microflora of human body. Microbial diseases and their control. Immunology: Cells and organs of the immune system. Antigens. Immune reaction. Main histocompatibility complex. B-lymphocytes. Production of immunoglobulins. Immunoglobulins, function and structure. T-lymphocytes and cellular immunity. Cytotoxic lymphocytes. Cytokines. Immunity against infection. Non-specific immunity. Allergic diseases. Immunity and nutrition. Immunopathology. Immunodeficiency. Autoimmune diseases.			
17PBONRA	Clinical Refraction	ZK	2
Description and theory of causes and occurrence of refractive errors. Optical system of eye (schematic and reduced eye model, retinal image, visual acuity). Clinical anomalies - refraction errors (hyperopia, myopia, astigmatism, presbyopia, aphakia). Occurrence and frequency of refractive errors. Causes of refractive errors. Accommodation and its changes. Presbyopia, anisometropia, aniseikonia. Measurement of refractive errors.			
17PBONMP	Proposal and Management of Project	KZ	2
The project as a coordinated effort by a group of people, its types and stages of project design, SWOT analysis. Requirements for individual types of projects, documentation, financing and management. Project management, organization, coordination and implementation of the project. Presentation of the project. Team management project. The project and its leadership. Determination of team types. Communication within the team and between managers and subordinates. Leadership workshops. Motivation. The system of grant agencies in the country. Getting project abroad. Bachelor thesis as a project. Possibilities of software products for the design and management of the project			
17PBOOFP	Ophthalmology Instruments	KZ	3
Functional principles of different diagnostic and therapeutic ophthalmic devices will be discussed. Students will be able to test most of machines during practical lessons at clinical department. Overview, physical principles, technical construction and parameters of following devices and methods will be studied: slit lamp, ophthalmoscope (direct and indirect, confocal scanning), retinoscope, refractometer, tonometer, campimeter, Heidelberg retinal tomograph, optical coherence tomography, retinal nerve fibre layer analysis (GDx), specular (endothelial) microscope, devices for subjective investigation of astigmatism, devices for investigation of ocular movements, corneal topographs, testing of refractive balance, eikonometer, POLA-test, ortopic machines, Hertel exophthalmometer, devices for color vision testing.			
17PBOOK1	Ophthalmology - Pathology, Clinic I.	Z,ZK	5
Routine eye examination, # Special examinations # Symptom and signs of the eye disorders # Principles of the management of common disorders # Preventive ophthalmology # The eye examination in infants and children			
17PBOOK2	Ophthalmology - Patology, Clinic II.	Z,ZK	5
Vitreous. Diseases and therapy of the retina. Glaucoma. Genetic aspects in ophthalmology. Congenital eye defects. Special subjects of pediatric interest. Ocular disorders associated with systemic diseases. Eye and bussines, sport and traffic.			
17PBOOP1	Optical Laboratory I.	KZ	2
Practical course where students will learn the basics of spectacle lens and frames applications with respect to refractive status of the eye and practical needs of a customer. They will also practice the technology (cutting, grinding, edging, polishing) of spectacle lenses processing, centering the lens, bevelling the lens into frames and adjusting the spectacle frames. The course makes possible to apply theoretical knowledge from ophthalmic optics in practice.			
17PBOOP2	Optical Laboratory II.	KZ	2
Practical course where students will learn the fundamental methods for practical dispensing of individual spectacle lenses. Students will practice the methods for measuring individual parameters of a client and of individual spectacle lenses processing. Dispensing progressive and degressive spectacle lenses. The course makes possible to apply theoretical knowledge from ophthalmic optics in practice.			

17PBOOF	Physical Optics	Z,ZK	4
Physical optics and its application in engineering and optometry. Fundamentals of wave optics (interference, diffraction, polarization, absorption, dispersion, reflectivity) with applications in instruments and optometry. Fundamental of photon theory of light. Photoelectric effect. Photodetectors. Light sources. Luminescence. Fundamentals of lasers and their applications in optometry and ophthalmology. The laboratory excercises focus on selected optical measuring methods, regarding geometric and wave optics. Measurements relating to the basic characteristics of optical materials, parameters of optical elements and systems will be taken.			
17PBOOGB	Geometric and Ophthalmic Optics	Z,ZK	6
This course focuses on basics of geometrical optics and its applications in the field of optical design of simple optical elements and systems (lenses, mirrors, prisms, telescopes, etc.). The second part of the course deals with a description and analysis of a human eye as an optical imaging system. The design and analysis of various types of spectacle lenses for correction of refraction errors is presented.			
17PBOOMPA	Practical Excercises in Optometry	KZ	8
Optometric practice of students in specialized institutions and optical shops.			
17PBOPZP	Problems of Persons with Visual Impairment	KZ	2
Education and training - integration. Social and legal problems. Psychological care for persons with visual impairment. Organizations of seriously vision handicapped people. Optic and electronic compensatory tools (camera magnifiers, digital magnifiers). Non-optical compensatory tools (white cane, indicators of light and surface, thermometer with speaker, guide dogs, etc.), environmental adaptations for persons with visual impairment. Rehabilitation of persons with vision handicap. System of training in using special optical aids, training in using electronic special devices for persons with visual impairment.			
17PBOPPA	First Aid	KZ	2
The course gives a brief overview of the main principles and procedures for providing emergency assistance, with special attention to the failure of basic life functions and immediately life-threatening conditions. At the same time also discussed the situation of disabled mass even under conditions, including the phenomenon of CBRN. After successful completion of this course the student should be able to diagnose the failure of basic dependen-life functions, identify conditions of immediate danger to life, to perform basic resuscitation and urgent to provide urgent first aid.			
17PBOPSL	Psychology	KZ	2
Development, methodology and method of psychology. Mental activities and psychic processes, psychology of personality, object of psychology and their formation and development. Modern psychology its concept and theory, psychic processes and stages. Psychological interpretation of personality. Application of knowledge in medical situations. Relation between technician and medical doctor, technician and patient, technician and nurse. Communication as a tool for good cooperation amongst people and helps in interactions with them. Basic expression and communication skills. Use of elocution and gestures in personal expression. Verbal and nonverbal communication. Dialogs, types of dialogs, questions during dialog. Model situations. Communication process as part of economics - components, tools and functions.			
17PBOSOP	Special Visual Aids	Z,ZK	3
Degrees of visual impairment - low vision, legal blindness, total blindness. Possibilities of compensation of severe visual impairment. Types of compensatory devices. Optical compensatory devices for near vision (hypercorrection, magnifiers, hyperocular lenses) and distance vision (telescopic systems - Galilei, Kepler). Electronic compensatory tools (camera magnifiers, digital magnifiers). System for prescription of special optical devices. System of funding with Health Insurance.			
17PBOSTA	Statistics	KZ	2
Students learn basic priciples of research methodology, data collection, formulation of hypotheses and evaluation of results. Fundamental statistical methods, their usage and interpretation. Individual lectures focus on random variables, their distributions, characteristics, transformations, population and sample, estimation of parameters and testing hypotheses.			
17PBOSRBA	Strabology	KZ	2
Strabismus - binocular viewing conditions: definitions, motor and sensory aspects. Examination, classification of strabismus. Heterophoria, heterotropia. Nonparetic and paretic strabismus, accommodative strabismus. Amblyopia, Principles of therapy of strabismus - timing, medical treatment, surgical treatment.			
17PBOSUR1	Subjective Refraction I.	Z,ZK	3
Basic knowledges about refraction of the eye. Techniques of the subjective refraction perform testing frame or the phoropter. Techniques of the examination near vision.			
17PBOSUR2A	Subjective Refraction II.	Z,ZK	7
During the lectures, students deepen their theoretical knowledge and practical skills of subjective refraction with the test frames and test sets of glasses. Further tests will follow on binocular balance, practice working with phoropter and other techniques.			
17PBOTPR	Team Project	KZ	5
Basic communication and presentation skills, including team work, team heading and project management. Creation of presentations and written texts. Typography rules. Types, purpose and requirements of technical presentations and technical texts. Writing a commented bibliographic search.			
17PBOVZF	Diagnostic of Visual Functions	KZ	2
Physiology and principles of testing of following will be discussed: vision, stereoscopy, visual field, central and peripheral vision, contrast sensitivity, dark adaptation, pupillary reactions, accommodation, eye movements, double vision, binocular vision, tear film, electrophysiological methods.			
17PBOZFOA	Foundations of Physiological Optics	ZK	2
Fundamentals of optical imaging. Physiological structure of human eye, its geometric and physical properties. Visual perception. Sensitivity of eye. Optical system of human eye. Axes and pupils of eye. Schematic optical models of human eye. Photometric parameters of optical system of eye. Accommodation and aging of eye. Monochromatic and chromatic aberrations of human eye. Resolving power and depth of field. Influence of aberrations on image quality. Contrast sensitivity. Ametropy. Astigmatism. Aphakia. Amblyopy. Physiology of eye movement, methods of eye tracking. Basic principles of binocular and stereoscopic vision.			
17PBOZPE	Fundamentals of Pedagogy and Education	KZ	2
Education as a scientific discipline, basic educational categories and their interrelationships. After completing the lessons, the student should understand the methods of general and special education.			

Name of the block: Compulsory elective courses

Minimal number of credits of the block: 8

The role of the block: S

Code of the group: 17PBO PV 4S 15 16

Name of the group: Optics and Optometry compulsory optional course 4th semester 15 16

Requirement credits in the group: In this group you have to gain at least 2 credits (at most 8)

Requirement courses in the group: In this group you have to complete at least 1 course (at most 4)

Credits in the group: 2

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
17PBOBS	Biological Signals Vladimír Kraj a Vladimír Kraj a Vladimír Kraj a (Gar.)	KZ	2	2P	L	s
17PBOBUI	Biological Effects of Ionizing Radiation	KZ	2	2P	L	s
17PBOHE	Hygiene and Epidemiology	KZ	2	2P	L	s
17PBOPPV	Psychology of Sales and Management Staff Markéta Žáková, P emysl Ku era Markéta Žáková P emysl Ku era (Gar.)	KZ	2	2P	L	s

Characteristics of the courses of this group of Study Plan: Code=17PBO PV 4S 15 16 Name=Optics and Optometry compulsory optional course 4th semester 15 16

17PBOBS	Biological Signals	KZ	2	The subject deals with origins and description of the most important electric and non-electric biological signals. The principles of generation, recording and basic properties are studied in all the signals. The studied signals involve native and evoked biosignals, including biological signals of the heart, brain, muscles, nervous system, auditory signals, visual system, signals from the gastro-intestinal system etc. Advanced methods of digital biosignal processing, spectrum analysis, modern methods of artificial intelligence, features extraction, automatic classification, graphic presentation of results. Adaptive segmentation, artificial neural networks for signal processing.		
17PBOBUI	Biological Effects of Ionizing Radiation	KZ	2	The lectures will give an overview of basic radiation biology. Students will become familiar with the biological effects of ionizing radiation: the physical and chemical processes by which radiation causes damage to the biological material; mechanisms of radiation action on the DNA and other constituents of the cell; types of damage and their repair; subcellular and cellular sensitivity and radiation response; physical, chemical and biological modifiers of radiation action; theories and models of cellular survival; and radiation biology of normal and neoplastic tissues.		
17PBOHE	Hygiene and Epidemiology	KZ	2	The student will become familiar with the work methods used in the field of epidemiology of communicable diseases, as well as in environmental epidemiology, disease and non-infectious origins in solving a number of priorities for public health.		
17PBOPPV	Psychology of Sales and Management Staff	KZ	2	Process of sale, its preparation and structure. Sellers and consumers (clients). Strategy and tactics of selling. Types of negotiation with a client (consumer). Reaction on problematic clients. Types of strategies for offering products. Selection of new employees. Training, operational and social adaptation of new staff. Personal leadership.		

Code of the group: 17PBO PV 5S 15 16

Name of the group: Optics and Optometry compulsory optional course 5th semester 15 16

Requirement credits in the group: In this group you have to gain at least 4 credits (at most 6)

Requirement courses in the group: In this group you have to complete at least 2 courses (at most 3)

Credits in the group: 4

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) Tutors, authors and guarantors (gar.)	Completion	Credits	Scope	Semester	Role
17PBOBFT	Biophotonics Jan Mikšovský, Miroslav Jelínek Petr Písařík Miroslav Jelínek (Gar.)	KZ	2	2P	Z	s
17PBOOVP	Optometry in Practice Markéta Žáková Markéta Žáková Markéta Žáková (Gar.)	KZ	2	2P	Z	s
17PBOPOZ	Care for Persons with Visual Impairment Zdeňka Vařanová Zdeňka Vařanová Zdeňka Vařanová (Gar.)	KZ	2	2P	Z	s

Characteristics of the courses of this group of Study Plan: Code=17PBO PV 5S 15 16 Name=Optics and Optometry compulsory optional course 5th semester 15 16

17PBOBFT	Biophotonics	KZ	2	Overview of principles and applications in the interdisciplinary sphere, connecting physics, optics and biology. Interaction of laser radiation with matter, interaction of radiation with tissue, biology basics, photobiology, bioimaging, basics of lasers, laser safety, optical biosensors, photodynamical therapy, optical manipulation with cells, nanotechnology for biophotonics, biomaterials for photonics.		
17PBOOVP	Optometry in Practice	KZ	2	Systems of the vision care around the world. The role of the optometrist in the Czech republic and the Europe. Documents related to job of optometrist. Profession of optometrist, eye doctor, optic, visual therapist and their cooperation. Optometry equipment in practice. Additional education of optometrists. Association of optometrists.		
17PBOPOZ	Care for Persons with Visual Impairment	KZ	2	Persons with severe visual impairment. Classification of vision impairment in Czech Republic. Legal and total blindness. Deaf-blind persons. Practical demonstration of usage of optical, non-optical and electronic devices for people with visual impairment. Excursion to organizations, which care about people with visual impairment.		

Code of the group: 17PBO PV 6S

Name of the group: Optics and Optometry compulsory optional course 6th semester 13_14_15_16

Requirement credits in the group: In this group you have to gain at least 2 credits (at most 6)

Requirement courses in the group: In this group you have to complete at least 1 course (at most 3)

Credits in the group: 2

Note on the group:

Code	Name of the course / Name of the group of courses (in case of groups of courses the list of codes of their members) <i>Tutors, authors and guarantors (gar.)</i>	Completion	Credits	Scope	Semester	Role
17PBOMMD	Modern Methods for Diagnostics and Correction of Eye <i>Ji í Novák Ji í Novák Ji í Novák (Gar.)</i>	KZ	2	2P	L	s
17PBOZE	Medical Ethics <i>Martina Dingová Šliková Martina Dingová Šliková (Gar.)</i>	KZ	2	2P	L	s
17PBOZLN	Medical Legislation and Standards <i>Vojt ch Kamenský, Ond ej Gajdoš Vojt ch Kamenský Peter Kneppo (Gar.)</i>	KZ	2	1P+1C	L	s

Characteristics of the courses of this group of Study Plan: Code=17PBO PV 6S Name=Optics and Optometry compulsory optional course 6th semester 13_14_15_16

17PBOMMD	Modern Methods for Diagnostics and Correction of Eye Principles, present and future applications of modern methods for diagnostics of a human eye and correction of aberrations of an eye. Techniques of measurement of aberrations and geometric parameters of the eye, analysis of an influence of aberrations on vision and possibilities to apply these factors into the design of ophthalmic correction tools. Analysis of an influence of the cornea on optical properties and aberrations of an eye, possibilities of anterior segment analysis and its application for the correction of the eye. Trends in the development of ophthalmic corrective tools, methods and instruments for a superior diagnostics and analysis of properties of the eye.	KZ	2
17PBOZE	Medical Ethics The course introduces students to basic ethical issues in applied ethics due to a future career orientation. It develops students' ability to think in ethical contexts, discuss, argue and defend their views in ethical dilemma situations which brings medical environment.	KZ	2
17PBOZLN	Medical Legislation and Standards	KZ	2

List of courses of this pass:

Code	Name of the course	Completion	Credits
17BOZP	Occupational Safety and Health, Fire Protection and First Aid	Z	0
17PBOAF1	Anatomy and Physiology I The combined subject of anatomy and physiology is the introductory course of medical subjects for non-medical specialties.	Z,ZK	5
17PBOAF2	Anatomy and Physiology II Anatomy and physiology II links to Anatomy and Physiology I. The subject covers functional aspects of particular organs and their systems.	Z,ZK	5
17PBOAFPO	Anatomy, Physiology and General and Special Pathology of Eye Introduction to pathology: definitions, goals, history, illnesses, symptoms. Etiology and pathogenesis of the disease on the organ, tissue, cellular and molecular level. External factors contributing to the emergence and development of disease. Pathogenic stimuli. Wound healing. Inflammation and tissue damage as a defensive phenomenon. Circulation disorders, atrophy, necrosis, tumors. Specific signs of pathological changes in the central nervous system, the eye, and the optical path.	ZK	2
17PBOBCHA	Biochemistry Cell compartments structure and functions. Protein structure and function. Enzymes as catalysts. Bioenergetics. Biological oxidation. Biogenic amines. Hormones biochemistry, hormonal regulation. Biologically significant radicals. Metabolism of saccharides, lipids and lipoproteins, amino-acids, proteins, nucleotides and nucleic acids. Regulation of metabolism on a cell and organ level. Biochemistry of the intestinal tract, pancreas, biochemistry of liver and xenobiotics metabolism. Biochemistry of kidneys. Biochemistry of tetrapyrrols and porphyrins. Biochemistry of muscles, bones. Biochemistry of nervous system. Biochemistry of blood, hemocoagulation process and fibrinolysis. Metabolism of body fluids and ions, acidobasic balance.	Z,ZK	3
17PBOBFT	Biophotonics Overview of principles and applications in the interdisciplinary sphere, connecting physics, optics and biology. Interaction of laser radiation with matter, interaction of radiation with tissue, biology basics, photobiology, bioimaging, basics of lasers, laser safety, optical biosensors, photodynamical therapy, optical manipulation with cells, nanotechnology for biophotonics, biomaterials for photonics.	KZ	2
17PBOBLG	Biology Basic information about the cellular level of organisms - from acellular through prokaryotic to eukaryotic, endosymbiotic hypothesis. Structure and conformation of biopolymers (nucleic acids and proteins). Prokaryotic cells. Eukaryotic cells. Plant and animal cell structure and function. The nucleus, chemistry and structure of chromatin and chromosomes. Cytoplasm. Endomembrane system: endoplasmic reticulum, the Golgi apparatus, lysosomes, microbodies (glyoxisomes, peroxisomes), vacuoles. Semiautonomic organelles: mitochondria, sites of respiration and chloroplasts, sites of photosynthesis. The origin of eukaryotes: endosymbiotic hypothesis. Ribosomes. The cytoskeleton: microtubules, microfilaments. The cell cycle: mitotic (M) phase and interphase (G1, S and G2 phases). The division of cell nucleus - amitosis, mitosis, phases of mitosis, the mitotic spindle; meiosis. The cell division - cytokinesis. Cell differentiation. Cell death. Apoptosis and necrosis. Fundamentals of virology. Viruses - structure, life cycle and molecular biology. Viral genome.	Z,ZK	5
17PBOBP	Bachelor Thesis Individual student projects at the end of bachelor studies. Topics are selected during the 5th term from a list. Bachelor thesis is defended at the end of the examination period. Bachelor thesis defence is a part of the state exam. Bachelor thesis can be written and defended either Czech or English. Students are supervised by a tutor during the above mentioned process.	Z	10
17PBOBS	Biological Signals The subject deals with origins and description of the most important electric and non-electric biological signals. The principles of generation, recording and basic properties are studied in all the signals. The studied signals involve native and evoked biosignals, including biological signals of the heart, brain, muscles, nervous system, auditory signals, visual system, signals from the gastro-intestinal system etc. Advanced methods of digital biosignal processing, spectrum analysis, modern methods of artificial intelligence, features extraction, automatic classification, graphic presentation of results. Adaptive segmentation, artificial neural networks for signal processing.	KZ	2
17PBOBT	Spectacles Technology Subject Spectacle Technology introduces students to technology and materials used in the production of glasses and their individual components. Students will learn about the materials used in spectacle optics - their composition, chemical and technological properties, processing characteristics, behavior under various conditions and machining properties. Furthermore, the properties and conditions of technological processes used for processing these materials into different functional parts of spectacles - spectacle lenses and frames. In the practical part of the exercise, students will perform practical glasses production.	Z,ZK	6

17PBOBUI	Biological Effects of Ionizing Radiation	KZ	2
The lectures will give an overview of basic radiation biology. Students will become familiar with the biological effects of ionizing radiation: the physical and chemical processes by which radiation causes damage to the biological material; mechanisms of radiation action on the DNA and other constituents of the cell; types of damage and their repair; subcellular and cellular sensitivity and radiation response; physical, chemical and biological modifiers of radiation action; theories and models of cellular survival; and radiation biology of normal and neoplastic tissues.			
17PBOBZOA	Binocular Vision, Orthoptics	Z,ZK	7
Binocular vision conditions. Strabismus - extraocular muscles. Movements - conjugate, ductions Psion. Heterophoria, heterotropia. Developments of binocular movement, binocular vision. Sensory ganges in strabismus, diplopia, suppression, amblyopia. Anomalous retinae correspondence, eccentric fixation. Determination of angle of deviation. Goals of treatment. Principles of therapy of strabismus - use of prisms, decentration of glasses. Pleoptics, orthoptics.			
17PBOCHMO	Chemistry for Optics and Optometry	Z,ZK	2
Students will learn the basic areas of applied chemistry, organic chemistry, polymer chemistry and macromolecular chemistry in biomedical engineering.			
17PBOEVO	Economy and Management	KZ	2
The subject presents basic economic terms, legal forms of entrepreneurship, founding budget, costs and their structure. Main contents of the subject are the problematics of accounting statements (P&L, balance sheet, cash flow). The subject also deals with competition analysis, financial analysis, product life-cycle, price strategy and the tax system.			
17PBOFO	Pharmacology of Eye	Z	2
Pharmacokinetics of drugs into the eye, application of drugs, the therapeutic effect and side effects. The most commonly used drugs.			
17PBOFYZ	Physics	Z,ZK	5
Physics course will allow students to acquire and strengthen knowledge in these branches of physics: mechanics, thermodynamics, electromagnetic field and solid state physics. We focus on solid theoretical bases, but independent work in student labs as well as solving practical examples are also important parts of the course. Through the course we also touch the limits of the classical Physics.			
17PBOGMB	Genetics and Molecular Biology	Z,ZK	5
General genetics: basic genetic expressions. Genotypes and Phenotypes. Mendel's theory of inheritance. Basis of clinical genetics: heredity of genetic diseases, monogenic autosomal and gonosomal heredity and monogenic autosomal and gonosomal hereditary dominant and recessive disorders, polygenic heredity, examples of hereditary diseases. Mutagenesis: types of mutations and mutations consequences, physical, chemical and biological mutagens. Carcinogenesis, cell cycle regulation, protooncogens, tumor suppressor genes, chromosomal changes in tumors. Clinical cytogenetics. Inborn chromosomal abnormalities numerical and structural, causes of chromosomal abnormalities origin, examples of the most frequent chromosomal abnormalities. Immunogenetics, heredity of blood groups. Prenatal cytogenetic diagnosis - methods, indications, ethic problems in genetics. Molecular cytogenetics, hybridization in situ. Methods in Assisted Reproduction Technology. Molecular biology. Genetic Engineering. DNA cloning. Gene therapy.			
17PBOHE	Hygiene and Epidemiology	KZ	2
The student will become familiar with the work methods used in the field of epidemiology of communicable diseases, as well as in environmental epidemiology, disease and non-infectious origins in solving a number of priorities for public health.			
17PBOHO	General Histology and Histology of Eye	KZ	2
Basics of processing samples for histological examination. Basics of cytology, general histology and microscopic anatomy. Development of eye in human embryo. Histological structure of eye and its accessory structures.			
17PBOITT	Information Technologies and Telemedicine	KZ	3
Computer history, structure of computers, motherboard, processors, memory, graphical card, computer buses, BIOS, I/O devices, server, desktop, notebook, pocket PC, data storage, mobile devices, memory card, OS, tasks and memory management, printers scanner, multimedial devices, mass data storage, multitasking, multiprocessing, set of instruction, assembler, programming languages, power test, network, LAN, WAN, internet, TCP/IP, HTTP, FTP etc., client-server, gate, router, using IT in medicine and telemedicine.			
17PBOKC1A	Contact Lenses and Practice I.	Z,ZK	5
Contact lens history and development. Contact lens terminology. Manufacturing methods. Classification of contact lenses and their materials. Material properties. Contact lens designs. Different methods of contact lens wearing and replacement. Contact lens care: composition and principles of action. Indications and contraindications of contact lenses. Spherical soft and rigid lenses. Instrumentation of contact lens practice. Patient history, basic examination and contact lens selection. Instructions regarding handling and contact lens care. Contact lens insertion and removal.			
17PBOKC2A	Contact Lenses and Practice II.	Z,ZK	5
Toric contact lenses. Bifocal and multifocal lenses and other methods of presbyopic correction. Contact lenses in children. Tinted, cosmetic and prosthetic lenses. Therapeutic use of contact lenses. Special types of contact lenses. Contact lenses wearing under special conditions (sport, challenging occupations and environments, diseases, etc.). Drugs interaction with contact lens wearing. Contact lens complications and their management. Spherical soft and rigid lens fitting. Contact lens fitting in astigmatism and presbyopia. Application of RGP lenses. Basic and specific contact lens care. Follow up examinations of contact lens patients.			
17PBOKC3A	Contact Lenses and Practice III.	KZ	3
Contact lens fitting in irregular astigmatism. Contact lens and children. Contact lens fitting after surgical procedures. Refractive surgery and contact lenses. Fitting of tinted, cosmetic and prosthetic lenses. Contact lens complications and their management. Recent advances in contact lenses. Contact lens practice management.			
17PBOKRVA	Correction of Refractive Errors	KZ	2
Subject is focused on theory and practical examination of refractive errors and various possibilities of correction of refractive errors. Optical and surgical correction of refractive errors. Objective methods of refraction. Subjective methods of refraction. Correction of myopia. Correction of hypermetropia. Correction of astigmatism. Correction of presbyopia. Determination of binocular balance. Basic techniques of surgical correction of refractive errors. Refractive surgery. Methods of laser keratorefractive surgery. Implantation of intraocular lenses.			
17PBOLTR	Medical Terminology	Z	1
Attendants are made acquainted with particular terms flowing from latin but also greek expressions during their lectures. Students are continuously informed about terms of whole diagnosis and therapeutical procedures. Education is combined with continuous knowlegde check up through the use of tests.			
17PBOMA1	Mathematics I	Z,ZK	5
The subject is an introduction to differential calculus, linear algebra, and applications in analytical geometry . Differential calculus: intro to sets of numbers (natural, rational, irrational), sequences of real numbers (bounded, unbounded, monotonous, convergent, divergent), real-valued functions of one independent real variable (injective, monotonous, continuous, differentiable), inverse functions, differential of a function, Taylor polynomials, number series. Linear algebra: intro to solving linear algebraic systems of equations (LAES), Gaussian elimination algorithm for solving LAES, intro to vector spaces (linear combination of vectors, linear dependence/independence of a set of vectors, basis and dimension of a vector space), intro to matrix algebra (matrix operations, rank of a matrix, determinant and methods of calculation, matrix inverse, eigenvalues and eigenvectors of a matrix). Conic sections (parabola, circle, ellipse, hyperbola)and quadric surfaces(paraboloid, ellipsoid, hyperboloid).			
17PBOMA2	Mathematics II	Z,ZK	5
The subject is an introduction to integral calculus and integral transforms. Integral calculus: definition of an indefinite integral, properties and methods of integration (integration by substitution, integration by parts, partial fractions), definite integral, properties, Newton-Leibnitz fundamental theorem, simple applications of both indefinite and definite integrals, improper integral, solving differential equations (ODEs) (1st order ODEs with separable variables, linear 1st order homogenous as well as non-homogenous ODEs, 2nd order linear ODEs homogenous and non-homogenous with constant coefficients),intro to multiple integrals, particularly applications of double integral. Integral transforms: Laplace transform - definition and properties, inverse Laplace transform, application of Laplace transform for solving nth order linear ODEs with constant coefficients, Z-transform - definition and properties, inverse Z-transform, application of Z-transform for solving nth order linear difference equations.			
17PBOMAZ	Management and Administration in Healthcare	KZ	2

17PBOMCHA	Macromolecular Chemistry	Z,ZK	2
Fundamentals of macromolecular chemistry with respect to materials for contact and spectacle lenses. Common types of polymers and their structure elements. Types of polymerization. Copolymerization. Graft and block copolymers. Polymer gels. Rubber elasticity. Hydrogels. Polysiloxans. Siliconhydrogels. Properties of hydrogels. Applications of hydrogels in engineering and medicine. Polymeranalogical reactions. ?Subsidiary? polymers. Polymers for spectacle lenses.			
17PBOMI	Microbiology and Immunology	KZ	3
Microbiology: Organization and function in microbial cell. Prokaryotic cell, binary fission. Phylogenetic system of bacteria and archaea. Cyanobacteria. Microbial nutrition, microbial growth - life cycle of prokaryotic cell, growth curve, kinetics of bacterial growth. Influence of environmental factors on microbial growth - temperature, pH, extreme environment. Antimicrobial, antibacterial agents - antibiotics and mechanisms of their effect, dezinfection and sterilization. Energetic metabolism. Genetics and molecular biology of microorganisms. Microflora of human body. Microbial diseases and their control. Immunology: Cells and organs of the immune system. Antigens. Immune reaction. Main histocompatibility complex. B-lymphocytes. Production of immunoglobulins. Immunoglobulins, function and structure. T-lymphocytes and cellular immunity. Cytotoxic lymphocytes. Cytokines. Immunity against infection. Non-specific immunity. Allergic diseases. Immunity and nutrition. Immunopathology. Immunodeficiency. Autoimmune diseases.			
17PBOMMD	Modern Methods for Diagnostics and Correction of Eye	KZ	2
Principles, present and future applications of modern methods for diagnostics of a human eye and correction of aberrations of an eye. Techniques of measurement of aberrations and geometric parameters of the eye, analysis of an influence of aberrations on vision and possibilities to apply these factors into the design of ophthalmic correction tools. Analysis of an influence of the cornea on optical properties and aberrations of an eye, possibilities of anterior segment analysis and its application for the correction of the eye. Trends in the development of ophthalmic corrective tools, methods and instruments for a superior diagnostics and analysis of properties of the eye.			
17PBOMVV	Methodology of Research	KZ	2
Science, character of scientific work and its goals. Basic terminology (hypothesis, rule of law, theory, model). Information portfolio, information searching using information technologies. Experiments in medicine. Measurement process and its evaluation. Use of methods of sociology and psychology. Project proposal, structure of scientific work, defense of scientific work. Searching on internet, in library catalogues, and in bibliographic systems. Philosophical aspects of scientific work.			
17PBONMP	Proposal and Management of Project	KZ	2
The project as a coordinated effort by a group of people, its types and stages of project design, SWOT analysis. Requirements for individual types of projects, documentation, financing and management. Project management, organization, coordination and implementation of the project. Presentation of the project. Team management project. The project and its leadership. Determination of team types. Communication within the team and between managers and subordinates. Leadership workshops. Motivation. The system of grant agencies in the country. Getting project abroad. Bachelor thesis as a project. Possibilities of software products for the design and management of the project			
17PBONRA	Clinical Refraction	ZK	2
Description and theory of causes and occurrence of refractive errors. Optical system of eye (schematic and reduced eye model, retinal image, visual acuity). Clinical anomalies - refraction errors (hyperopia, myopia, astigmatism, presbyopia, aphakia). Occurrence and frequency of refractive errors. Causes of refractive errors. Accommodation and its changes. Presbyopia, anisometropia, aniseikonia. Measurement of refractive errors.			
17PBOOF	Physical Optics	Z,ZK	4
Physical optics and its application in engineering and optometry. Fundamentals of wave optics (interference, diffraction, polarization, absorption, dispersion, reflectivity) with applications in instruments and optometry. Fundamental of photon theory of light. Photoelectric effect. Photodetectors. Light sources. Luminiscence. Fundamentals of lasers and their applications in optometry and ophthalmology. The laboratory excercises focus on selected optical measuring methods, regarding geometric and wave optics. Measurements relating to the basic characteristics of optical materials, parameters of optical elements and systems will be taken.			
17PBOOFF	Ophthalmology Instruments	KZ	3
Functional principles of different diagnostic and therapeutic ophthalmic devices will be discussed. Students will be able to test most of machines during practical lessons at clinical department. Overview, physical principles, technical construction and parameters of following devices and methods will be studied: slit lamp, ophthalmoscope (direct and indirect, confocal scanning), retinoscope, refractometer, tonometer, campimeter, Heidelberg retinal tomograph, optical coherence tomography, retinal nerve fibre layer analysis (GDx), specular (endothelial) microscope, devices for subjective investigation of astigmatism, devices for investigation of ocular movements, corneal topographs, testing of refractive balance, eikonometer, POLA-test, ortopic machines, Hertel exophthalmometer, devices for color vision testing.			
17PBOOGB	Geometric and Ophthalmic Optics	Z,ZK	6
This course focuses on basics of geometrical optics and its applications in the field of optical design of simple optical elements and systems (lenses, mirrors, prisms, telescopes, etc.). The second part of the course deals with a description and analysis of a human eye as an optical imaging system. The design and analysis of various types of spectacle lenses for correction of refraction errors is presented.			
17PBOOK1	Ophthalmology - Pathology, Clinic I.	Z,ZK	5
Routine eye examination, # Special examinations # Symptom and signs of the eye disorders # Principles of the management of common disorders # Preventive ophthalmology # The eye examination in infants and children			
17PBOOK2	Ophthalmology - Patology, Clinic II.	Z,ZK	5
Vitreous. Diseases and therapy of the retina. Glaucoma. Genetic aspects in ophthalmology. Congenital eye defects. Special subjects of pediatric interest. Ocular disorders associated with systemic diseases. Eye and bussines, sport and traffic.			
17PBOOMPA	Practical Excercises in Optometry	KZ	8
Optometric practice of students in specialized institutions and optical shops.			
17PBOOP1	Optical Laboratory I.	KZ	2
Practical course where students will learn the basics of spectacle lens and frames applications with respect to refractive status of the eye and practical needs of a customer. They will also practice the technology (cutting, grinding, edging, polishing) of spectacle lenses processing, centering the lens, bevelling the lens into frames and adjusting the spectacle frames. The course makes possible to apply theoretical knowledge from ophthalmic optics in practice.			
17PBOOP2	Optical Laboratory II.	KZ	2
Practical course where students will learn the fundamental methods for practical dispensing of individual spectacle lenses. Students will practice the methods for measuring individual parameters of a client and of individual spectacle lenses processing. Dispensing progressive and degressive spectacle lenses. The course makes possible to apply theoretical knowledge from ophthalmic optics in practice.			
17PBOOVP	Optometry in Practice	KZ	2
Systems of the vision care around the world. The role of the optometrist in the Czech republic and the Europe. Documents related to job of optometrist. Profession of optometrist, eye doctor, optic, visual therapist and their cooperation. Optometry equipment in practis. Additional education of optometrists. Association of optometrists.			
17PBOPOZ	Care for Persons with Visual Impairment	KZ	2
Persons with severe visual impairment. Classification of vision impairment in Czech Republic. Legal and total blindness. Deaf-blind persons. Practical demonstration of usage of optical, non-optical and electronic devices for people with visual impairment. Excursion to organizations, which care about people with visual impairment.			
17PBOPPA	First Aid	KZ	2
The course gives a brief overview of the main principles and procedures for providing emergency assistance, with special attention to the failure of basic life functions and immediately life-threatening conditions. At the same time also discussed the situation of disabled mass even under conditions, including the phenomenon of CBRN. After successful completion of this course the student should be able to diagnose the failure of basic dependen-life functions, identify conditions of immediate danger to life, to perform basic resuscitation and urgent to provide urgent first aid.			

17PBOPPV	Psychology of Sales and Management Staff	KZ	2
Process of sale, its preparation and structure. Sellers and consumers (clients). Strategy and tactics of selling. Types of negotiation with a client (consumer). Reaction on problematic clients. Types of strategies for offering products. Selection of new employees. Training, operational and social adaptation of new staff. Personal leadership.			
17PBOPSL	Psychology	KZ	2
Development, methodology and method of psychology. Mental activities and psychic processes, psychology of personality, object of psychology and their formation and development. Modern psychology its concept and theory, psychic processes and stages. Psychological interpretation of personality. Application of knowledge in medical situations. Relation between technician and medical doctor, technician and patient, technician and nurse. Communication as a tool for good cooperation amongst people and helps in interactions with them. Basic expression and communication skills. Use of elocution and gestures in personal expression. Verbal and nonverbal communication. Dialogs, types of dialogs, questions during dialog. Model situations. Communication process as part of economics - components, tools and functions.			
17PBOPZP	Problems of Persons with Visual Impairment	KZ	2
Education and training - integration. Social and legal problems. Psychological care for persons with visual impairment. Organizations of seriously vision handicapped people. Optic and electronic compensatory tools (camera magnifiers, digital magnifiers). Non-optical compensatory tools (white cane, indicators of light and surface, thermometer with speaker, guide dogs, etc.), environmental adaptations for persons with visual impairment. Rehabilitation of persons with vision handicap. System of training in using special optical aids, training in using electronic special devices for persons with visual impairment.			
17PBOSOP	Special Visual Aids	Z,ZK	3
Degrees of visual impairment - low vision, legal blindness, total blindness. Possibilities of compensation of severe visual impairment. Types of compensatory devices. Optical compensatory devices for near vision (hypercorrection, magnifiers, hyperocular lenses) and distance vision (telescopic systems - Galilei, Kepler). Electronic compensatory tools (camera magnifiers, digital magnifiers). System for prescription of special optical devices. System of funding with Health Insurance.			
17PBOSRBA	Strabology	KZ	2
Strabismus - binocular viewing conditions: definitions, motor and sensory aspects. Examination, classification of strabismus. Heterophoria, heterotrophia. Nonparetic and paretic strabismus, accommodative strabismus. Amblyopia, Principles of therapy of strabismus - timing, medical treatment, surgical treatment.			
17PBOSTA	Statistics	KZ	2
Students learn basic principles of research methodology, data collection, formulation of hypotheses and evaluation of results. Fundamental statistical methods, their usage and interpretation. Individual lectures focus on random variables, their distributions, characteristics, transformations, population and sample, estimation of parameters and testing hypotheses.			
17PBOSUR1	Subjective Refraction I.	Z,ZK	3
Basic knowledges about refraction of the eye. Techniques of the subjective refraction perform testing frame or the phoropter. Techniques of the examination near vision.			
17PBOSUR2A	Subjective Refraction II.	Z,ZK	7
During the lectures, students deepen their theoretical knowledge and practical skills of subjective refraction with the test frames and test sets of glasses. Further tests will follow on binocular balance, practice working with phoropter and other techniques.			
17PBOTPR	Team Project	KZ	5
Basic communication and presentation skills, including team work, team heading and project management. Creation of presentations and written texts. Typography rules. Types, purpose and requirements of technical presentations and technical texts. Writing a commented bibliographic search.			
17PBOVZF	Diagnostic of Visual Functions	KZ	2
Physiology and principles of testing of following will be discussed: vision, stereoscopy, visual field, central and peripheral vision, contrast sensitivity, dark adaptation, pupillary reactions, accommodation, eye movements, double vision, binocular vision, tear film, electrophysiological methods.			
17PBOZE	Medical Ethics	KZ	2
The course introduces students to basic ethical issues in applied ethics due to a future career orientation. It develops students' ability to think in ethical contexts, discuss, argue and defend their views in ethical dilemma situations which brings medical environment.			
17PBOZFOA	Foundations of Physiological Optics	ZK	2
Fundamentals of optical imaging. Physiological structure of human eye, its geometric and physical properties. Visual perception. Sensitivity of eye. Optical system of human eye. Axes and pupils of eye. Schematic optical models of human eye. Photometric parameters of optical system of eye. Accommodation and aging of eye. Monochromatic and chromatic aberrations of human eye. Resolving power and depth of field. Influence of aberrations on image quality. Contrast sensitivity. Ametropy. Astigmatism. Aphakia. Amblyopy. Physiology of eye movement, methods of eye tracking. Basic principles of binocular and stereoscopic vision.			
17PBOZLN	Medical Legislation and Standards	KZ	2
17PBOZPE	Fundamentals of Pedagogy and Education	KZ	2
Education as a scientific discipline, basic educational categories and their interrelationships. After completing the lessons, the student should understand the methods of general and special education.			

For updated information see <http://bilakniha.cvut.cz/en/FF.html>

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