Annex no 3 to the Resolution No 72 of the NCU Senate of 16 December 2025 r.

S t u d y p r o g r a m m e

Part A) of the study programme

L e a r n i n g o u t c o m e s

Faculty offering the field of study:	**Faculty of Pharmacy**
Field of study:	**Pharmacy**
Level of study:	**long-cycle studies**
Level of the Polish Qualifications Framework:	**level 7**
Degree profile:	**general academic**
Professional degree awarded to the graduate:	**magister farmacji**
Allocation of the field of study within academic or artistic discipline(s), to which learning outcomes for a given field of study refer:	**Discipline: Pharmaceutical sciences (100%)** **Main discipline: Pharmaceutical sciences**

Symbol	**Upon completion the graduate achieves the learning outcomes specified below:**
	KNOWLEDGE **The graduate knows and understands:**
K_A.W01	organisation of living matter and the cytophysiology of cells;
K_A.W02	classical, population and molecular genetics, as well as genetic aspects of cell differentiation;
K_A.W03	monogenic and polygenic inheritance of human traits and the genetic polymorphism of the human population;
K_A.W04	anatomical structure of the human organism and fundamental relationships between the structure and function of the organism in health and illness;
K_A.W05	mechanisms of organism functioning on molecular, cellular, tissue and system level;
K_A.W06	pathophysiology of cells and systems of the human organism;
K_A.W07	disorders of adaptive and regulative functions of the human organism;
K_A.W08	structure, features and biological functions of amino acids, proteins, nucleotides, nucleic acids, carbohydrates, lipids and vitamins;
K_A.W09	disorders of adaptive and regulatory functions of the organism;
K_A.W10	molecular aspects of signal transduction;
K_A.W11	major metabolic pathways and their interconnections, the mechanisms of regulation of metabolism and the effect of drugs on the processes;
K_A.W12	functioning of the immune system and the mechanisms of immune response;
K_A.W13	principles of immunodiagnostics and the principles and methods of immunoprophylaxis and immunotherapy;
K_A.W14	molecular basis of the cell cycle – proliferation, apoptosis and neoplastic transformation;
K_A.W15	issues of DNA recombination and cloning;
K_A.W16	functions and genome and transcriptome testing methods;
K_A.W17	gene expression regulations mechanisms and the role of epigenetics in this process;
K_A.W18	characteristics of bacteria, viruses, fungi and parasites and the principles of microbiological diagnostics;
K_A.W19	basics of infectious diseases aetiopathology;

K_A.W20	principles of disinfection and antisepsis and the influence of antimicrobial agents on microorganisms and human health;
K_A.W21	issues of hospital-acquired infection and threats from the alert-pathogens;
K_A.W22	pharmacopoeial requirements and methods of testing microbiological purity and sterility of drugs;
K_A.W23	microbiological methods of testing mutagenic effects of drugs;
K_A.W24	morphological and anatomical characteristics of prokaryotic organisms, mushrooms and plants providing the source of medicinal raw materials and materials used in pharmacy;
K_A.W25	research methods used in systematics and search for new species and varieties of medicinal plants and mushrooms;
K_A.W26	principles of managing a herbarium and its meaning and usefulness in pharmaceutical sciences;
K_A.W27	methods for assessing human primary vital signs in health emergencies and the principles of giving advanced first aid;
K_A.W28	basic philosophical issues (metaphysics, epistemology, axiology and ethics);
K_A.W29	psychological tools and principles of interpersonal communication with patients, their carers, doctors and other healthcare system workers;
K_A.W30	social determinants and limitations of disease and disability;
K_A.W31	psychological and social aspects of supportive attitudes and actions;
K_A.W32	molecular biology techniques in pharmaceutical biotechnology and gene therapy;
K_B.W1	physical basis of physiological processes (circulation, nerve impulse transmission, gas and substance exchange, movement);
K_B.W2	effect of physical and chemical factors of the environment on human organism;
K_B.W3	methodology of biophysical measurements;
K_B.W4	biophysical basics of diagnostic and therapeutic techniques;
K_B.W5	structure of the atom and the molecule, the periodic table of elements, and the properties of radioactive isotopes in terms of their application in diagnostics and therapy;
K_B.W6	formation mechanisms and types of chemical bonds and the mechanisms of intermolecular forces;
K_B.W7	types and properties of solutions;
K_B.W8	basic types of chemical reactions;
K_B.W9	characteristics of metals and non-metals, and the nomenclature and properties of inorganic compounds used in diagnostics and disease treatment;
K_B.W10	methods of identification of inorganic compounds including pharmacopoeial methods;
K_B.W11	classical methods of quantitative analysis;
K_B.W12	classification of instrumental analysis techniques, the theoretical and methodological basis of spectroscopic, electrochemical, chromatographic and mass spectrometry techniques, as well as the operation principles of devices used in the said techniques;
K_B.W13	criteria for selecting the analytical method;
K_B.W14	principles of the analytical method validation;
K_B.W15	thermodynamics basics and chemical kinetics and quantum basics of matter structure;
K_B.W16	physicochemistry of heterogeneous systems and surface phenomena and the mechanisms of catalysis;
K_B.W17	classification of carbon compounds and nomenclature of organic compounds;
K_B.W18	structure of organic compounds in the context of the molecular orbital theory and describes the mesomeric and inductive effects;
K_B.W19	types and mechanisms of chemical reactions involving organic compounds (substitution, addition, elimination);

K_B.W20	classification of organic compounds into functional groups and their properties;
K_B.W21	structure and properties of heterocyclic compounds and selected compounds of natural origin: carbohydrates, steroids, terpenes, lipids, peptides and proteins;
K_B.W22	structure, properties and ways of receiving polymers used in pharmaceutical technologies;
K_B.W23	preparation and methods of spectroscopic and chromatographic analysis of natural compounds;
K_B.W24	elementary functions and basics of differential and integral calculus;
K_B.W25	elements of the probability theory and mathematical statistics (phenomena and probability, variables, random variable distribution functions, mean value and variance), basic random variable distributions, point and interval estimation of parameters;
K_B.W26	methods for testing statistical hypotheses and the significance of correlation and regression;
K_B.W27	theoretical methods used in pharmacy and basics of bioinformatics and molecular modelling in the field of medication design;
K_C.W1	classification of medicinal substances in accordance with the Anatomic Therapeutic Chemical (ATC) Classification System;
K_C.W2	chemical structure of basic medicinal substances;
K_C.W3	correlation between chemical structure, physicochemical properties and mechanisms of medicinal substances effect;
K_C.W4	elements and compounds marked by isotopes used in diagnostics and disease treatment;
K_C.W5	pharmacopoeia's structure and its meaning to the substance quality and medicinal products;
K_C.W6	methods used in pharmaceutical quality assessment and in the analysis of medicinal substances and the ways of validating those methods;
K_C.W7	methods of controlling the quality of drugs marked by isotopes;
K_C.W8	durability of basic medicinal substances and their possible reactions to decomposition and factors influencing their durability;
K_C.W9	problematic aspects of falsified medicines;
K_C.W10	methods of preparing selected medicinal substances, the necessary physical operations, discrete chemical processes;
K_C.W11	requirements concerning the description of manufacturing and quality assessment of medicinal substances in registration documentation;
K_C.W12	methods of obtaining and separating optically active medicinal substances and methods of obtaining various polymorphic forms;
K_C.W13	methods of searching for novel medicinal products;
K_C.W14	basic categories of drugs and has knowledge of issues in patent protection;
K_C.W15	physicochemical and functional properties of basic auxiliary substances used in drug dosage form technology;
K_C.W16	production potential of living cells and organisms and possibilities of regulation using technological methods;
K_C.W17	conditions in living cells and organisms culture and the processes used in pharmaceutical biology together with purifying the received medicinal substances;
K_C.W18	methods and techniques of changing the scale an optimisation of the parameter processes in pharmaceutical biotechnology;
K_C.W19	basic groups, biological properties and the use of biological medicinal substances;
K_C.W20	forms of biopharmaceuticals and problems with their durability;
K_C.W21	basic vaccines, principles of their use and storage;
K_C.W22	basic blood-borne products and blood substitutes and the method of obtaining them;
K_C.W23	pharmacopoeial requirements of biological medicine and principles of introducing them to the market;
K_C.W24	new achievements in the research on biological and synthetic medicine;

K_C.W25	nomenclature, composition, structure and properties of particular medicine forms;
K_C.W26	rules for the selection of the form of the drug depending on the properties of the medicinal substance and the intended use of the medicinal product;
K_C.W27	principles of preparing prescription medications and their storage conditions;
K_C.W28	types of physicochemical variances between the components of pharmaceutical preparations;
K_C.W29	basic technological processes and equipment used in drug dosage form technology;
K_C.W30	obtaining liquid, semi-solid and solid dosage forms on a laboratory and industrial scale and the influence of technological process parameters on dosage form properties;
K_C.W31	aseptic techniques and methods of obtaining sterile medicinal products, substances and material;
K_C.W32	types of drug packaging and dosage systems;
K_C.W33	principles of Good Manufacturing Practice specified in the regulations issued on the basis the Article 39 (5) (1) of the Pharmaceutical Law of September 6, 2001 (Journal of Laws of 2019, item 499, as amended), including the principles of technological processes documentation;
K_C.W34	methods of dosage form quality assessment and production series analysis;
K_C.W35	factors determining drug stability and methods of testing;
K_C.W36	range of chemical pharmaceutical testing required for the registration documentation of the medicinal product;
K_C.W37	range of risk analysis, quality design and process analysis-based technology in pharmaceutical production;
K_C.W38	principles of preparing homeopathic medications;
K_C.W39	methods for preparing radiopharmaceuticals ex tempore;
K_C.W40	possibilities of using nanotechnology in pharmacy;
K_C.W41	types and methods of manufacturing and quality assessment of plant preparations;
K_C.W42	raw materials of plant origin used in medical treatment and in drug, dietary supplements and cosmetic production;
K_C.W43	groups of chemical compounds crucial to medicinal substances and plant preparation properties;
K_C.W44	chemical structures, mechanisms of action and applications of compounds present in medicinal plants;
K_C.W45	methods of substance and plant preparation testing and methods of isolating the components from plant material;
K_C.W46	nanoparticles and their use in diagnostics and therapy;
K_C.W47	biomedical polymers and macromolecular conjugates of medicinal substances and their use in medicine and pharmacy;
K_D.W1	processes affecting a medication in the organism, depending on the route and method of administration
K_D.W2	structure and function of biological barriers in the organism affecting drug absorption and distribution;
K_D.W3	influence of dosage forms and method of administration on absorption and duration of effect;
K_D.W4	pharmacokinetic processes (LADME) and their meaning in development research and in pharmacotherapy optimisation;
K_D.W5	parameters describing pharmacokinetic processes and means of indication;
K_D.W6	physiological, pathophysiological and environmental factors determining the course of pharmacokinetic processes;
K_D.W7	interactions of drugs in pharmacokinetic, pharmacodynamics and pharmaceutical phases;
K_D.W8	principles of therapy monitored by the concentration of active substance and principles of changes in drug dosage;

K_D.W9	methods of pharmaceutical and biological availability assessment and issues concerning the correlation of in vitro – in vivo (IVIVC) testing results;
K_D.W10	meaning of factors influencing the improvement of pharmaceutical and biological availability of a medicinal product;
K_D.W11	biopharmaceutical assessment of original and generic medications, including bioequivalence assessment methods;
K_D.W12	drug targets and drug action mechanisms and achievements of structural biology in this field;
K_D.W13	pharmacological properties of individual drug groups;
K_D.W14	determinants of drug action in pharmacodynamics phase including hereditary factors and objectives of personalised therapy;
K_D.W15	basics of molecularly-targeted therapy strategy and drug resistance mechanisms;
K_D.W16	routes of drug administration and drug dosage;
K_D.W17	indications, contraindications and side effects characteristic to the drug and dependant on the dosage;
K_D.W18	classification of adverse drug reactions;
K_D.W19	principles of drug combination, types of drug interactions, factors influencing their occurrence and possibilities of their avoidance;
K_D.W20	basic notions of pharmacogenetics and pharmacogenomics and new achievements in the field of pharmacology;
K_D.W21	basic notions of toxicokinetics, toxicometrics and toxicogenetics;
K_D.W22	processes affecting a xenobiotic in the organism, with a focus on the processes of biotransformation, depending on the route of administration and route of exposure;
K_D.W23	issues related to risk exposure to poisons (acute toxicity, chronic toxicity, long-term effects);
K_D.W24	endogenous and exogenous factors modifying the activity of enzymes metabolising the xenobiotics;
K_D.W25	toxic effects of selected drugs, addictive, psychoactive and other chemical substances and the procedures in case of poisoning;
K_D.W26	principles of air and biological monitoring in exposure to xenobiotics;
K_D.W27	in vitro and in vivo methods used in xenobiotics toxicity testing;
K_D.W28	principles of planning and methodology of toxicological testing required in the process of searching and registering new drugs;
K_D.W29	health hazards and consequences related to environment pollution;
K_D.W30	basic nutrients, system expenditure, its meaning, physiological availability and metabolism and nutrition sources;
K_D.W31	knows methods used in the assessment of nutritional value of food;
K_D.W32	issues related to substances added do food, food contamination and inappropriate quality of goods intended for contact with food;
K_D.W33	issues related to enriched foods, dietary supplements and special purpose foods;
K_D.W34	methods of assessing nutritional habits of a healthy and sick person;
K_D.W35	basics of drug-food interaction;
K_D.W36	requirements and methods of dietary supplement quality assessment, in particular the ones including vitamins and minerals;
K_D.W37	methods of enteral nutrition;
K_D.W38	principles of designing complex plant preparations;
K_D.W39	criteria for assessing the quality of medicinal plant products and dietary supplements;
K_D.W40	molecular mechanisms of substances of natural origin, their metabolisms and biological availability;
K_D.W41	medicinal products of natural origin and therapeutic indications for their use;
K_D.W42	issues related to clinical studies on plant-based medications and meaning and position of phytotherapy in the conventional medicine system;

K_D.W43	procedure of standardisation of a plant-based drug and its use in the registration process;
K_D.W44	new achievements pertaining to plant-based drugs;
K_E.W1	legal basis and principles of pharmaceutical market organisation in the scope of retail turnover in the Republic of Poland and functioning of retail and hospital pharmacies;
K_E.W2	principles of pharmaceutical market organisation in the scope of retail turnover in the Republic of Poland and functioning of pharmaceuticals wholesalers;
K_E.W3	principles of issuing, registering and filling prescriptions and principles of issuing drugs in a pharmacy;
K_E.W4	legal basis and principles of practice of the profession of a pharmacist, regulations pertaining to obtaining a licence to practice the profession of a pharmacist and functioning of a professional organisation for pharmacists;
K_E.W5	legal basis and organisation of medicinal products manufacturing process;
K_E.W6	principles of organising and financing health protection system in the Republic of Poland and the role of a pharmacist in this system;
K_E.W7	significance of the appropriate drug administration in the health protection system;
K_E.W8	idea of pharmaceutical care and notions related to pharmaceutical care, in particular pertaining to problems and needs related to using drugs;
K_E.W9	principles of monitoring efficiency and safety of patient's pharmacotherapy in pharmaceutical care process;
K_E.W10	principles of individualisation of pharmacotherapy allowing for the differences in drug action affected by physiological factors in disease states in clinical conditions;
K_E.W11	main scientific sources of medication information;
K_E.W12	principles of evidence-based therapeutic procedures;
K_E.W13	therapeutic standards and guidelines of therapeutic procedure;
K_E.W14	role of a pharmacist and representatives of other medical professions in a therapeutic team;
K_E.W15	hazards related to the independent use of drugs by patients;
K_E.W16	issues of addiction to medication and other substances and the role of a pharmacist in fighting addictions;
K_E.W17	principles of drug use depending on the form, type of packaging and dosing system;
K_E.W18	principles of introducing medicinal products, medical devices, dietary supplements, foods for particular nutritional uses and cosmetics;
K_E.W19	basics of health economics and pharmacoeconomics;
K_E.W20	methods and tools of cost and effect assessment for needs of economic analyses;
K_E.W21	knows and understands guidelines pertaining to the assessment of medical technologies, particularly with respect to cost performance, as well as the methodology of assessing drug efficiency and safety;
K_E.W22	legal basis and principles of conducting and organising drug testing, including experimental testing and testing involving people;
K_E.W23	legal, ethical and methodological aspects of conducting clinical studies and the role of a pharmacist in such studies;
K_E.W24	significance of population health indexes;
K_E.W25	principles of conducting various epidemiological studies;
K_E.W26	principles of monitoring the safety of medicinal products placed on the market;
K_E.W27	pharmacy and the pharmacy profession, directions in the development of education preparing for the practice of the profession of a pharmacist, as well as international pharmaceutical organisations and other organisations for pharmacists;
K_E.W28	basic notions in ethics, deontology and bioethics, as well as issues related to the deontology of the pharmacist profession;
K_E.W29	ethical principles of modern pharmaceutical marketing;
K_E.W30	principles of health promotion, its objectives and the role of a pharmacist in promoting healthy lifestyle;

K_F.W1	research methods and techniques used as part of a scientific project;
SKILLS **The graduate is able to:**	
K_A.U1	apply the knowledge of the genetic basis of cell differentiation and inheritance mechanisms to characterise genetic polymorphism;
K_A.U2	evaluate genetic determinants of the development of disease in the human population;
K_A.U3	use anatomical terminology in health status assessment;
K_A.U4	describe the mechanisms of functioning of the human organism at molecular, cellular, tissue and system levels;
K_A.U5	describe the mechanisms of development of functional disorders and correctly interpret the pathophysiological processes of disease development;
K_A.U6	apply knowledge of biochemistry in the analysis and assessment of physiological and pathological processes;
K_A.U7	detect and determine proteins, nucleic acids, carbohydrates, lipids, hormones and vitamins;
K_A.U8	perform the analysis of enzyme reaction kinetics;
K_A.U9	describe and explain immune mechanisms and processes in health and illness;
K_A.U10	perform the isolation, determination and amplification of nucleic acids and conduct the analysis;
K_A.U11	apply basic techniques of work involving microbes and the principles of aseptic work;
K_A.U12	identify microorganisms on the basis of morphological characteristics and physiological and culture properties;
K_A.U13	make use of immunological methods and molecular biology techniques in microbiological diagnostics;
K_A.U14	test and assess antimicrobial agents' activity;
K_A.U15	carry out microbiological control with the use of pharmacopoeial methods;
K_A.U16	identify and determine the structural components of plant cells, tissues and organs using microscopic histochemical methods;
K_A.U17	identify species of medicinal plants on the basis of their morphological and anatomical features;
K_A.U18	identify health- and life-threatening situations and give advanced first aid in the event of a health- or life-threatening situation;
K_A.U19	initiate and support group, help and remedial activities, influence attitude development and lead a team;
K_A.U20	make assessment of actions and moral dilemmas in accordance with ethical norms;
K_A.U21	use psychological tools in interpersonal communication with patients, carers, doctors and other health care system workers;
K_B.U1	describe and interpret physical, biophysical and physicochemical quantities with the use of appropriate laboratory apparatus and perform physical and chemical calculations;
K_B.U2	describe and interpret biophysical properties and phenomena, and evaluate the effects of physical environmental factors on living organisms;
K_B.U3	describe and analyse physical phenomena and processes related to diagnostics and disease therapy;
K_B.U4	identify inorganic substances with the use of pharmacopoeial methods;
K_B.U5	conduct water analysis for pharmaceutical purposes;
K_B.U6	perform validation of an analytical method;
K_B.U7	perform qualitative and quantitative analyses of elements and chemical compounds and assess the credibility of analysis result;
K_B.U8	perform tests of chemical reaction kinetics;
K_B.U9	analyse physicochemical properties and processes forming the basis of drugs biologicalfunctioning and pharmacokinetics;

K_B.U10	assess and predict properties of chemical compounds on the basis of their structure, plan andperform synthesis of organic compounds in a laboratory scale and identify them;
K_B.U11	use mathematical, statistical and computer tools to develop, interpret and present results of experiments, analyses and measurements;
K_B.U12	use computer tools to develop and present data and for creative problem solving;
K_C.U1	classify medicinal substances in accordance with the Anatomic Therapeutic Chemical (ATC) Classification System, including international terminology;
K_C.U2	discuss the application of radiopharmaceuticals in diagnostics and treatment;
K_C.U3	assess the properties of a substance for pharmacological use on the basis of its chemical structure;
K_C.U4	make use of pharmacopoeias, guidelines and literature related to assessment of pharmacological substance quality and medicinal product;
K_C.U5	perform control of a pharmacological substance and a medicinal product in accordance with pharmacopoeial requirements;
K_C.U6	perform pharmacological substance identity an quality testing and conduct the analysis of its content in a medicinal product with the use of pharmacopoeial methods, including spectroscopic and chromatographic methods;
K_C.U7	interpret the results of substance quality assessment for pharmaceutical and medicinal product purposes and verify the accordance of the obtained results with specification;
K_C.U8	detect by observation the faults of a medicinal product which qualify it to be reported to the competent authority for pharmacovigilance cases;
K_C.U9	select stages and critical parameters in the process of medicinal substance synthesis and prepare a block diagram of an exemplary synthesis process;
K_C.U10	perform the synthesis of a medicinal substance and propose a cleansing method;
K_C.U11	explain the presence of solvent residues and other pollution in a medicinal substance;
K_C.U12	analyse stages and parameters of a biotechnological process;
K_C.U13	assess the quality and durability of a medicinal substance obtained biotechnologically and propose its specification;
K_C.U14	use pharmacopoeias, prescriptions and technological regulations, guidelines and literature on the technology of the form of the drug, in particular in relation to prescription drugs;
K_C.U15	propose an appropriate drug form depending on a medicinal substance properties and its purpose;
K_C.U16	manufacture prescription drugs, select packaging and determine their shelf life and method of storage;
K_C.U17	identify and solve problems resulting from the composition of a prescription drug, control its dosage and verify its composition;
K_C.U18	make plant preparations in laboratory conditions and make an assessment of its quality with the use of pharmacopoeial methods;
K_C.U19	assess functional properties of auxiliary pharmacological substance;
K_C.U20	prepare preparations in aseptic conditions and selects adequate sterilisation methods;
K_C.U21	prepare parenteral feeding formulae;
K_C.U22	prepare cytostatic drugs in a form which is ready to serve;
K_C.U23	prepare operational procedures and make minutes of activities performed during manufacturing of the prescription and pharmaceutical drugs;
K_C.U24	plan stages of drug manufacturing in industrial conditions, select the equipment and methods of inter-process control;
K_C.U25	perform analyses related to dosage form quality assessment, operate control and measurement equipment and interpret the results of testing;
K_C.U26	assess the risk of poor-quality medicinal product and medical device as well as clinical consequences;

K_C.U27	propose a medicinal product specification and plan the testing of medicinal substance and medicinal product durability;
K_C.U28	determine factors affecting medicinal product durability and select storage conditions;
K_C.U29	identify a medicinal plant raw material and classify it into the appropriate botanical family on the basis of its morphological and anatomical characteristics;
K_C.U30	use micro- and macroscopic methods to determine the identity of a plant medicinal substance;
K_C.U31	evaluate the quality and therapeutic value of plant raw material using pharmacopoeial monographs and perform its analysis using pharmacognostic testing methods;
K_C.U32	perform analyses of a simple and compound plant medicine and identify its active substances with the use of chromatographic or spectroscopic methods;
K_C.U33	provide information about chemical composition and properties of medicinal substances and plant preparations;
K_C.U34	search for the scientific information regarding medicinal substances and products;
K_D.U1	examine differences in medicinal substance absorption depending on the composition and form of the medication and physiological and pathological conditions;
K_D.U2	explain the significance of membranous transport in pharmacokinetic processes (LADME);
K_D.U3	calculate and interpret the pharmacological parameters of a medication determined using pharmacokinetic models or other methods;
K_D.U4	present meaning, propose methodology and interpret the results of pharmaceutical and biological availability testing and bioequivalence testing;
K_D.U5	use law regulations, guidelines and scientific publications regarding the biological availability and pharmaceutical bioequivalence;
K_D.U6	present and explain the profiles of active substance concentration depending on the drug and dosage form;
K_D.U7	perform the analysis of release from an oral dosage form in order to determine similarities between different medicinal products with the use of pharmacopoeial methods and equipment;
K_D.U8	justify the possibility of exempting a medicinal product from in vivo bioequivalence studies on the basis of the Biopharmaceutics Classification System;
K_D.U9	predict the results of changes in the pharmaceutical and biological availability of a medicinal substance resulting from dosage form modification;
K_D.U10	explain the causes and results of interactions during the pharmacokinetic phase and determine methods of prevention;
K_D.U11	describe the pharmacological properties of a medication with respect to drug target and mechanism of action;
K_D.U12	justify the need to change drug dosage depending on physiological and pathological conditions and genetic factors;
K_D.U13	predict adverse reactions of certain drug groups depending on drug dose and mechanism of action;
K_D.U14	explain the causes and effects of interactions in the pharmacodynamic phase and identify ways to prevent these interactions;
K_D.U15	provide information on indications and contraindications for the use of drugs, and on the proper dosage and intake;
K_D.U16	provide pharmacological information in a way that is understandable to the patient;
K_D.U17	cooperate with representatives of other medical professions in ensuring the safety and effectiveness of pharmacotherapy;
K_D.U18	assess the risks associated with environmental pollution by environmental poisons and medicinal substances and their metabolites;

K_D.U19	characterize the biotransformation of xenobiotics and assess its importance in metabolic activation and detoxification;
K_D.U20	predict the direction and strength of xenobiotic toxicity depending on its chemical structure and type of exposure;
K_D.U21	isolate poisons from biological material and select the appropriate detection method;
K_D.U22	carry out exposure assessment (biological monitoring) based on toxicological analysis in biological material;
K_D.U23	characterize food products in terms of their composition and nutritional value;
K_D.U24	assess the nutritional value of food by calculation and analytical methods (including gas and liquid chromatography and atomic absorption spectrometry);
K_D.U25	assess the diet in terms of meeting energy and essential nutrients in health and illness;
K_D.U26	explain the principles and role of proper nutrition in the prevention and course of diseases;
K_D.U27	assess human exposure to food contaminants;
K_D.U28	predict the effects of changes in the concentration of the active substance in the blood as a result of eating certain food products;
K_D.U29	explain the causes and effects of drug-drug interaction and food;
K_D.U30	provide patient advice on drug-food interactions;
K_D.U31	provide information on the use of nutritional preparations and dietary supplements;
K_D.U32	evaluate the quality of products containing herbal medicinal raw materials;
K_D.U33	design a herbal medicine with a specific effect;
K_D.U34	evaluate the action profile of the plant medicinal product based on its composition;
K_D.U35	give the patient advice on the use, contraindications, interactions and side effects of natural medicines.
K_E.U1	determine the principles of drug management in a hospital and pharmacy;
K_E.U2	implement prescriptions using available IT tools and provide information on the medicine dispensed;
K_E.U3	determine the scope of responsibilities, supervise and organize the work of staff in the pharmacy;
K_E.U4	specify storage conditions for medicinal products, medical devices and dietary supplements, identify products that require special storage conditions, and control storage conditions;
K_E.U5	plan, organize and conduct pharmaceutical care;
K_E.U6	conduct pharmaceutical consultations in the process of pharmaceutical care and pharmaceutical consultancy;
K_E.U7	cooperate with the doctor in the field of optimization and rationalization of therapy in closed and open treatment;
K_E.U8	choose over-the-counter medications for medical conditions that do not require medical consultation;
K_E.U9	prepare a pharmacotherapy monitoring plan, specifying methods and principles for assessing the effectiveness and safety of therapy;
K_E.U10	perform and explain the individualization of the patient's dosage in clinical settings;
K_E.U11	choose the form of medicine for the patient, taking into account clinical recommendations, patient needs and product availability;
K_E.U12	indicate the right way to handle the medicine while it is being used by the patient and provide information about the medicine;
K_E.U13	indicate the proper way of handling the drug by healthcare system employees;
K_E.U14	carry out patient education related to the medications he uses and other problems related to his health and illness, and prepare individualized educational materials for the patient;
K_E.U15	use IT tools in work;

K_E.U16	predict the impact of various factors on the pharmacokinetic and pharmacodynamic properties of drugs and solve problems regarding the individualization and optimization of pharmacotherapy;
K_E.U17	monitor and report adverse drug reactions, implement preventive measures, provide information related to pharmacological complications to healthcare system employees, patients or their families;
K_E.U18	identify the risks associated with the use of pharmacotherapy in various patient groups and plan preventive measures;
K_E.U19	identify the role and tasks of individual pharmacy self-government bodies as well as the rights and obligations of its members;
K_E.U20	evaluate and interpret the results of epidemiological studies and draw conclusions from them and indicate the basic errors occurring in these studies;
K_E.U21	indicate the appropriate pharmaceutical organization or body dealing with the occupational problem;
K_E.U22	identify basic ethical problems related to modern medicine, protection of life and health and conducting scientific research;
K_E.U23	actively participate in the work of the therapeutic team, cooperating with employees of the healthcare system;
K_E.U24	actively participate in conducting clinical trials, in particular in the scope of supervising the quality of the investigational medicinal product, and monitoring of the clinical trial and managing the management of medicinal products and medical devices intended for clinical investigations;
K_E.U25	use different sources of information about the drug and critically interpret this information;
K_E.U26	take part in health promotion and prevention activities;
K_E.U27	estimate the costs and effects of pharmacotherapy, calculate and interpret cost-effectiveness ratios, indicate the more cost-effective procedure and determine the influence of new medical technology on financing the health protection system;
K_E.U28	perform a critical analysis of publications regarding to efficacy, security and economic aspects of pharmacotherapy as well as publications regarding to work practice and pharmaceutical market;
K_E.U29	compare the frequency of occurrence of health-related phenomena as well as estimate and interpret population health indices;
K_E.U30	abide by the principles of occupational deontology, including the Code of Ethics for Pharmacists of the Republic of Poland;
K_E.U31	respect the patient's rights;
K_E.U32	communicate with patients and healthcare personnel in a foreign language on B2+ level of Common European Framework;
K_F.U1	plan scientific research, discuss its purpose and expected results;
K_F.U2	interpret scientific research and relate it to the current state of knowledge;
K_F.U3	use national and international specialist research literature;
K_F.U4	perform scientific research, interpret and document its results;
K_F.U5	present the results of scientific study.
SOCIAL COMPETENCIES **In the scope of social competencies the graduate is ready to:**	
K1.	establishing relationships with the patient and colleagues based on mutual trust and respect;
K2.	notice and recognize their own limitations, make a self-assessment of deficits and educational needs;
K3.	implement the principles of colleagueship and co-operation in a team of professionals, including representatives of other medical professions, also in a multicultural and multinational environment;
K4.	observe secrecy concerning health, patient's rights and rules of professional ethics;

K5.	present an ethical and moral behaviour compliant with ethical principles and take actions on the basis of code of ethics in work practice;
K6.	propagate health-promoting behaviours;
K7.	use objective sources of information;
K8.	draw conclusions based on their measurements or observation;
K9.	formulate opinions on various aspects of professional activity;
K10.	take responsibility related to decisions made within the framework of professional activity, including the safety aspects.

Part *B) of the study programme*

D e s c r i p t i o n o f t h e p r o c e s s r e s u l t i n g i n t h e a c h i e v e m e n t o f l e a r n i n g o u t c o m e s

Faculty offering the field of study:	Faculty of Pharmacy
Field of study:	Pharmacy
Level of study:	long-cycle studies
Level of the Polish Qualifications Framework:	level 7
Degree profile:	general academic profile
Allocation of the field of study within academic or artistic discipline(s), to which learning outcomes for a given field of study refer:	Pharmaceutical sciences (100%) **Main discipline:** Pharmaceutical sciences
Mode of study:	full-time studies
Number of semesters:	11
Number of ECTS required for the award of qualifications corresponding to the level:	360
Total number of teaching hours:	5426
Professional degree awarded to the graduate:	magister farmacji
The relationship between the study programme and NCU mission and strategy:	The pharmacy education program is consistent with the unity of science and didactics model. The high qualifications of the research and teaching staff of the Pharmaceutical Faculty and their great commitment to the scientific activity in the field of pharmaceutical sciences guarantees the highest quality of education - one of the most important elements of the Faculty's mission. The developed program based on the knowledge and experience of specialists in this field and access to multi-profile laboratories, which enables the improvement of practical skills, guarantees good preparation for the profession of pharmacist. Pharmaceutical education at the general academic profile is an activity consistent with the Development Strategy of the Nicolaus Copernicus University in Toruń for the years 2021-2026, adopted by the Senate NCU, whose main overarching goal is to strengthen the leading position of the Nicolaus Copernicus University in Poland and achieve significant places among European universities. The didactic and scientific activity conducted as part of the course will serve the development and dissemination of knowledge. The selection of appropriate scientific and didactic staff for individual subjects, in addition to the highest level of education, will also

	contribute to the implementation of major goals in the field of science, including strengthening the high position of the University among the highest-valued scientific institutions in the country and abroad. The prepared education program, apart from improving the attractiveness of studies, creating conditions for achieving a greater degree of competitiveness of graduates on the labor market, is also aimed at transferring the latest knowledge, comprehensive development of social skills and competences, as well as care for the general level of culture and attachment to ethical values.

Courses/course modules along with expected learning outcomes

Course module	Course	Expected learning outcomes	Forms and methods of teaching ensuring the achievement of learning outcomes	Methods of verifying and assessing expected learning outcomes achieved by the student
Course module A **Biomedical and humanistic basis of pharmacy**	Anatomy	Knows the correct structure of the human body and basic relationships between the structure and function of the body in conditions of health and disease - K_A.W4 Uses Polish anatomical denomination to describe the state of health - K_A.U3 Skillfully interprets the role of individual organs and systems in the proper functioning of the human body - K_A.U5 Student follows ethical principles - K5 Has a habit of using objective sources of information - K7 He draws conclusions based on his own experience - K8	**Lecture** ▪ informative lecture (traditional) with a multimedia presentation **Laboratory tutorials:** • formalin preparations, • anatomical models • preparatory films • charts and anatomical multimedia • slide presentations.	The credit is a theoretical credit and takes place in the winter session: 1) The condition of getting started is passing all the tests with a positive grade. 2) Assessment takes the form of a single-choice test (60 questions); the condition for passing the test is a minimum of 60% of correct answers. 3) Failure to register for a student is subject to the provisions of the Study Regulations (item VIII, § 32). 4) During the course it is forbidden to use any teaching aids and electronic devices enabling communication with other people at a distance (e.g. mobile phone). Student behavior justifying the possession of the aids or devices referred to above, or finding such devices will result in automatic unsatisfactory assessment of passing the credit.

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<td>5) The occurrence of the circumstances referred to in item 4 may result in a referral to the Disciplinary Board
for students.
6) Final materials, i.e. the answer card and a copy of the test are the property of the Department and the Department of Normal Anatomy, so it is forbidden for Students to take them.
7) Correction credit is determined in a correction session within the time limit set by the Head of the Department and announced on the Notice Board.

Grading scale:
<table>
<tr><th>Total points</th><th>Grade</th></tr>
<tr><td>> 36</td><td>2</td></tr>
<tr><td>36 – 42</td><td>3</td></tr>
<tr><td>43 – 48</td><td>3,5</td></tr>
<tr><td>49 – 54</td><td>4</td></tr>
<tr><td>55 – 57</td><td>4,5</td></tr>
<tr><td>58 – 60</td><td>5</td></tr>
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<tr>
<td></td>
<td>Biochemistry</td>
<td>Knows and understands the structure and biological role of carbohydrates, lipids, amino acids, proteins, nucleic acids, hormones and vitamins (K_A.W8).
Knows the types and types of lipids and proteins forming biological membranes (K_A.W9).
Knows and understands the structure and functions of membrane channels and</td>
<td><u>Lecture</u>:
▪ informative lecture supported by multimedia techniques,
▪ problem lecture with multimedia presentation,

<u>Laboratory tutorials:</u></td>
<td>The basis for passing the General Biochemistry subject is compliance with the principles set out in the Didactic Regulations of the Department and Clinical Biochemistry Department.

Tests: passing a grade based on a test (the written test consists of single-choice closed questions and open-ended questions) from knowledge gained during lectures, laboratories and exercises. To</td>
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<td>mechanisms associated with transport across biological membranes (K_A.W9).
Knows and understands the mechanisms of signal transduction between cells, as well as between the cell and extracellular matrix (K_A.W10).
Knows and understands metabolic processes and regulatory strategies at the molecular, cellular, organ and systemic levels (K_A.W11).

Is able to use biochemical knowledge to assess physiological and pathological processes occurring in cells and at the level of the whole organism (K_A.U6).
Is able to detect and determine amino acids also using thin layer chromatography (K_A.U7).
Is able to detect, fractionate and determine proteins using chromatographic techniques and the biuret method (K_A.U7).
Is able to perform the characteristic reactions for simple sugars, disaccharides and polysaccharides (K_A.U7).
Can detect and determine cholesterol and vitamins in biological material (K_A.U7).U6: izolować RNA z komórek drożdżowych (K_A.U7).</td>
<td>▪ laboratory method, observation, demonstration,
▪ exercise method.</td>
<td>obtain a positive assessment, it is necessary to get 60% of points.

Test: (0 - 30 points; ; pass threshold ≥ 60%)

<table>
<tr><th>Number of points</th><th>Grade</th></tr>
<tr><td>29-30</td><td>5</td></tr>
<tr><td>27-28</td><td>4,5</td></tr>
<tr><td>24-26</td><td>4</td></tr>
<tr><td>21-23</td><td>3,5</td></tr>
<tr><td>18-20</td><td>3</td></tr>
<tr><td>0-17</td><td>2</td></tr>
</table>

The final theoretical exam consists of 50 test questions (single choice answer) regarding the knowledge acquired during lectures, laboratories and exercises. The student scores one point for every correct answer. You need 30 points (60%) to get a positive grade. Not obtaining the required number of points is tantamount to obtaining an unsatisfactory grade and the need to pass a retake exam.

Exam: (0 - 50 points; pass threshold ≥ 60%)
<table>
<tr><th>Number of points</th><th>Grade</th></tr>
<tr><td>47-50</td><td>Excellent</td></tr>
<tr><td>43-46</td><td>Very good</td></tr>
<tr><td>39-42</td><td>Good</td></tr>
<tr><td>35-38</td><td>Satisfactory</td></tr>
<tr><td>30-34</td><td>Acceptable</td></tr>
<tr><td>0-29</td><td>Fail</td></tr>
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</table>

		Is able to determine the concentration of nucleic acids and assess their purity after isolation (K_A.U7). Is able to perform kinetic studies of invertase enzymatic reactions using the reaction of sugars with 3,5-dinitrosalicylic acid (DNS) (K_A.U8). Is ready to draw conclusions from quantitative and qualitative determinations made during biochemistry classes (K8).		Practical implementation of the exercises (practical test) Others - short test of written information at the beginning of the exercise: (0 - 50 points; pass threshold ≥ 60%) Extended observation (> 50%)
	Biology and genetics	Demonstrates knowledge of the organization of living matter and the interaction of the parasite-host system - K_A.W1 Knows the basics of classical, population and molecular genetics - K_A.W2 Knows the genetic aspects of cell differentiation - K_A.W2 Understands monogenic and poligenic inheritance of human traits - K_A.W3 Is able to characterize the genetic polymorphism of the human population - K_A.W3 Knows the structure and biological functions of nucleic acids - K_A.W2 Demonstrates knowledge of molecular mechanisms of intra and extracellular signal transduction - K_A.W2	**Lecture** ▪ teaching didactic methods ▪ informative lecture (traditional) with a multimedia presentation **Laboratory tutorials:** ▪ seeking didactic methods ▪ practical exercises, ▪ work with a book, ▪ project method, ▪ didactic discussion	Participation in lectures and laboratories is obligatory. A student who, for justified reasons, has to leave the class, is obliged to make up for the backlog after consultation with the assistant leading the group. In justified cases of skipping two or more exercises, it is possible to do them with the consent of the head of teaching. **Lectures:** assessment criteria: written exam in the form of a test. **Laboratories:** assessment criteria: passing a report (two presentations on selected issues in medical genetics and parasitology, made by the student at home), passing practical tasks during exercises (assessment of parasite drawings made during microscopy of parasitological preparations) . In the case of written tests (tests and exam),

		Demonstrates knowledge of the functioning of the immune system and the mechanisms governing it - K_A.W1 Has knowledge of recombination and DNA mutations, which are the basis of individual variability - K_A.W2 Is able to correctly name and characterize the relationships between organisms - K_A.U1 Is able to identify parasites on the basis of morphological characteristics as well as physiological and breeding properties - K_A.U2 Is able to use knowledge about the genetic basis of organisms differentiation and mechanisms of inheritance to characterize inter-individual variability - K_A.U1 Is able to assess human genetic predisposition to the development of diseases - K_A.U2 Is able to describe the mechanisms of human body functioning - Is able to characterize the molecular mechanisms of pathogenic processes - K_A.U4 Has the ability to correctly interpret the pathophysiology of genetic and parasitic diseases - K_A.U4 He is ready to promote pro-health behaviors - K6		the points obtained are converted into degrees according to the following scale: **Percentage of points** / **Grade** 92-100% / 5.0 84-91% / 4.5 76-83% / 4.0 68-75% / 3.5 60-67% / 3.0 0-59% / 2.0 In the case of oral tests, the following criteria are used to assess the learning outcomes achieved by the student: **Grade 5.0**: the student has mastered the knowledge of all the material and possesses extra-curricular messages, presents his knowledge in a logical and systematic way, is able to use it in practice. **Grade 4.5**: the student mastered the issues from all the curriculum material, logically and coherent presents the knowledge possessed. **Grade 4.0**: the student has mastered the knowledge of most of the material, led by an academic teacher can formulate accurate conclusions, presents his knowledge in a logical way. **Grade 3.5**: the student knows the basic issues and mastered the minimum curriculum, understands the questions

		Has a habit of using objective sources of information - K7 He draws conclusions based on his own experience - K8		asked, logically presents his knowledge. **Grade 3.0**: the student has mastered the issues contained in the curriculum, understands the questions, but answers inconsistently in a descriptive manner, confuses the correct terminology, can not practically apply the acquired knowledge. **Grade 2.0**: the student has not mastered the minimum curriculum, does not understand the questions, provides unintended answers, does not use the basic vocabulary correctly.
	Molecular biology	Knows the molecular aspects of the cell cycle - proliferation, apoptosis and tumor transformation - K_A.W14 Knows the problems of recombination and DNA cloning - K_A.W15, Knows the methods of genome testing and the principles of hybridization and polymerase chain reaction (PCR) - K_A.W16, K_A.W17 Plans research using the isolation, determination and amplification of nucleic acids and modern techniques of genome research - K_A.U10 Plans research using molecular biology techniques in pharmaceutical biotechnology, gene therapy and laboratory diagnostics - K_A.U10	**Lecture** ▪ informative lecture (conventional), ▪ problem lecture, ▪ multimedia presentation. **Seminars:** ▪ activating and problem methods ▪ discussion, case method.	The condition of passing the course is: attendance (obligatory attendance at seminars, two absences are the basis for failing to pass this course) and active participation in didactic classes. **Seminars**: credit requires the preparation of two presentations on the topic given by the lecturer. **Lectures**: written exam in the form of a test (single-choice closed questions). The condition of taking the exam is passing seminars. Exam: passing the exam requires 60% of the points. Points obtained are converted into grades on the following scale: **Grade of points** — **Percetage** Excellent — 92-100% Very good — 84-91% Good — 76-83% Satisfactory — 68-75% Acceptable — 60-67%

		Has a habit of using objective sources of information - K7		Fail 0-59%
	Botany	Is able to characterize the morphological and anatomical structure of fungi, lichens, bryophytes, ferns and seed plants supplying medicinal raw materials - K_A.W24 Has basic knowledge of pharmacopoeial and non-pharmacopoeial plant materials - K_A.W24 Knows the basics of systematics of plants and fungi and the rules for using keys to determine vascular plants - K_A.W25 Knows the rules for making a herbarium, including labeling of herbarium plants - K_A.W26 Identifies and characterizes plant cell structures and plant tissues - K_A.U16 Identifies and characterizes the morphological and anatomical structure of plant organs - K_A.U16 Recognizes selected families, types and species of plants with particular emphasis on medicinal taxa based on morphological features - K_A.U17 Develops teamwork skills - K3 Evaluates the value of various sources of information, preferring objective, reliable and consistent	**<u>Lecture</u>** ▪ informative lecture (conventional), ▪ multimedia presentation **<u>Laboratory tutorials:</u>** ▪ prezentacja multimedialna, ▪ metody poszukujące – laboratoryjna, obserwacji, ćwiczeniowa. **<u>Tutorials:</u>** ▪ multimedia presentation. ▪ problem methods **<u>Outdoor classes:</u>** • observation of plants in the Garden of Medicinal and Cosmetic Plants CM Nicolaus Copernicus University and the Botanical Garden LPKiW in Myślęcinek.	**Laboratories, exercises and field classes:** obligatory attendance, correct performance of exercises, passing 2 out of 3 written tests (passing 60% required), making a herbarium, compliance with OHS rules and didactic regulations of the Chair and Department of Pharmaceutical Biology and Botany. **Exam:** written (theoretical) and oral (practical) exam. The condition of passing the exam is passing both parts - theoretical and practical. The final grade of the subject results from three grades (arithmetic average): from both parts of the exam and the average of colloquium grades**.** The scale of grades used for grading tests and exam: 92-100%– excellent 84-91%– very good 76-83% – good 68-75% – satisfactory 60-67% – acceptable 0-59% – fail

		with the state of modern knowledge - K7 Draws and draws conclusions from his own observations of plants and measurements of their characteristics - K8		
	Physiology	Describes the physiology of the nervous system and explains the mechanisms of transmission in the nervous system - K_A.W5 Characterizes thermoregulatory mechanisms - K_A.W5 Explains the physiology of endocrine and reproductive systems as well as mechanisms of hormonal regulation - K_A.W5 Explains physiological mechanisms of the circulatory, lymphatic and respiratory systems as well as mechanisms of cardiopulmonary integration - K_A.W5 Describes the physiology of the digestive system and explains the mechanisms regulating food intake - K_A.W5 Describes the physiology of the urinary system - K_A.W5 Characterizes the mechanisms of modification of physiological processes within the nervous system, endocrine, circulatory, reproductive, digestive, urinary and respiratory systems by selected pharmacological agents - K_A.W5	**Lecture:** ▪ informative lecture (conventional), ▪ problem lecture with multimedia presentation **Laboratory tutorials:** ▪ seeking didactic methods - laboratory, observation, classical problem-based exercise method, discussion, demonstration	The basis for passing the subject Physiology is compliance with the principles set out in the Didactic Regulations of the Chair of Physiology. **Lectures:** – Colloquia: assessment based on tests (written tests: open and closed single-choice questions) - credit ≥ 60% – Final theoretical exam - grade based on the number of points scored on the exam test - credit ≥ 60% **Laboratories:** – Colloquia, tests: credit for grade on the basis of tests (written tests: open and closed single-choice questions) - credit ≥ 60% – Reports / work cards: unrated credit ≥ 60% – Final theoretical exam - grade based on the number of points scored on the exam test - credit ≥ 60%

		Describes the course of hemostasis and explains the impact of selected pharmacological agents on its course - K_A.W5 Describes human adaptation mechanisms to various environmental conditions (high and low temperature, diving, high altitudes) - K_A.U4 Describes the physiological mechanisms and relationships between individual elements of the human body - K_A.U4 Uses the acquired knowledge to analyze the functional state of the body - K_A.U5 Has a habit of using objective sources of information - K7 Draws and draws conclusions from his own measurements and observations - K8		
	History of Philosophy	Knows the directions of development of professional and scientific pharmacy, as well as the development of historical philosophical thought and ethical foundations for resolving moral dilemmas related to the profession of pharmacist and medical professions - K_A.W28 Initiates and supports group activities, influences the formation of attitudes and assistance and remedial actions - K_A. U19	**Tutorials:** ▪ analysis of selected fragments of philosophical texts, iconographic and multimedia materials ▪ didactic discussion	**The condition of passing the course is:** 1. Participation in discussions conducted during exercises 2. Written test in the form of a multiple-choice test 3. The rating results from the sum of points obtained: a. from the test b. for the paper / presentation c. for participating in discussions The maximum number of points that can be obtained is 100. for the test you can get from 0 to 30 points. for a paper / presentation up to 30 points

		Assesses actions and resolves moral dilemmas based on ethical norms and principles - K5		for participating in discussions - up to 40 points The condition of passing the course is to obtain min. 60 points Grades: 60 - 67 pkt. - acceptable 68 - 75 pkt - satisfactory 76 - 83 pkt - good 84 - 91 pkt - very good 92 - 100 pkt - excellent
	Immunology	Knows the structure of the immune system in terms of all its components, i.e. immune cells, tissues and organs (including the division into central and peripheral organs) - K_A.W12 Knows the principles of central and peripheral immune system organs functioning. Knows the differences in the functions of central (primary) and peripheral (secondary) organs. Knows the functions of specific and non-specific response cells - K_A.W12 Knows the division of defense mechanisms into innate and acquired. Correctly interprets and understands the differences in the functioning of non-specific and adaptive defense mechanisms - K_A.W12 Knows the basic immunodiagnostic methods used in assessing the	**Lecture** ▪ informative lecture (conventional), ▪ problem-based lecture with multimedia presentation **Laboratory tutorials:** ▪ observation method, ▪ practical exercises, ▪ exposing methods: film, demonstration, discussion	**Laboratories:** Presentations: ≥60% Practical laboratory exercises: ≥60% Colloquium from laboratories: ≥60% Passing the laboratories: - At each class, students write admission tickets from the current topic in order to pass the pass, obtain ≥ 60% points. - students receive additional points for papers prepared independently for the classes and for oral answers from +1 point. up to -1 (no answer, no paper requested) Criterion of passing: <60% points - failed ≥ 60% points - passed In the event of failure to complete the test the student is entitled to one amendment (test form). **Lectures:** ≥ 60%

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<td>functioning of the immune system - K_A.W13
Knows the basics of immunology of preventive vaccinations, understands how post-vaccine immunity arises - K_A.W13
Knows the basic vaccines available on the market, their structure and effect on the immune system, and knows preparations used as immunotherapeutics and understands their impact on the immune system - K_A.W13
Knows the concepts of probiotic, prebiotic, synbiotic and their effects on the immune system - K_A.W13
Can distinguish between proper and pathological functioning of defense mechanisms - K_A.U9
Is able to describe the operation of defense mechanisms in the fight against various pathogens (bacteria, virus, parasite, fungus) - K-A.U9

He is ready to see the need for self-education and update his own knowledge: K1
Is ready to promote the legitimacy of the use of preventive vaccinations and immunostimulatory preparations: K6</td>
<td></td>
<td>The basis for passing the lectures is a positive test result (30-35 closed questions). The test takes place within the set shortest possible time - after the lectures.
Completion of lectures ends with an assessment, according to the following scale:

<table>
<tr><th>Percentage of points</th><th>Grade</th></tr>
<tr><td>92-100%</td><td>excellent</td></tr>
<tr><td>84-91%</td><td>very good</td></tr>
<tr><td>76-83%</td><td>good</td></tr>
<tr><td>68-75%</td><td>satisfactory</td></tr>
<tr><td>60-67%</td><td>acceptable</td></tr>
<tr><td>0-59%</td><td>fail</td></tr>
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<td>Advanced first aid</td>
<td>Knows how to organize and undertake rescue operations at the scene of an accident, taking care of the safety of themselves and the victims, including legal conditions for saving health and life in emergencies - K_A.W27
Characterizes the causes of sudden cardiac arrest - K_A.W27
Recreates the algorithm for performing basic resuscitation procedures in people of different ages in life-threatening conditions - K_A.W27
Discusses and is aware of the risks at the time of providing first aid and qualified first aid - K_A.W27
Knows the rules for providing assistance in the event of life and health hazards - K_A.W27
Describes the principles of using an automatic defibrillator (AED) - K_A.W27
Knows how to organize and take emergency actions in the event of communication incidents and care of injured persons - K_A.W27
Has the ability to care for own safety and the injured party - K_A.U18
Is able to properly secure the place of the incident - K_A.U18
Correctly recognizes the symptoms of a threat to life and health - K_A.U18</td>
<td><u>Lecture</u>
▪ problem-based lecture
▪ informative lecture
▪ didactic discussion

<u>Laboratory tutorials:</u>
▪ case studies
▪ simulation methods (case study; simulated patient)
▪ exposing methods: film, demonstration</td>
<td><u>Lecture:</u>
Final test:
<table>
<tr><th>Points</th><th>Grade</th></tr>
<tr><td>20</td><td>excellent</td></tr>
<tr><td>18-19</td><td>very good</td></tr>
<tr><td>16-17</td><td>good</td></tr>
<tr><td>14-15</td><td>satisfactory</td></tr>
<tr><td>12-13</td><td>acceptable</td></tr>
<tr><td>0-11</td><td>fail</td></tr>
</table>
<u>Exercises:</u>
Demonstration in simulated conditions (> 75%)</td>
</tr>
</table>

		Correctly performs basic resuscitation procedures in people of different ages in health emergency according to the recommended algorithm. Properly supports the automatic external defibrillator - AED - K_A.U18 Has the ability to deal with health emergencies of internal origin - K_A.U18 Able to deal with the injured in the event of a health emergency of traumatic origin - K_A.U18 Is able to provide assistance in the event of a health hazard of environmental origin - K_A.U18 Acts in accordance with ethical principles - K5 Is aware of the conditions determining the possibility of life and health threatening - K10		
	Microbiology	Knows the general characteristics, growth conditions and biochemical properties of clinically important microorganisms (viruses, bacteria, fungi) pathogenic for humans, lists their virulence factors - K_A.W18 Knows the principles and methods of microbiological diagnostics (biochemical, serological, genetic) and their application in the diagnosis of selected viral, bacterial and fungal infections - K_A.W18 Methods for assessing the sensitivity of microorganisms to	**Lecture:** ▪ informative lecture (conventional) with a multimedia presentation ▪ problem lecture ▪ conversational lecture **Laboratory tutorials:**	The basis for passing the subject of Microbiology is compliance with the principles set out in the Didactic Regulations of the Department and Department of Microbiology. The final theoretical exam consists of 60 questions: test (one-choice answer) regarding knowledge gained during lectures (up to 50% of questions) and laboratories. For each correct answer, the student receives one point. 36 (60%) points are required to obtain a positive grade.

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<td>antibiotics and methods for detecting mechanisms of antibiotic resistance - K_A.W18
Knows and understands the processes of microbial genetic variability and basic mechanisms of the immune response to infection - K_A.W19
Knows the pathogenesis and epidemiology of selected local and systemic infections - K_A.W19
Knows and understands the types of antimicrobial activities, the principles of aseptics, antiseptics and the effect of disinfectants and antiseptics on microorganisms K_A.W20
Knows the criteria for the division of antimicrobial drugs, explains the mechanisms and scope of their action and the principles of antibiotic therapy - K_A.W20
Knows the methods of testing the microbiological purity of the environment and pharmacopoeial requirements and methods of testing the microbiological purity of pharmaceuticals and medical materials - K_A.W22
Knows the definition of alarm pathogens, their threats and problems of nosocomial infections - K_A.W21
Knows microbiological methods of drug testing - K_A.W23</td>
<td>▪ observation method
▪ practical exercises
▪ analysis of microbiological test results
▪ exposing methods: film, demonstration
▪ classical problem-based method
▪ discussion</td>
<td>A student may be released from the exam with a very good final grade if his average grade (weighted average calculated from grades for: activity [x1], tests [x1], colloquia [x3], seminars [x1]) is a minimum of 4.50.

Final theoretical exam, colloquia, written tests: passing a grade based on a test (written test: single choice closed questions) from knowledge gained in lectures and laboratories.

In the case of written tests (at admission cards, colloquia and exam), the points obtained are converted into degrees according to the following scale:

<table>
<tr><th>Percentage of points</th><th>Grade</th></tr>
<tr><td>92-100%</td><td>excellent</td></tr>
<tr><td>84-91%</td><td>very good</td></tr>
<tr><td>76-83%</td><td>good</td></tr>
<tr><td>68-75%</td><td>satisfactory</td></tr>
<tr><td>60-67%</td><td>acceptable</td></tr>
<tr><td>0-59%</td><td>fail</td></tr>
</table>

Theoretical final exam: ≥ 60%
Colloquia, tests (written tests): ≥ 60%
Reports / work cards: ≥ 60%
Prolonged observation / Activity (≥ 50% or 1-3 points; 3 points = excellent grade)</td>
</tr>
</table>

		Is able to choose appropriate microbiological media, perform sowing to grow microorganisms and perform and evaluate microscopic preparations K_A.U11 Is able to identify microorganisms based on the assessment of their morphology, physiological, breeding and biochemical properties - K_A.U12 Is able to use biochemical and serological methods and propose the use of molecular biology methods in microbiological diagnostics for the detection and identification of microorganisms - K_A.U13 Is able to determine, in accordance with the recommendations, the antibiotic sensitivity of bacteria and fungi, taking into account methods for detecting drug resistance mechanisms, and interpret the result obtained - K_A.U14 Is able to assess the impact of physico-chemical factors on microorganisms, assess the microbiological purity of the environment and test the effectiveness of disinfection and sterilization - K_A.U14 Is able to carry out microbiological control of drugs in accordance with pharmacopoeial methods K_A.U15 He is ready to recognize and recognize his own limitations, make		

		self-assessments of deficits and educational needs (directional effect) in order to be ready to continue learning - K_ K2 Is ready to cooperate with other team members during practical classes and to cooperate with representatives of other medical professions - K_K3 Takes care of promoting healthy behaviors by taking care of the use of rational antibiotic therapy - K_K6 Draws conclusions from research and own observations carried out during classes - K_K8		
	Pathophysiology	Explains the involvement of the inflammatory process in etiopathogenesis and course of selected disease entities - K_A.W6 Knows the etiopathogenesis, clinical course of selected disease entities - K_A.W6 Presents the pros and cons of the latest therapeutic strategies for selected diseases - K_A.W6 Classifies and critically evaluates modifiable and unmodifiable, as well as endo- and exogenous pathogens - K_A.W7 Analyzes the pathomechanism and clinical consequences of cardiovascular, respiratory,	**Lecture:** ▪ informative lecture with presentation ▪ problem-based lecture ▪ interactive lecture **Laboratory tutorials:** teaching methods seeking: • observation • show, • classical problem-based exercise method • case study	Credit conditions for the course and assessment criteria: 1. **Lectures**: - exam (written, covering the full range of subject topics: lectures, laboratories and auxiliary materials). 2. **Laboratories**: • positive grades from 3 final tests. • presence in laboratories - every absence must be justified and made up in a manner agreed by the person conducting the exercises. • positive rating issued by the tutors (average of all grades obtained by the student during the classes and activity during the classes). In the case of written tests (exam,

<table>
<tr>
<td></td>
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<td>nervous, endocrine, genitourinary, hematopoietic diseases
and digestive tract, including lifestyle diseases - K_A.U5
Can plan the diagnostic and therapeutic algorithm of selected disease entities - K_A.U5
It associates changes at the cellular, tissue and organ levels with clinical symptoms and the results of physical and physical examination. - K_A.U5
Presents the pathophysiology of selected disease entities based on objective sources of information - K7
Draws conclusions based on the analysis of clinical cases and critically assesses them. - K8</td>
<td>• analysis of test results
• discussion,
• films,
• multimedia presentations</td>
<td>colloquium), the points obtained are converted into grades on the following scale:
<table><tr><th>Percentage of points</th><th>Grade</th></tr><tr><td>92-100%</td><td>excellent</td></tr><tr><td>84-91%</td><td>very good</td></tr><tr><td>76-83%</td><td>good</td></tr><tr><td>68-75%</td><td>satisfactory</td></tr><tr><td>60-67%</td><td>acceptable</td></tr><tr><td>0-59%</td><td>fail</td></tr></table></td>
</tr>
<tr>
<td>Psychology</td>
<td>He knows the rules of interpersonal communication with the patient and other healthcare professionals. K_A.W29
Is aware of the psychological conditions and restrictions resulting from the disease and the need to promote behavior supporting mental health. K_A.W30
Knows the problems of group work and its support. K_A.W31
Initiates and supports group activities using knowledge in the field of psychology. K_A.U19
Communicates effectively in a group and with a patient. K_A.U19</td>
<td><u>Lecture:</u>
▪ problem-based lecture with multimedia presentation.
<u>Tutorials:</u>
▪ simulation exercises,
▪ discussion in groups,
▪ expert tables method</td>
<td>The condition of passing the course is active participation in didactic classes and obtaining the appropriate number of points.

Tutorials: written test
<table><tr><th>Percentage of points</th><th>Grade</th></tr><tr><td>88-100%</td><td>excellent</td></tr><tr><td>81-87%</td><td>very good</td></tr><tr><td>74-80%</td><td>good</td></tr><tr><td>67-73%</td><td>satisfactory</td></tr><tr><td>60-66%</td><td>acceptable</td></tr><tr><td>0-59%</td><td>fail</td></tr></table></td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>Has a habit of using objective sources of information - K7</td><td></td><td></td></tr>
<tr><td></td><td>Sociology</td><td>Knows the sociological and cultural conditions of an individual's functioning in a health risk society (social inequalities, fashion, media, medicalization and pharmacologization processes, etc.) - K_A.W30
Demonstrates knowledge of the principles of interpersonal communication (correct communication, barriers to communication with the patient, difficult patient - difficult situations) - K_A.W30
Has knowledge of the functioning of group activities (support groups, associations, foundations) - K_A.W30
Lists social causes and consequences resulting from illness and disability - K_A.W30
Recognizes and is able to apply in simulated conditions the basic rules of interpersonal communication (social engineering dimension of communication) - K_A.U21
Is able to distinguish and assess selected social processes that have an impact on the development of medicine, a functional and dysfunctional medical institution, assesses the patient's place in the institution and analyzes the</td><td><u>Tutorials:</u>
▪ discussion,
▪ exposing methods: film, demonstration,
▪ ideas exchange</td><td>Tutorials:
Colloquium (0-60 points)
Project (0-30 points)
Participation in didactic discussion in groups (20 points)
Reflections, Microsoft Teams (3 x 5 points)

<table><tr><th>Percentage of points</th><th>Grade</th></tr><tr><td>88-100%</td><td>excellent</td></tr><tr><td>81-87%</td><td>very good</td></tr><tr><td>74-80%</td><td>good</td></tr><tr><td>67-73%</td><td>satisfactory</td></tr><tr><td>60- 66%</td><td>acceptable</td></tr><tr><td>0-59%</td><td>fail</td></tr></table></td></tr>
</table>

		activities of foundations, associations and support groups - K_A.U19, K_A.U21 Is aware of the need to promote healthy behaviors - K6 He is ready to accept the responsibility associated with decisions taken as part of his professional activity - K10		
Course module B **Physicochemical basis of pharmacy**	Biophysics	physical basis of physiological processes (circulation, nerve impulse transmission, gas and substance exchange, movement) – K_B.W1 effect of physical and chemical factors of the environment on human organism - K_B.W2 methodology of biophysical measurements -K_B.W3 biophysical basics of diagnostic and therapeutic techniques - K_B.W4 describe and interpret physical, biophysical and physicochemical quantities with the use of appropriate laboratory apparatus and perform physical and chemical calculations - K_B.U1 describe and interpret biophysical properties and phenomena, and evaluate the effects of physical environmental factors on human organism	**Lectures:** ▪ informative lecture (conventional) ▪ problem – oriented lecture **Laboratory tutorials:** ▪ participation in laboratory tutorials ▪ observation ▪ theoretical calculations	The student is allowed to pass the course after passing the laboratory classes. A student gets completion of lab classes after verification of learning outcomes. A student obtains completion of the course as a result of the exam in the form of a test. The student receives 30 test questions graded on a scale of 0-1. Getting 16 points is a test pass. The test concerns learning outcomes.

		- K_B.U2 describe and analyse physical phenomena and processes related to diagnostics and disease therapy - K_B.U3 Uses objective sources of information – K7 Draws conclusions based on their measurements or observation – K8		
	Analytical chemistry	Knows the basics of classical methods of quantitative analysis, including weight analysis and volume analysis (alkacimetry, redoximetry, argentometry, complexonometry) - K_B.W11 Knows the use of classical quantitative analysis methods - K_B.W11 Knows the classification and theoretical foundations of instrumental analytical techniques - K_B.W12 Explains the methodical basics and the use of instrumental techniques, including spectroscopic, electrochemical, chromatographic and mass spectrometry - K_B.W12 Knows and is able to apply the criteria for choosing the instrumental analytical method to perform a specific analytical task - K_B.W13 Knows the definitions of analytical method validation parameters, is	**Lectures:** ▪ informative lecture (conventional) ▪ problem – oriented lecture ▪ multimedia presentation **Laboratory tutorials:** ▪ participation in laboratory tutorials ▪ observation ▪ practical laboratory studies **Seminars:** ▪ activating and problem-oriented methods – discussion,	**Winter semester:** The condition of passing the course is active participation in didactic classes and obtaining the appropriate number of points. **Laboratory tutorials:** written tests, passing tests - passing lab classes requires 60% points for analysis and tests. **Summer semester:** written colloquium; analysis of a research paper; passing requires 60% of points **Exam:** passing the exam requires 60% of the points The grade in the subject depends on the sum of points obtained in the classes in the first and second semester, seminar and exam. **Grading scale:** 92 – 100% points excellent (5) 84 – 91% points very good (4.5) 76 – 83% points good (4) 68 – 75% points satisfactory (3.5) 60 – 77% points acceptable (3) 0 – 59% points fail (2)

		able to plan, perform and evaluate the validation process - K_B.W14 Knows types of solutions and their division due to different criteria (e.g. real and colloidal solutions, suspensions) - K_B.W7 Is able to optimize and validate the classic method for carrying out the analytical task - K_B.U6 Performs identification and quantitative analysis of elements and chemical compounds using appropriate classic methods - K_B.U7 Is able to select, optimize and validate the instrumental method for carrying out the analytical task - K_B.U6 Performs quantitative analysis of elements and chemical compounds using appropriate instrumental techniques - K_B.U7 Is able to assess the reliability and analytical quality of measurement results using appropriate statistical tools - K_B.U7 Performs analysis of water intended for pharmaceutical purposes using the recommended analytical methods - K_B.U5 Uses objective sources of information - K7 Is able to formulate conclusions from own measurements or observations – K8	▪ classical problem-oriented method, ▪ use the Moodle platform	

<table>
<tr>
<td></td>
<td>Physical chemistry</td>
<td>Knows hermodynamics basics and chemical kinetics and quantum basics of matter structure - K_B.W15
Understand basics of statics and chemical kinetics - K_B.W15
Knows physicochemistry of heterogeneous systems and surface phenomena and the mechanisms of catalysis
- K_B.W16
Knows quantum mechanisms of catalysis - K_B.W16
analyse physicochemical properties and processes forming the basis of drugs biological functioning and pharmacokinetics - K_B.U9
Describes the physicochemical processes underlying the biological action of drugs - K_B.U9
describe phenomena related to pharmacokinetics - K_B.U9

In the scope of social competencies the graduate is ready to:
use objective sources of information - K7
draw conclusions based on their measurements or observation - K8</td>
<td><u>Lectures:</u>
▪ traditional lecture supported by multimedia techniques, interactive lecture, informative lecture
▪ activating methods: case study method, discussion, informal discussion, "for" and "against" debate
▪ problem methods: brainstorming, classical problem-oriented method
▪ exposing methods: demonstration of selected phenomena

Laboratory tutorials<u>:</u>
▪ practical methods (practical laboratory studies,</td>
<td>The condition of passing the course is: the presence, positive assessment issued by the teacher conducting the laboratory and auditorium classes and the lack of offenses listed in the "Health and Safety Rules" of the Didactic Regulations of the Department of Physical Chemistry.

Lectures: Completion of the course Physical Chemistry takes place on the basis of a written exam consisting of 15 closed questions in the form of test questions and 5 open questions (short answers).
For each correct solution of a closed question, the student receives 1 point. You can get 1 point for every full answer to an open question.
The necessary condition for passing the exam is the simultaneous fulfillment of two conditions: getting a total number of points (from both parts of the exam) greater than 50% and getting at least 30% in the open part of the exam (and only in this case bonuses are counted).
The grading scale for the exam is linear in accordance with the following points:
<table>
<tr><th>Grade</th><th>The percentage of possible points to get:</th><th>The number of possible points to get:</th></tr>
<tr><td>excellent</td><td>91-100</td><td>18 - 20</td></tr>
<tr><td>very good</td><td>81-90</td><td>16 - 17</td></tr>
<tr><td>good</td><td>71-80</td><td>14 - 15</td></tr>
<tr><td>satisfactory</td><td>61-70</td><td>12 - 13</td></tr>
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</tr>
</table>

			measurement and observation, experiments) ▪ feeding methods (description, talk) ▪ activating methods (case study method, discussion, informal discussion, "for" and "against" debate) ▪ problem methods: brainstorming, classical problem-oriented method **<u>Seminars:</u>** ▪ feeding methods (description, talk) ▪ activating methods (case study method, discussion, informal discussion, "for" and "against" debate) ▪ problem methods (brainstorming,	<table><tr><td>acceptable</td><td>51-60</td><td>11</td></tr><tr><td>fail</td><td>0-51</td><td>0 - 10</td></tr></table> The condition of taking the exam is getting credit for classes. **Laboratory tutorials and seminars:** on the basis of combined credit (laboratories are carried out in the first 13 weeks, the last two weeks - seminars). Assessment criteria: during one laboratory, the student is assessed on the basis of the substantive degree of preparation for the exercise (0-4 points), the quality of tasks and instructions (0-2 points), preparation of the conducted experiments in the form of a report (0-4 points) and two tests (0-50 points). During the seminar, the student can collect a total of 20 points, based on the test. A minimum of 51% of all points has to be obtained (220 points) as well as correctly completed reports from conducted experiments should be obtained. Detailed assessment criteria are included in the regulations of the subject (access in the Department and Physical Chemistry Departments).

			classical problem method)	
	General and inorganic chemistry	**The graduate knows and understands:** structure of the atom and the molecule, the periodic table of elements, and the properties of radioactive isotopes in terms of their application in diagnostics and therapy - K_B.W5 properties of elements resulting from their position in the periodic table K_B.W5 formation mechanisms and types of chemical bonds and the mechanisms of intermolecular forces -K_B.W6 mechanisms of intermolecular interactions in various states of matter K_B.W6 types and properties of solutions - K_B.W7 types of solutions and issues in the field of ionic equilibria K_B.W7 basic types of chemical reactions - K_B.W8 types of chemical reactions K_B.W8 basic kinetic concepts and equations, and the impact of factors on the reaction rate K_B.W8 issues related to precipitation of hard-soluble compounds and formation of complex compounds K_B.W8	**<u>Lectures</u>:** ▪ teaching didactic methods - informative lecture (conventional), problem-oriented lecture, multimedia presentation **Laboratory tutorials<u>:</u>** ▪ seeking didactic methods - laboratory, observation, practice **<u>Seminars</u>:** ▪ activating and problem methods - discussion, classical problem method	**Winter semester:** The condition of passing the course is active participation in didactic classes and obtaining the appropriate number of points. **Laboratory tutorials<u>:</u>** written tests, passing tests - passing lab classes requires 60% points for analysis and tests. **Summer semester:** **Seminars:** written tests; passing seminars requires 60% of points **Exam:** passing the exam requires 60% of points The grade of the course depends on the total points scored during lab classes in the first and second semester, the seminar and the exam. **Grading scale:** 92 – 100% points excellent (5) 84 – 91% points very good (4.5) 76 – 83% points good (4) 68 – 75% points satisfactory (3.5) 60 – 77% points acceptable (3) 0 – 59% points fail (2)

		define and explain oxidation and reduction processes and know the basics of electrochemistry K_B.W8 properties of metals and non-metals K_B.W9 names and properties of inorganic and complex compounds K_B.W9 application of inorganic substances in pharmacy K_B.W9 characteristics of metals and non-metals, and the nomenclature and properties of inorganic compounds used in diagnostics and disease treatment - K_B.W9 methods of identification of inorganic compounds including pharmacopoeial methods - K_B.W10 **The graduate is able to:** perform tests of chemical reaction kinetics – K_B.U8 Analyze the impact of various factors on the reaction speed - K_B.U8 **In the scope of social competencies the graduate is ready to:** use objective sources of information - K7 draw conclusions based on their measurements or observation - K8		
	Organic chemistry	**The graduate knows and understands:**	**<u>Lectures:</u>** ▪ informative lecture (conventional)	**Winter semester:** The condition of passing the course is active participation in didactic classes and obtaining the appropriate number of points.

		classification of carbon compounds and the nomenclature of organic compounds - K_B.W17 structure of organic compounds in the context of the molecular orbital theory and describes the mesomeric and inductive effects - K_B.W18 types and mechanisms of chemical reactions involving organic compounds (substitution, addition, elimination) - K_B.W19 types of chemical reactions of organic compounds - K_B.W19 classification of organic compounds into functional groups and their properties - K_B.W20 chemical properties of hydrocarbons, chlorinated compounds, organometallic compounds, alcohols and phenols, ethers, aldehydes and ketones, carboxylic acids, amines, nitro compounds, sulfonic acids and carbonic acid derivatives - K_B.W20 structure and chemical properties of five- and six-membered heterocyclic compounds containing nitrogen, oxygen and sulfur - K_B.W21 structure and properties of organic compounds of natural origin: alkaloids, carbohydrates, steroids, terpenes, lipids, amino acids, peptides and proteins - K_B.W21, K_B.W22	▪ problem-oriented lecture with multimedia presentation **Laboratory tutorials:** ▪ individual work ▪ laboratory classes ▪ analysis of results **Seminars:** ▪ activating and problem-oriented methods, i.e. discussion, case study method and classical problem method ▪ individual work	**Laboratory tutorials:** Laboratory classes in the winter semester include: purification of organic compounds by simple or fractional distillation, extraction and crystallization, three syntheses with development, elemental and qualitative analysis of groups of compounds discussed in the winter semester, and writing four tests. A student can get a maximum of 5 points for each synthesis (15 points in total). A student can receive a maximum of 85 points for colloquia. The total number of possible points - 100. The condition for passing the laboratory is to obtain a minimum 60% of total points. **Seminars:** The presence is compulsory. Abandoned classes should be justified (sick leave). The condition of passing the seminar is to obtain at least 60% of all points from partial colloquium and final colloquium (maximum number of points - 20). If the required number of points is not obtained, the student is entitled to two dates of retake test. **Summer semester:** **Laboratory tutorials:** Laboratory classes in the summer semester include performing four syntheses (with the report), qualitative analysis of groups of compounds discussed in the summer semester and writing four colloquia.

		structure, properties and ways of receiving polymers used in pharmaceutical technologies - K_B.W22 basics of preparation and identification of organic compounds and their purification by crystallization, extraction and distillation methods - K_B.W23 **The graduate is able to:** assess and predict properties of chemical compounds on the basis of their structure, plan and perform synthesis of organic compounds in a laboratory scale and identify them - K_B.U10 identify selected organic compounds using qualitative reactions and physicochemical data - K_B.U10 **In the scope of social competencies the graduate is ready to:** establish relationships with a patient and colleagues based on mutual trust and respect - K1 notice and recognize their own limitations, make a self-assessment of deficits and educational needs - K2 use objective sources of information - K7 draw conclusions based on their measurements or observation - K8		A student can get a maximum of 5 points for each synthesis (20 points in total). A student can receive a maximum of 80 points for colloquia. The total number of possible points - 100. The condition for passing the laboratory is to obtain a minimum of 60% of points. **Seminars:** The presence is compulsory. Abandoned classes should be justified (sick leave). The condition of passing the seminar is to obtain at least 60% of all points from partial colloquium and final colloquium (maximum number of points - 20). If the required number of points is not obtained, the student is entitled to two dates of retake test. **Exam:** passing the exam requires 60% of points **Grading scale:** 92 – 100% points excellent (5) 84 – 91% points very good (4.5) 76 – 83% points good (4) 68 – 75% points satisfactory (3.5) 60 – 77% points acceptable (3) 0 – 59% points fail (2)

<table>
<tr>
<td></td>
<td>Mathematics</td>
<td>The graduate knows and understands:
elementary functions and basics of differential and integral calculus - K_B.W24
the concept of function, describes the basic properties of functions of one real variable, provides definitions and properties of elementary functions: polynomials, rational, exponential, logarithmic and trigonometric functions - K_B.W24
basic properties of number sequences, explains the concepts of monotonicity, limitations and convergence of number sequences - K_B.W24
the concept of the limit of a function at a point, explains the concept of unilateral boundaries and function continuity - K_B.W24
the concept of the derivative of a function at a point, gives formulas for derivatives of elementary functions and formulas for a derivative of a linear combination and composition of functions, gives the interpretation of derivatives of higher orders and their application to study the course of function variability - K_B.W24
the concept of indefinite and definite integral, gives the primary functions of selected elementary</td>
<td><u>Lectures</u>:
▪ informative lecture (conventional) with a multimedia presentation
▪ problem-oriented lecture

Laboratory tutorials<u>:</u>
▪ classical problem-oriented method</td>
<td>Laboratory tutorials:
Completion of the lab classes is based on three written tests. In order to pass the test, a student has to get at least 50% of the points.

Lecture
The knowledge and skills acquired during the lecture are assessed during the final exam.

Lectures and laboratory tutorials:
The grade for the subject is issued based on the results of the exam according to the number of points obtained in accordance with the table below:

<table>
<tr><th>Percentage of points</th><th>Grade</th></tr>
<tr><td>90-100%</td><td>excellent</td></tr>
<tr><td>80-89%</td><td>very good</td></tr>
<tr><td>70-79%</td><td>good</td></tr>
<tr><td>60-69%</td><td>satisfactory</td></tr>
<tr><td>50-59%</td><td>acceptable</td></tr>
<tr><td>0-49%</td><td>fail</td></tr>
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</td>
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<table>
<tr>
<td></td>
<td></td>
<td>functions, explains the geometric interpretation of the definite integral - K_B.W24
The graduate is able to:
draw graphs and study the properties of basic elementary functions: polynomials, rational, exponential, logarithmic and trigonometric functions - K_B.U11
determine the limits of numerical sequences; sets the limits of elementary functions - K_B.U11
calculates derivatives of functions - K_B.U11
carry out the course of function variability and draws graphs of elementary functions - K_B.U11
calculate simple indefinite and definite integrals - K_B.U11
use mathematical, statistical and computer tools to develop, interpret and present results of experiments, analyses and measurements - K_B.U11
In the scope of social competencies the graduate is ready to:
use objective sources of information - K7</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Statistics</td>
<td>The graduate knows and understands:
elements of the probability theory and mathematical statistics (phenomena and probability, random variables, random variable distribution functions, mean value</td>
<td><u>Lectures</u>:
▪ informative lecture with multimedia presentation

Laboratory tutorials<u>:</u></td>
<td>Lecture: test exam, graded on the following scale:
<table><tr><th>Percentage of points</th><th>Grade</th></tr><tr><td>80-100%</td><td>excellent</td></tr><tr><td>70-79%</td><td>very good</td></tr></table></td>
</tr>
</table>

		and variance), basic random variable distributions, point and interval estimation of parameters - K_B.W25 probability density concept of continuous random variable - K_B.W25 basic distributions of continuous random variable - K_B.W25 methods for testing statistical hypotheses and the significance of correlation and regression - K_B.W26 The graduate is able to: use mathematical, statistical and computer tools to develop, interpret and present results of experiments, analyses and measurements- K_B.U11 determine the probability of random events - K_B.U11 determine the cumulative distribution function, expected value and variance for the basic distributions of the random variable - K_B.U11 calculate sample descriptive statistics - K_B.U11 use software dedicated for data analysis (e.g. Statistica, SPSS, SAS, R)- K_B.U11 determine the confidence interval for the Student's t distribution - K_B.U11	▪ classical problem-oriented method using data analysis software	60-69% good 50-59% satisfactory 30-49% acceptable 0-29% fail **Laboratory tutorials:** Written tests: passing (≥50%)

<table>
<tr><td></td><td></td><td>formulate hypotheses for performing statistical inference - K_B.U11
determine linear regression parameters - K_B.U11
choose the method of statistical analysis for specific data, describe its results and draw conclusions - K_B.U11
K1: understands the need for self-education and enlarging knowledge – K8</td><td></td><td></td></tr>
<tr><td></td><td>Information technology</td><td>Explains the basic rules for entering data into Excel, creating formulas, addressing cells, creating cell names and ranges of cells - K_B.W26
Explains the basic principles of text formatting in Word: paragraph formatting, formatting using styles, chapter numbering, inserting headers and footers, links, table of contents - K_B.W26
Presents and characterizes functions of MSAccess system objects such as tables, queries, forms and reports - K_B.W27
Can enter data into MS Excel spreadsheet - K_B.U12
Is able to construct formulas in MS Excel (including array formulas), address cells, create cell names, create data series in MS Excel sheets and format sheet cells - K_B.U12</td><td><u>Lectures</u>:
▪ not applicable
▪
Laboratory tutorials<u>:</u>
▪ computer laboratory
▪ classical problem-oriented method
▪ discussion

<u>Seminars:</u>
▪ not applicable</td><td>In the case of the final test, the points obtained are converted into degrees according to the following scale:
<table><tr><th>Percentage of points</th><th>Grade</th></tr><tr><td>90-100%</td><td>excellent</td></tr><tr><td>80-89%</td><td>very good</td></tr><tr><td>70-79%</td><td>good</td></tr><tr><td>60-69%</td><td>satisfactory</td></tr><tr><td>50-59%</td><td>acceptable</td></tr><tr><td>0-49%</td><td>fail</td></tr></table>
Final test in the computer laboratory (≥50%)

Prolonged observation/Activity: (1-3 points; 3 points = very good)</td></tr>
</table>

		Is able to use selected mathematical, statistical, date and time, textual and logical functions of the MS Excel package for the presentation and analysis of biomedical data - K_B.U12 Is able to choose and use the appropriate form of graphic data presentation - K_B.U12 Can create a simple database design in MS Access - K_B.U12 Can carry out text formatting in Word: paragraph formatting, formatting using styles, chapter numbering, inserting headers and footers, links, table of contents - K_B.U12 K1: Understands the need for self-education and enlarging knowledge - K2		
Course module C **Drug analysis, synthesis and technology**	Pharmaceutical Biotechnology	The graduate knows the conditions of living cells and organisms culture and understands the mechanism controlling the production potential of living cells and organisms and available biotechnological methods of their regulation; – K_C.W16, K_C.W17 The graduate explains the processes generally used in pharmaceutical biotechnology and gives examples and is also familiar with several processes of purification of obtained medicinal substances as well as methods and techniques of changing	**Lectures**: ▪ informative lecture (conventional) with a multimedia presentation ▪ problem lecture ▪ conversational lecture **Laboratories:** ▪ observation method ▪ practical classess	The basis for passing the subject of Pharmaceutical Biotechnology is compliance with the principles set out in the Didactic Regulations of the Chair of Pharmacodynamics and Molecular Pharmacology. The course ends with a credit with a grade. Test form, single and multiple choice. The degrees are issued according to the following scale:

		the scale and optimization of process parameters in pharmaceutical biotechnology; – K_C.W17, K_C.W18 The graduate lists and distinguishes between basic groups of biological medicinal substances, knows their biological properties and applications; – K_C.W19 The graduate knows the definition of durability and problems of durability of various forms of biopharmaceuticals; – K_C.W20 The graduate knows the characteristics and types of basic vaccines, the principles of their use and storage; – K_C.W21 The graduate characterizes basic blood-borne products and blood substitutes and the method they are obtained; – K_C.W22 The graduate knows the pharmacopoeial requirements described in the current Pharmacopoeia, which should be met by biological drugs and the principles of placing them on the market; – K_C.W23 The graduate distinguishes between biological and synthetic medicine and also finds the latest achievements in the field of biological and synthetic medicine research; – K_C.W24	▪ case study ▪ analysis of study results related to cell culture ▪ exposing methods: demonstration ▪ classical problem method ▪ discussion	**Percentage of points** / **Grade** 90-100% – Excellent 85-89% – Very good 80-84% – Good 75-79% – Satisfactory 60-74% – Acceptable 0-59% – Fail **Credit with a grade**: > 60% **Prolonged observation / activity**

		The graduate knows the techniques of molecular biology in pharmaceutical biotechnology and gene therapy; – K_A.W32 The graduate is able to analyze the stages and parameters of the biotechnological process – K_C.U12 The graduate is able to assess the quality and durability of a biotechnologically obtained medicinal substance and prepare or propose its specification; – K_C.U13 The graduate correctly chooses sources of information, including sources based on Evidence Based Medicine; – K7 The graduate is ready to accurately formulate conclusions from own and available research, as well as from observing the environment and work; – K8		
	Medicinal Chemistry	The graduate knows the chemical and biochemical mechanisms of drug action; – K_C.W1 The graduate knows the physicochemical properties of medicinal substances that affect the biological activity of drugs; – K_C.W2 The graduate divides medicinal substances according to anatomical-therapeutic-chemical classification (ATC) or in the pharmacological	**Lectures**: ▪ informative lecture (conventional) ▪ problem lecture with a multimedia presentation **Laboratories**: ▪ laboratory and practical classes	**Winter term:** **Lectures:** Verification and assessment of learning outcomes achieved by the student is carried out by two mid-term control tests. **Tutorials:** Lectures will be held during the winter term with 50 teaching hours for 15 weeks. Attendance at seminars is obligatory. Classes abandoned for random reasons should be justified (appropriate sick leave) and worked off with another training group that will carry out the material of

		system, taking into account international names and synonymous names; - K_C.W3 The graduate knows drugs and compounds marked by isotopes used in the diagnosis and therapy of diseases, methods of obtaining them and their properties; - K_C.W4, K_C.W7 The graduate knows the classical and instrumental methods used in assessing the quality of substances for pharmaceutical purposes and in quantitative analysis in medicinal products; - K_C.W5, K_C.W6, K_C.W8, K_C.W9 The graduate can explain the relationship between the chemical structure and the action of drugs of different classification; – K_C.U1, K_C.U3 The graduate carries out quality control of substances for pharmaceutical purposes and medicines in accordance with pharmacopoeial requirements; uses the appropriate analytical method in pharmaceutical research and validates the analytical method; – K_C.U5, K_C.U6, K_C.U8 Based on the structure and activity of radiopharmaceuticals, the graduate can indicate their use in medicine; – K_C.U2	▪ work in teams and individually ▪ measurement and analysis of results ▪ verification of student knowledge ▪ (written or oral answer) **Tutorials**: ▪ Auditorium tutorials with a multimedia presentation ▪ conversation lecture	abandoned classes. The student is obliged to prepare theoretically for each practical class in the aforementioned range of material. Verification and assessment of learning outcomes achieved by the student is checked by means of two mid-term tests. The basis for passing the exercises is obtaining positive grades from all tests conducted by the teacher. **Laboratories:** The cycle of laboratory classes includes 11 analyzes of preparations: - 8 analyzes of one-component preparations, 2 from each group - 1 analysis of one-component preparation and 2 analyzes of two-component preparations from all groups of compounds and writing 2 tests covering the material of all sections divided into two blocks. Obtaining at least 60% of points from the test is a condition for passing it. **Summer term:** **Lectures:** Verification and assessment of learning outcomes achieved by the student is carried out by two mid-term control tests. Lectures/subject ends with a written exam. **Laboratories:** The cycle of laboratory classes includes 12 quantitative analyzes of pharmaceutical preparations and writing 2 tests. The basis for passing is at least 60% of each test.

		Using pharmacopoeial monographs, the graduate is able to perform a qualitative and quantitative analysis of pure medicinal substance and its extraction from the drug form; – K_C.U1 The graduate evaluates the results obtained in the field of testing the quality of substances for pharmaceutical purposes, as well as confirms their compliance; – K_C.U7 The graduate draws and formulates conclusions from his own measurements and observations; – K8		The basis for passing each exercise is obtaining a quantitative analysis result within the error range determined by the teacher and providing within a week after the end of the exercise a correctly prepared report, whose assessment and acceptance by the assistant is a condition for his final passing. The improvement of exercises and tests takes place in the 14th and 15th exercise week.
	Pharmacognosy	The graduate has knowledge of medicinal pharmacopeial and non-pharmacopoeial medicinal raw materials, as well as methods of analysis and qualitative assessment of medicinal plant raw materials; – K_C.W41 The graduate knows the criteria for assessing the quality of medicinal plant products and dietary supplements; – K_C.W41 The graduate has knowledge of raw materials of natural origin used in medicine and used as consumer products in the pharmaceutical, cosmetics and food industries; - K_C.W42	**Lectures:** ▪ informative lecture ▪ problem lecture with multimedia presentation **Seminars:** ▪ didactic discussion, ▪ work in groups (case method) **Laboratories:** ▪ didactic discussion, ▪ demonstration	**Winter term:** The condition of passing the course is: attendance at classes (two absences in the semester are the basis for failing this semester), positive assessment issued by the tutor (average of all grades obtained by the student during the laboratories and activity during the seminar), no offenses listed in "Health and Safety Rules "of the Didactic Regulations of the Department of Pharmacognosy. **Lectures:** assessment criteria: written exam in the form of a test (open and closed questions) - written after completing all the classes in the subject, after the semester VI.

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<td>The graduate knows the principles of placing medicinal plant products and dietary supplements containing plant materials on the market; - K_C.W42
The graduate knows side effects specific to the herbal medicine and dose dependent; - K_C.W42
The graduate knows the impact of groups of chemical compounds - primary and secondary metabolites on the biological and pharmacological activity of plant raw materials; - K_C.W43
The graduate demonstrates knowledge of the mechanisms of action of plant substances at the biochemical and molecular level; - K_C.W43
The graduate has knowledge of highly and very highly potent plant materials, as well as chemical composition, healing properties and toxicity of narcotic plants; - K_C.W44
The graduate knows the physicochemical properties of medicinal substances that affect the biological activity of drugs; - K_C.W44
The graduate knows the chemical and biochemical mechanisms of action of plant medicines; - K_C.W44</td>
<td></td>
<td>Laboratories: Assessment criteria: assessment based on tests (tests, open and closed single-choice questions).
In the case of written tests (test from laboratories), the points obtained are converted into grades on the following scale:
<table>
<tr><th>Percentage of points</th><th>Grade</th></tr>
<tr><td>92-100%</td><td>Excellent</td></tr>
<tr><td>84-91%</td><td>Very good</td></tr>
<tr><td>76-83%</td><td>Good</td></tr>
<tr><td>68-75%</td><td>Satisfactory</td></tr>
<tr><td>60-67%</td><td>Acceptable</td></tr>
<tr><td>0-59%</td><td>Fail</td></tr>
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Summer term:
The condition of passing the course is: attendance at laboratories and seminars: (two absences in the first term are the basis for not passing this term), a positive grade issued by the tutor (average of all grades obtained by the student during the classes and activity during classes), no offenses listed in the "Health and Safety Rules" of the Didactic Regulations of the Department of Pharmacognosy
Laboratories and seminars: Assessment criteria: assessment based on tests (tests, open and closed single-choice questions)

In the case of written credits (exercise test and exam test), the obtained points are</td>
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<td>The graduate knows the research methods used in systematics and the search for new species and varieties of medicinal plants; - K_C.W45
The graduate demonstrates knowledge of the basics of biotechnology in the preparation of a medicinal substance; - K_C.W45
The graduate recognizes the medicinal plant material on the basis of its morphological and anatomical features and qualifies it for the appropriate botanical group; - K_C.U29
The graduate determines the identity of the plant raw material by macro- and microscopic methods, in cut and powdered form, including as a component of herbal mix and mixture of powdered raw materials; - K_C.U30
The graduate assesses the quality of the raw material and its medicinal value using analytical and biological methods, and primarily based on pharmacopoeial monograph; - K_C.U31
The graduate applies analytical and biological methods and techniques in qualitative and quantitative research on active substances occurring in plant materials; - K_C.U32
The graduate carries out a phytochemical analysis of the plant</td>
<td></td>
<td>converted into grades on the following scale:
<table>
<tr><th>Percentage of points</th><th>Grade</th></tr>
<tr><td>92-100%</td><td>Excellent</td></tr>
<tr><td>84-91%</td><td>Very good</td></tr>
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<tr><td>0-59%</td><td>Fail</td></tr>
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</table>

		raw material and determines the group of chemical compounds or chemical compound present in this raw material; - K_C.U32 The graduate provides information on medicinal plant material with information on its chemical composition, medicinal properties, side effects and interactions; - K_C.U33 The graduate searches in the literature necessary scientific information, selects and evaluates it, and uses it for practical purposes; - K_C.U33 The graduate is aware of the need to promote healthy behaviour; - K6 The graduate has a habit of using objective sources of information; - K7 The graduate draws and formulates conclusions from his own measurements and observations; - K8		
	Synthesis and technology of pharmaceutical substances	The graduate knows the methods of preparing selected medicinal substances, the necessary physical operations, discrete chemical processes; - K_C.W10. The graduate knows and understands the requirements for the description of how to manufacture and assess the quality of a medicinal substance in the registration documentation; - K_C.W11.	**Lectures**: ▪ problem lecture with multimedia presentation **Laboratories:** ▪ performing experiments ▪ problem analysis. **Seminars:**	The condition of passing the course is active participation in didactic classes and obtaining the appropriate number of points. **Laboratories:** short written tests, colloquia - passing the laboratory requires 60% of points possible to obtain. **Seminars**: preparation of the presentation and discussion - passing requires 60% of the points available.

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<td>The graduate knows the methods of obtaining and separating optically active medicinal substances and the methods of obtaining various polymorphic forms; K_C.W12.
The graduate knows the methods of searching new medicinal substances; - K_C.W13.
The graduate knows and understands the issues of patent protection of substances for pharmaceutical purposes and medicinal products; - K_C.W14.
The graduate can identify the stages and critical parameters in the process of synthesis of a drug substance and prepare a block diagram of an example synthesis process; - K_C.U9
The graduate is able to synthesize a medicinal substance and propose a method for its purification; - K_C.U10.
The graduate can explain the presence of solvent residues and other impurities in the medicinal substance; - K_C.U11.
The graduate uses objective sources of information; -K7
The graduate draws conclusions from his own measurements or observations; -K8</td>
<td>▪ presentations
▪ discussion</td>
<td>Lectures: written test - 8 descriptive questions 0-10 points, 4 descriptive questions 0-5 points, total> 60%

<table><tr><th>Percentage of points</th><th>Grade</th></tr><tr><td>88-100%</td><td>Excellent</td></tr><tr><td>81-87%</td><td>Very good</td></tr><tr><td>74-80%</td><td>Good</td></tr><tr><td>67-73%</td><td>Satisfactory</td></tr><tr><td>60-66%</td><td>Acceptable</td></tr><tr><td>0-59%</td><td>Fail</td></tr></table></td>
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<tr>
<td></td>
<td>Pharmaceutical Technology I</td>
<td>The graduate knows methods of aseptic treatment and obtaining sterility of medicinal products,</td>
<td><u>Lectures:</u></td>
<td>Written exam
Observations</td>
</tr>
</table>

		substances and materials; - K_C.W31 The graduate knows the types of packaging and dispensing systems and knows how to select them to ensure the quality of the prescription medicine; – K_C.W32 The graduate knows the types of physicochemical incompatibilities between the components of pharmaceutical preparations; – K_C.W28 The graduate knows the scope of chemical and pharmaceutical tests required for the registration documentation of the medicinal product; – K_C.W36 The graduate knows and understands the impact of technological process parameters on the properties of the form of a prescription drug; - K_C.W30 The graduate knows the rules for preparing and controlling prescription drugs and how to determine their storage conditions; - K_C.W27 The graduate assesses the properties of the prescription drug and presents the method of its preparation and characterizes the factors that affect the durability of the prescription drug, and selects the right immediate packaging and storage conditions; - K_C.U16	▪ informative lecture (conventional) ▪ problem lecture ▪ multimedia presentation **<u>Laboratories and practical classes:</u>** ▪ seeking didactic methods - laboratory, observation, practice	**Assessment criteria:** 2 - fail – below 2,99 (below 59,9%) 3 - acceptable – 3,0 – 3,49 (60%-69,9%) 3,5 – satisfactory – 3,50 – 3,83 (70%-76,7%) 4 – good – 3,84 - 4,16 (76,8%-83,3%) 4,5 – very good – 4,17-4,50 (83,4%-90%) 5 – excellent – above 4,50 (above 90%)

		The graduate explains the importance of the pharmaceutical form and composition of the medicinal product for its operation; - K_C.U15 The graduate recognizes and solves the problems arising from the composition of the prescription drug prescribed on the prescription, verifies its composition in order to prepare it correctly and checks the doses, and detects qualitative defects of the prescription drug qualifying for pharmaceutical supervision based on its observation; - K_C.U17 The graduate is able to use the pharmacopoeia, guidelines and literature regarding the assessment of the quality of substances for pharmaceutical use and medicinal products; - K_C.U4. The graduate can prepare plant preparations in laboratory conditions and assess their quality using pharmacopoeial methods; – K_C.U18 The graduate is able to assess the functional properties of excipients for pharmaceutical use; – K_C.U19 The graduate knows how to prepare operational procedures and draw up protocols of activities carried out while preparing the prescription and pharmacy medicine; - K_C.U23		

		The graduate uses pharmacopoeias, prescriptions and technological regulations, guidelines and literature on the technology and quality of the form of the drug, in particular in relation to prescription drugs; - K_C.U14 The graduate prepares eye medications under aseptic conditions and selects the sterilization method; K_C.U20 The graduate can search for scientific information on medicinal substances and products; - K_C.U34 The graduate has a habit of using objective sources of information to search and select information needed in the selection of auxiliary substances when creating prescription drugs; - K7 The graduate draws and formulates conclusions from his own measurements and observations of prescription drugs; - K8		
	Pharmaceutical Technology II	The graduate knows and understands the basic technological processes and devices used in drug dosage form technology; - K_C.W29 The graduate knows the functional properties of excipients and knows how to select them depending on the type of medicine; - K_C.W15	**<u>Lectures:</u>** ▪ informative lecture (conventional) ▪ problem lecture **<u>Laboratories and practical classes:</u>** ▪ classic problem method	**Lectures:** Presence (exam for the fifth year) **<u>Laboratories and practical classes</u>:** Credit for a grade (exam for the fifth year) Observations **Assessment criteria:** 2 - fail – below 2,99 (below 59,9%) 3 - acceptable – 3,0 – 3,49 (60%-69,9%)

		The graduate knows the types of packaging and dosing systems, and knows how to select them in order to ensure the quality of industrially manufactured medicine forms; - K_C.W32 The graduate knows and understands the methods of testing the quality of the drug form and factors affecting the stability of the drug, the processes that the drug may undergo during storage, and methods of testing the stability of medicinal products; - K_C.W34 The graduate knows and understands the impact of technological process parameters on the properties of industrially manufactured drug forms; - K_C.W35 The graduate knows the principles of preparation and control of medicines, including parenteral nutrition and cytostatics, and how to determine their storage conditions; – K_C.W33 The graduate knows biomedical polymers and macromolecular drug conjugates and their use in medicine and pharmacy; – K_C.W47 The graduate assesses the properties of an industrially manufactured medicinal product and presents how it is manufactured, as well as assesses the application properties	▪ laboratory method	3,5 – satisfactory – 3,50 – 3,83 (70%-76,7%) 4 – good – 3,84 - 4,16 (76,8%-83,3%) 4,5 – very good – 4,17-4,50 (83,4%-90%) 5 – excellent – above 4,50 (above 90%)

		of an industrially manufactured medicine based on its composition and advises on the proper use, depending on the form of the drug; - K_C.U24 The graduate characterizes the factors that affect the durability of an industrially manufactured medicine form, and selects the right immediate packaging and storage conditions; – K_C.U28 The graduate is able to propose a specification for a medicinal product and plan studies on the stability of a medicinal substance and a medicinal product; -K_C.U27 The graduate detects qualitative defects qualifying for notification for pharmaceutical supervision on the basis of his observation of an industrially manufactured medicinal product; - K_C.U26 The graduate prepares parenteral preparations under aseptic conditions; - K_C.U21 The graduate prepares cytostatic drugs; - K_C.U22 The graduate performs analyses in the field of assessing the quality of the drug form and operates appropriate control and measuring equipment, as well as interpreting the results of the medicinal product quality testing; - K_C.U25		

		The graduate has a habit of using objective sources of information to search and select information needed in the selection of excipients when creating solid drug forms; - K7 The graduate draws and formulates conclusions from his own measurements and observations of solid drug forms; - K8		
	Pharmaceutical Technology III	The graduate knows nomenclature, composition, structure and properties of particular new medicine forms; - K_C.W25 The graduate knows the requirements for various modern forms of medicinal products, in particular pharmacopoeial requirements; - K_C.W26 The graduate knows the methods of preparing liquid, semi-solid and solid forms of the drug on a laboratory and industrial scale as well as the principles of operation of devices for their manufacture; - K_C.W29 The graduate knows the principles of Good Manufacturing Practice and documenting technological processes; – K_C.W33 The graduate knows the scope of use in pharmaceutical production of risk analysis, quality design and		**Lectures** Written exam **Laboratories:** Credit for a grade **Assessment criteria:** 2 - fail – below 2,99 (below 59,9%) 3 - acceptable – 3,0 – 3,49 (60%-69,9%) 3,5 – satisfactory – 3,50 – 3,83 (70%-76,7%) 4 – good – 3,84 - 4,16 (76,8%-83,3%) 4,5 – very good – 4,17-4,50 (83,4%-90%) 5 – excellent – above 4,50 (above 90%)

		technology based on process analysis; – K_C.W37 The graduate knows the possibility of using nanotechnology in pharmacy; – K_C.W40 The graduate knows nanoparticles and their use in diagnostics and therapy; – K_C.W46 The graduate knows the rules of preparing homeopathic medicines; - K_C.W38 The graduate knows the methods of preparing radiopharmaceuticals; - K_C.W39 The graduate assesses the properties of medicinal products such as lamellas, creams, gels and presents the method of its production; - K_C.U16 The graduate detects qualitative defects qualifying for notification for pharmaceutical supervision of semi-solid medicinal products based on their observation; - K_C.U26 The graduate has a habit of using information technologies to search and select information needed in the selection of excipients when creating semi-solid and modern forms of medicine; - K7 The graduate draws and formulates conclusions from his own measurements and observations of semi-solid drug forms; - K8		

Course module D **Biopharmacy and the effects of drug activities**	Biopharmacy	Explains the structure of physiological barriers and their functions in the mechanisms of passage of drugs - K_D.W2 Describes the fate of drug in the body and the pharmacokinetic processes to which the drug in the body is subject - K_D.W1, K_D.W3 Uses the term of bioavailability and calculates parameters characterizing bioavailability and criteria for its assessment - K_D.W3, K_D.W9, K_D.W10 Uses the term of pharmaceutical availability and calculates the parameters characterizing pharmaceutical availability and criteria for its assessment - K_D.W9, K_D.W10 Interprets the impact of the drug form, route of administration, physicochemical properties of drug substances and excipients and physiological factors on the bioavailability of the drug substance and its duration of action - K_D.W9, K_D.W10 Substantiates the correlation between drug release results obtained in vitro and bioavailability results determined in vivo (IVIVC) - K_D.W9 Analyzes issues related to bioequivalence and organizes issues related to biopharmaceutical	**Lecture:** Informative lecture with the elements of multimedia presentation ▪ Conversation lecture **Tutorials:** ▪ Laboratory classes ▪ Didactic discussion with a multimedia presentation ▪ Computer-assisted learning ▪ Exposing methods: film	Completion of individual laboratory classes on the basis of correctly performed laboratory exercises and completed exercise reports, continuous assessment of current preparation for classes and student activity: Two written tests: passing after obtaining >60% of points from each test. **Grade:** 92% - 100% - Excellent (5) 84% - 91% - Very good (4.5) 76% - 83% - Good (4) 68% - 75% - Satisfactory (3.5) 60% - 67% - Acceptable (3) 0% - 59% - Fail (2) Obtaining credit for lectures and laboratory classes is a condition for passing the subject. The final grade is the average of the grades obtained: 4,75 - 5,00 Excellent (5) 4,25 - 4,74 Very good (4.5) 3,75 - 4,24 Good (4) 3,25 - 3,74 Satisfactory (3.5) 2,75 - 3,24 Acceptable (3) 0 - 2,74 Fail (2)

		assessment of original and generic drugs - K_D.W11 Predicts the interaction of drugs with food, stimulants and environmental pollution – K_D.W35, K_D.W7 Is able to determine the requirements for bioavailability and bioequivalence studies and use these studies to evaluate drugs - K_D.U4 Is able to perform a pharmaceutical availability test under various conditions and for different forms of the drug and apply them to assess bioequivalence - K_D.U4, K_D.U7 Is able to apply the BCS classification system in the process of releasing a medicinal product from in vivo bioequivalence studies - K_D.U8 Is able to determine the effect of modification of the drug form on the pharmaceutical and biological availability of the drug substance - K_D.U4, K_D.U7, K_D.U9 Is able to assess the effect of the composition of the drug, its form and physiological and pathological conditions on the absorption of the drug substance and advise on the proper application, dosage and intake of the drug - K_D.U1 Is able to interpret and present scientific research on		

		bioavailability, pharmaceutical availability and bioequivalence - K_D.U4, K_D.U5, K_D.U7 Is able to perform a pharmaceutical availability test to assess the similarity of medicinal products using statistical analysis methods - K_D.U4, K_D.U7 Is able to interpret the results of research on bioavailability, pharmaceutical availability and bioequivalence - K_D.U4, K_D.U5 Demonstrates the conclusions drawn from the measurements and observations made - K8 Demonstrates the ability to work in a team – K3		
	Bromatology	Knows the basic nutrients and can determine the body's need for them, their importance, physiological availability and metabolism as well as nutritional sources - K_D.W30 Knows and uses methods used to assess the nutritional value of food - K_D.W31 Knows the problems of substances added to food, food contamination and the poor quality of products intended to come into contact with food - K_D.W32 Knows and understands the problems of enriched foods, dietary supplements and foods for particular nutritional uses - K_D.W33	**Lecture:** ▪ Problem lecture with the elements of multimedia presentation **Lab:** ▪ performing experiments ▪ problem analysis	The course is passed if the student actively participated in didactic classes and obtained the appropriate number of points. **Labs:** written colloquia, class work and multimedia presentation - passing laboratory requires 60% of the possible points (163 points), i.e. 60% × 163 points = 98 points. **Lectures: Written exam**, five descriptive questions 0-10 points, cumulatively >60%. **Percentage of points Grade** 95-100% Excellent (5) 89-94% Very good (4.5) 82-88% Good (4)

		Knows the methods used to assess the diet of healthy and sick people; - K_D.W34 Knows and understands the basics of drug-food interaction - K_D.W35 Knows the requirements and methods of assessing the quality of dietary supplements, in particular those containing vitamins and minerals - K_D.W36 Is able to explain the causes and effects of interactions in the pharmacokinetic phase and determine ways to prevent these interactions - K_D.U10 Is able to explain the causes and effects of interactions in the pharmacodynamic phase and determine ways to prevent these interactions - K_D.U14 Is able to characterize food products in terms of their composition and nutritional value - K_D.U23 Is able to assess the nutritional value of food by calculation and analytical methods (including gas and liquid chromatography and atomic absorption spectrometry); - K_D.U24 Has the ability to assess the diet in terms of covering energy needs and basic nutrients in health and disease - K_D.U25		76-81% 70-75% 0-69%	Satisfactory (3.5) Acceptable (3) Fail (2)

		Is able to explain the principles and role of proper nutrition in the prevention and course of diseases - K_D.U26 Is able to assess the exposure of the human body to contaminants present in food - K_D.U27 Can predict the effects of changes in the concentration of the active substance in the blood as a result of consuming certain food products - K_D.U28 Can explain the causes and effects of drug-drug interaction and food - K_D.U29 Is able to give advice to patients regarding drug-food interactions - K_D.U30 Is able to provide information on the use of nutritional preparations and dietary supplements - K_D.U31 Has the ability to assess the quality of products containing medicinal plant raw materials - K_D.U32 Is ready to establish relations with the patient and colleagues based on mutual trust and respect - K1 Is ready to see and recognize his own limitations and self-assess deficits and educational needs - K2 Has a habit of promoting health-oriented behaviors - K6 Has a habit of using objective sources of information - K7		

		Draws and phrases conclusions from own measurements or observations - K8		
	Pharmacokinetics	Uses pharmacokinetic parameters to describe the kinetics of drug-related processes in the body - K_D.W4, K_ D.W5 Uses compartmental theory to describe pharmacokinetic processes determining dose-concentration-time relationships - K_D.W5 Predicts the effect of intrinsic and extrinsic factors on the course of drug pharmacokinetic processes in the body - K_D.W6 Explains the term of bioavailability and the parameters characterizing it - K_D.W9 Substantiates the use of drug concentration-monitored therapy - K_D.W8 Can calculate the pharmacokinetic parameters of the drug describing the kinetics of the processes that the drug undergoes in the body - K_D.U2, K_D.U3, K_D.U6 Is able to carry out and interpret the drug bioavailability study - K_D.U4 Is able to plan the change of drug dosage in an individual patient based on the influence of intrinsic and extrinsic factors and on the basis of monitored drug	**<u>Lecture:</u>** – Informative lecture with the elements of multimedia presentation – Conversation lecture **<u>Tutorials:</u>** – Laboratory classes, – Didactic discussion with the elements of multimedia presentation – Computer-assisted learning –	Completion of individual laboratory classes on the basis of correctly performed laboratory exercises and completed exercise reports, continuous assessment of current preparation for classes and student activity. Two written tests: passing if >60% of points from each test was obtained **Grade:** 92% - 100% - Excellent (5.) 84% - 91% - Very good (4.5) 76% - 83% - Good (4) 68% - 75% - Satisfactory (3.5) 60% - 67% - Acceptable (3.0) 0% - 59% - Fail (2) Obtaining credit for lectures and tutorials is a condition of passing the subject.. **The final grade is the average of the grades obtained:** 4,75 - 5,00 Excellent (5) 4,25 - 4,74 Very good (4.5) 3,75 - 4,24 Good (4) 3,25 - 3,74 Satisfactory (3.5) 2,75 - 3,24 Acceptable (3) 0 - 2,74 Fail (2)

		concentration in the blood - K_D.U12 Demonstrates the conclusions drawn from the measurements and observations made - K8 Demonstrates the ability to work in a team - K3		
	Pharmacology with pharmacodynamics I	Knows the target points and mechanisms of drug action including the achievement of structural biology in this field - K_D.W12 Knows the division and pharmacological properties of known drug groups -K_D.W13 Knows the determinants of drug action in the pharmacodynamic phase, taking into account the hereditary factors of molecularly targeted therapy and drug resistance mechanisms - K_D.W14, K_D.W15 Characterizes the route of administration, indicating the differences between them affecting pharmacotherapy, skillfully distinguishes drug dosing methods and is able to explain the assumptions of personalized therapy - K_D.W14- K_D.W16 Knows the concepts of indications, contraindications and drug-specific and dose-related adverse reactions Understands the classification of	**Lecture:** ▪ Informative lecture (conventional) with the elements of multimedia presentation ▪ Problem lecture **Tutorials:** ▪ assisted learning with a the elements of multimedia presentation ▪ teaching discussion method ▪ case study ▪ discussion of scientific publications ▪ classical problem method	The basis for passing the subject Pharmacology with Pharmacodynamics is compliance with the principles set out in the didactic regulations of the Department of Pharmacodynamics and Molecular Pharmacology. **Lectures:** Admission to the lecture colloquium is based on the obligatory presence at lectures. The colloquium consists of test questions (one-choice answer) in the field of knowledge acquired during lectures. The student scores one point for every correct answer. To pass the lectures 60% of points are necessary. The obtained grade is a component of the final grade in the semester. **Tutorials:** The short written tests take place at the end of the classes that cover the topics of the current classes. Those tests are scored on a scale of 0 to 5 points, which gives 25 points in total for 5 classes. These points are taken into account when calculating the grade for the tutorials in the semester. Completing

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<td>adverse reactions - K_D.W18-K_D.W17
Knows and understands the concepts of polypragmasia as well as the principles of proper drug pairing and the possibility of drug interactions occurring and avoiding, - K_D.W19
Knows the basic concepts of pharmacogenetics and pharmacogenomics and is aware and familiar with new developments in the field of pharmacology - K_D.W20
Is able to specify the causes and effects of drug interactions and interprets the impact of factors on drug action - K_D.U9
Can explain the pharmacological properties of the drug based on the target point and mechanism of action - K_D.U11
Is able to propose the necessity to change the drug dosage resulting from physiological and pathological conditions as well as genetic factors - K_D.U12
Can capture the possibility of adverse effects of individual groups of drugs depending on the dose and mechanism of action - K_D.U13
Is able to notice the possibility of side effects, determine their causes and effects in the pharmacodynamic phase and determine ways to</td>
<td></td>
<td>tutorials> 60% of the points one can get in classes.

Tutorial colloquium consists of 25 questions (written tests: open and / or closed single choice questions). The student scores one point for every correct answer. 60% of points are required to pass the colloquium.
Tutorials grade is calculated on the basis of points obtained from short tests at the end of each class and tutorial test.

Marks are given in accordance with following assessment scale:

<table>
<tr><th>Percentage of points</th><th>Grade</th></tr>
<tr><td>90-100%</td><td>Excellent (5)</td></tr>
<tr><td>85-89%</td><td>Very good (4.5)</td></tr>
<tr><td>80-84%</td><td>Good (4)</td></tr>
<tr><td>75-79%</td><td>Satisfactory (3.5)</td></tr>
<tr><td>60-74%</td><td>Acceptable (3)</td></tr>
<tr><td>0-59%</td><td>Fail (2)</td></tr>
</table>

Graded credit: the grade is calculated from the average grade obtained from lectures and practicals.</td>
</tr>
</table>

		prevent these interactions - K_D.U14 Independently constructs information necessary to provide the patient with indications and contraindications for the use of drugs and in the scope of their proper dosage and intake - K_D.U15 Is able to present information on pharmacology in a way understandable to the patient - K_D.U16 Is able to establish interpersonal contacts necessary in contacts with representatives of other medical professions in the scope of ensuring safety and effectiveness of pharmacotherapy - K_D.U17 Is ready to use the experience gained in the implementation of the principles of professional camaraderie and cooperation in a team of specialists, including representatives of other medical professions, also in a multicultural and multinational environment - K3 Skilfully uses objective sources of information including Evidence Based Medicine in his daily duties - K7 Formulates the conclusions from own research and available in		

<table>
<tr><td></td><td></td><td>literature as well as from observation of the environment and at work - K8
He is ready to make responsible decisions at work, guaranteeing the safety of himself and others - K10</td><td></td><td></td></tr>
<tr><td></td><td>Pharmacology with pharmacodynamics II</td><td>Knows the target points and mechanisms of drug action including the achievement of structural biology in this field - K_D.W12
Knows the division and pharmacological properties of known drug groups -K_D.W13
Knows the determinants of drug action in the pharmacodynamic phase, taking into account the hereditary factors of molecularly targeted therapy and drug resistance mechanisms - K_D.W14, K_D.W15
Knows the route of administration, indicating differences between them affecting pharmacotherapy, skillfully distinguishes drug dosing methods and is able to explain the assumptions of personalized therapy - K_D.W14- K_D.W16
Knows the terms of indications, contraindications and drug-specific and dose-related adverse reactions
Understands the classification of adverse reactions - K_D.W18- K_D.W17</td><td><u>Lecture</u>:
▪ Informative lecture (conventional) with the elements of multimedia presentation
▪ Problem lecture

<u>Lab:</u>
▪ observation method
▪ practical excercises
▪ exposing methods: film, screening
▪ observation method
▪ case study

<u>Tutorials:</u>
▪ assisted learning with a multimedia presentation</td><td>Fall semester:
Lectures
Lectures are credited on the basis of obligatory attendance.

Labs and Tutorials:

The short written tests take place at the end of the classes and cover the topics of the current classes.

There are 2 laboratory classes colloquia and 1 auditorium classes one during the semester. Colloquia are graded on the basis of tests (written tests: open and closed single-choice questions); passing> 60%

In the case of colloquia, the points obtained are converted into grades according to the following scale:

<table><tr><th>Percentage of points</th><th>Grade</th></tr><tr><td>90-100%</td><td>Excellent (5)</td></tr><tr><td>85-89%</td><td>Very good (4.5)</td></tr><tr><td>80-84%</td><td>Good (4)</td></tr><tr><td>75-79%</td><td>Satisfactory (3.5)</td></tr><tr><td>60-74%</td><td>Acceptable (3)</td></tr><tr><td>0-59%</td><td>Fail (2)</td></tr></table></td></tr>
</table>

<table>
<tr>
<td></td>
<td></td>
<td>Knows the term of polypragmasia, as well as the rules for the correct association of drugs and the possibility of drug interactions and avoidance - K_D.W19
Knows and understands the basic concepts of pharmacogenetics and pharmacogenomics and is aware and familiar with new developments in the field of pharmacology - K_D.W20
Is able to specify the causes and effects of drug interactions and interprets the impact of factors on drug action - K_D.U9
Explains the pharmacological properties of the drug based on the target point and mechanism of action - K_D.U11
Is able to propose the necessity to change the drug dosage resulting from physiological and pathological conditions as well as genetic factors - K_D.U12
Can capture the possibility of adverse effects of individual groups of drugs depending on the dose and mechanism of action - K_D.U13
Notes the possibility of adverse effects, determine their causes and effects in the pharmacodynamic phase, and identify ways to prevent these interactions - K_D.U14
Independently constructs information necessary to provide</td>
<td>▪ teaching discussion method
▪ case study
▪ discussion of scientific publications
▪</td>
<td>Learning outcomes implemented in the 7th semester will be verified during the exam completing the course of learning the subject as described in part A.

Spring semester:
Lectures
Lectures are credited on the basis of obligatory attendance.

Labs:
The short written tests take place at the end of the classes and cover the topics of the current classes.

There are 3 laboratory classes colloquia and 1 auditorium classes one during the semester. Colloquia are graded on the basis of tests (written tests: open and closed single-choice questions); passing> 60%

In the case of colloquia, the points obtained are converted into grades according to the following scale:

<table>
<tr><th>Percentage of points</th><th>Grade</th></tr>
<tr><td>90-100%</td><td>Excellent (5)</td></tr>
<tr><td>85-89%</td><td>Very good (4.5)</td></tr>
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</table>
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<table>
<tr>
<td></td>
<td></td>
<td>the patient with indications and contraindications for the use of drugs and in the scope of their proper dosage and intake - K_D.U15
Is able to present information on pharmacology in a way understandable to the patient - K_D.U16
Is able to establish interpersonal contacts necessary in contacts with representatives of other medical professions in the scope of ensuring safety and effectiveness of pharmacotherapy - K_D.U17
Is ready to use the experience gained in the implementation of the principles of professional camaraderie and cooperation in a team of specialists, including representatives of other medical professions, also in a multicultural and multinational environment -K3
Skilfully uses objective sources of information including Evidence Based Medicine in their daily duties - K7
Formulates the conclusions from own research and available in literature as well as from observation of the environment and at work - K8
Is ready to make responsible decisions at work, guaranteeing the safety of himself and others - K10</td>
<td></td>
<td>Learning outcomes implemented in the eighth semester will be verified during the exam completing the course of learning the subject as described in part A.

The exam consists of test questions (one-choice answer) and a short answer regarding knowledge gained during lectures and practical classes. The student scores one point for every correct answer. 60% of the points are necessary to obtain a positive grade.
Marks are given in accordance with the following assessment scale:

<table>
<tr><th>Percentage of points</th><th>Grade</th></tr>
<tr><td>90-100%</td><td>Excellent (5)</td></tr>
<tr><td>85-89%</td><td>Very good (4.5)</td></tr>
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</table>

Not passing the final exam is tantamount to obtaining an unsatisfactory grade and the need to retake an exam.</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>Medicines of natural origin</td><td>Knows raw materials of natural origin used in medicine and used in the pharmaceutical, cosmetics and food industries - K_D.W38
Knows the rules for composing complex plant preparations, including the chemical composition of plant raw materials, their dosage, side effects and interactions with other drugs - K_D.W38
Knows the criteria for assessing the quality of medicinal plant products and dietary supplements - K_D.W39
Knows chemical structures of compounds found in medicinal plants, their action and application - K_D.W39
Knows pharmacopoeial and non-pharmacopoeial medicinal plant raw materials and methods of assessing their quality and medicinal value - K_D.W39
Knows groups of chemical compounds - primary and secondary metabolites that determine the biological and pharmacological activity of plant raw materials - K_D.W40
Knows strong and very strong plant materials, as well as chemical composition, healing properties and</td><td><u>Lecture</u>:
▪ Informative lecture,
▪ Problem lecture with the elements of multimedia presentation
<u>Seminars</u>:
▪ classic (problem) exercise method,
▪ didactic discussion,
▪ multimedia presentations (presented by students)</td><td>The condition of passing the course is: attendance (two absences in the first semester are the basis for not passing this semester), preparing and delivering presentations, active participation in classes (participation in discussions).
Lectures: assessment criteria: passing a grade in the form of a test (open and closed questions).
Seminars: assessment criteria: credit based on active participation in class.

In the case of credit grade in writing, the points obtained are converted into grades on the following scale:
<table><tr><th>Percentge of points</th><th>Grade</th></tr><tr><td>92-100%</td><td>Excellent (5)</td></tr><tr><td>84-91%</td><td>Very good (4.5)</td></tr><tr><td>76-83%</td><td>Good (4)</td></tr><tr><td>68-75%</td><td>Satisfactory (3.5)</td></tr><tr><td>60-67%</td><td>Acceptable (3)</td></tr><tr><td>0-59%</td><td>Fail (2)</td></tr></table></td></tr>
</table>

		toxicity of narcotic plants - K_D.W40 Knows the mechanisms of action of plant substances at the biochemical and molecular level - K_D.W40 Knows the problems of natural origin drugs and dietary supplements containing medicinal plant materials and their use in the prevention and therapy of various disease entities - K_D.W41 Knows the rules of use and dosage of medicinal plant materials, their toxicity, effects of side effects and interactions with synthetic drugs, other raw materials and substances of plant origin - K_D.W41 Knows the differences between the leaflet about the medicine and the leaflet attached to dietary supplements and other products available in the pharmacy - K_D.W41 Knows market medicinal products of plant origin and methods of their production - K_D.W41 Knows the issues of clinical trials of plant medicines and the position and importance of phytotherapy in the conventional medicine system - K_D.W42 Knows the rules of placing medicinal plant products and dietary supplements containing		

		plant materials on the market - K_D.W43 Knows and understands the principles of marketing medicinal products, medical devices, cosmetics and dietary supplements - K_D.W43 Knows the basic sources of information about the drug (books, magazines, databases) - K_D.W44 Knows the current direction of searching for plant medicines used in the therapy of various diseases, as well as achievements in this field - K_D.W44 Designs the composition of a plant preparation with a specific action - K_D.U33 Carries out the standardization procedure for medicinal plant product and prepares the application for its registration - K_D.U33 Assesses the action profile of a specific preparation based on knowledge of its composition - K_D.U34 Formulates research problems related to the medicine of plant origin - K_D.U34 Uses various sources of information about medicines, including in English, and interprets this information critically - K_D.U34		

		Uses domestic and foreign scientific literature - K_D.U34 Uses information technologies to search for necessary information and to independently and creatively solve problems - K_D.U35 Provides information on medicinal plant material, determines its chemical composition, medicinal properties, side effects and interactions - K_D.U35 searches in the literature for scientific information, selects and evaluates them, and uses them for practical purposes - K_D.U35 Provides complete information on the marketed herbal preparation, gives its medicinal use, describes interactions and effects of adverse effects - K_D.U35 Gives advice on the use, contraindications, interactions and adverse effects of plant-derived drugs - K_D.U35 Presents information about the drug of natural origin in an accessible and adapted to the level of recipients - K_D.U35 He formulates the conclusions from his own research and those available in the literature as well as from observing the environment and at work - K8		

		He is ready to make responsible decisions at work, guaranteeing the safety of himself and others - K10		
	Toxicology	Knows the basic concepts related to toxicology, including issues related to toxicokinetics, toxicometry and alternative methods used in toxicology - K_D.W21 Knows the physical and chemical properties of xenobiotics, which can interpret their harmful or toxic properties, with particular emphasis on biotransformation processes, depending on the route of administration or exposure; a - K_D.W22 Knows the dangers of exposure to poisons based on toxicomeric studies including acute toxicity, chronic toxicity and distant effects - K_D.W23 Knows the relationship between the structure of chemical compounds and reactions taking place in living organisms, including factors modifying xenobiotics activity - K_D.W24 Knows the rules of conduct in poisoning with selected drugs and psychoactive compounds, including antidotes - K_D.W25 Knows the principles of air monitoring and biological monitoring in the assessment of exposure based on the detection	**Lecture:** ▪ Informative lecture (conventional), ▪ Problem lecture with the elements of multimedia presentation. **Labs:** ▪ classes ▪ work in groups and individually, ▪ measurement and analysis of results	The basis for passing the toxicology subject is compliance with the principles set out in the Didactic Regulations of the Department of Toxicology and Bromatology. The condition of passing the course is: passing laboratory classes getting over 60% of 4 written tests and obtaining a positive grade from the final exam. **Lectures:** Completion based on two written tests and a final exam in the form of a single-choice test (open and closed single-choice questions). Points obtained from the exam are converted into grades on the following scale: **Percentage of points Grade** 92-100% Excellent (5) 84-91% Very good (4.5) 76-83% Good (4) 68-75% Satisfactory (3.5) 60-67% Acceptable (3) 0-59% Fail (2) The final retake exam takes place in the retake session. A student may take an exam in so-called zero date, when he obtained a total of more than 95% of the points from

		methods (qualitative and quantitative) of various poisons in the air and biological material - K_D.W26 - xenobiotic toxicity testing methods - K_D.W26 - the process and the resulting planning principles and methodology for toxicological studies for new substances with therapeutic potential - K_D.W28 - factors that are a consequence of environmental pollution affecting human health - K_D.W29 **In terms of skills, the graduate is able to:** - assess the hazards that are a consequence of environmental pollution by various factors, in particular drugs and their metabolites - K_D.U18 - characterize the biotransformation of xenobiotics and assess its importance in metabolic activation and detoxification - K_D.U19 - assess the xenobiotic effect taking into account its chemical structure and type of exposure - K_D.U20 - propose a method of detecting poisons including isolation of substances from biological material - K_D.U21 - propose the selection of toxicological tests, based on the		the colloquium and the Head of the Department of Toxicology and Bromatology gave the appropriate consent. There are no exemptions from the exam. **Seminars:** Not applicable. **Labs:** Credit based on the practical part of the laboratory classes and passing two written tests. Continuous assessment during classes in the form of short written or oral tests: The student receives credit after obtaining> 70% of correct answers. The student is entitled to retake a short test after failing to pass it on the first date, that takes place within the time limit set by the teacher, but before the date of the colloquium from laboratory classes. Final exam:> 60% Lecture colloquium:> 70% Laboratory colloquium:> 70% Written tests:> 70%

		sensitivity and specificity of tests, to facilitate the selection of the correct diagnosis - K_D.U22 - on the basis of obtained qualitative and quantitative toxicological tests results, interprets poisoning with a specific xenobiotic - K_D.U22 **In terms of social competence, the graduate is ready to:** - taking positions and creating opinions on various aspects of professional activity - K 9 - using team action to implement tasks and is responsible for their results - K 3 - clear knowledge-based formulation of conclusions supported by the results of own measurements or observations - K 8.		
Course module E **Pharmaceutical Practice**	Professional ethics	Knows the basic concepts of ethics, deontology and bioethics, as well as the issues of the historical development of ethical systems - K_E.W28 Knows the ethical principles of modern pharmaceutical marketing - K_E.W29 Understands the need to develop ethical and moral attitudes and sensitivity in professional practice - K_E.W28 Understands the need for the code of ethics in professional practice -	**Lectures**: ▪ informative lecture, ▪ didactic lecture **Tutorials:** ▪ auditorium exercises with a multimedia presentation, ▪ conversational lecture	The student receives credit based on the result of the test covering the issues of lectures and seminars. The condition of participation in the final test is attendance at lectures and practical classes. Test - closed (multiple choice) and open questions (0 - 30 points: **Points: Grade:** >18 Fail (2) 18-20 Acceptable (3) 21-23 Satisfactory (3.5) 24-26 Good (4)

		K_E.U30, Applies to the Code of Ethics of the Apothecary of the Republic of Poland - K_E.U30; Refers to the pharmacist's professional ethics and patient's rights in relation to the patient and medical staff - K_E.U30 Adheres to the confidentiality regarding patient's health and rights - K4 Presents an ethical and moral attitude consistent with ethical principles - K5 Takes action based on the code of ethics in professional practice - K5		27-28 Very good (4.5) 29-30 Excellent (5) 100% presence at the lecture Written test - multiple-choice test solution - approx. 20 questions). The condition of passing the test is to obtain a minimum of 60% correct answers.
	Practical pharmacy	Knows the rules of dispensing drugs from a pharmacy based on a medical order and without a prescription, as well as the drug distribution system in Poland - K_E.W1 Knows the principles of drug application depending on the type of medicine form, as well as the type of packaging and dispensing system - K_E.W17 Knows and understands the legal bases and principles of practicing the profession of pharmacist - K_E.W4 Understand the role of pharmacist in the health care system - K_E.W6	**Labs:** ▪ seeking didactic methods, ▪ classic problem method **Seminars:** ▪ seminar method **Tutorials:** ▪ searching didactic methods	**Laboratories + practical classes:** written exam **Seminars:** graded credit **Assessment criteria:** 2 - Fail - up to 2.99 (up to 59.9%) 3 - Acceptable - 3.0 - 3.49 (60% -69.9%) 3.5 - Satisfactory - 3.50 - 3.83 (70% - 76.7%) 4 - Good - 3.84 - 4.16 (76.8% -83.3%) 4.5 – Very good - 4.17-4.50 (83.4% -90%) 5 - Excellent - above 4.50 (above 90%)

		Knows drug management at the pharmacy - K_E.W7 Differentiates the categories of availability of medicinal products and medical devices and discusses the basic principles of drug management in hospitals - K_E.U1 Determines the scope of duties of individual persons belonging to professional staff in pharmacies, including indicates the division of responsibility in the area of dispatching drugs from the pharmacy and providing information about medicines - K_E.U3 Indicates medicinal products and medical devices requiring special storage conditions - K_E.U4 Indicates the right way to handle the medicine during use, describes the stages of dealing with the drug in an open and hospital pharmacy from the moment of ordering to delivery to the patient, demonstrates how to use medical devices and diagnostic tests, and conducts a conversation with the patient to advise the medicinal product or other product at the pharmacy - K_D.U35 Implements a medical prescription using a pharmacy computer program and provides relevant information regarding the medicine dispensed, including the method of		

		taking it, depending on its pharmaceutical form - K_E.U2 Conducts a pharmaceutical consultation while dispensing a medicine without a prescription (OTC) - K_E.U14 Indicates the correct way of handling medicine by healthcare system employees - K_E.U13 Is able to use IT tools in work - K_E.U15 Is able to provide information related to complications of pharmacotherapy to healthcare system employees, patients or their families - K_E.U17 Is able to conduct a critical analysis of publications on medicines - K_E.U28 Is able to comply with the principles of pharmacy ethics - K_E.U30 Is aware of the social conditions and restrictions resulting from the disease and the need to promote health-oriented behavior in the practice of the pharmacist profession - K5 Has a habit of supporting assistance and remedial actions in the prevention of diseases and health-promoting activities -K6 Has a habit of using information technologies (pharmacy programs) to search and select information related to the dispensing of		

		medicinal products and medical devices - K8		
	Pharmacoeconomics	Knows the difference between health care systems and specific methods of drug management - K_E.W7 Knows the basics of health economics and pharmacoeconomics - K_E.W19 Distinguishes methods and tools for assessing costs and effects used in economic analyzes of health programs - K_E.W20 Knows guidelines for conducting health technology assessment - K_E.W21 Is able to estimate the costs and effects of pharmacotherapy, calculate and interpret cost and effectiveness factors, and assess the chance of implementing a new medical technology into the health care system - K_E.U27 Assesses actions and resolves moral dilemmas related to the costs of treatment processes based on ethical norms and principles - K5 Uses objective sources of information to obtain current knowledge in the field of pharmacoeconomics - K7	**Lectures:** ▪ informative lecture (conventional) ▪ multimedia presentation **Tutorials:** ▪ classic problem method	**Lectures:** Written exam **Tutorials:** Written exam **Assessment criteria:** 2 - Fail - up to 2.99 (up to 59.9%) 3 - Acceptable - 3.0 - 3.49 (60% -69.9%) 3.5 - Satisfactory - 3.50 - 3.83 (70% - 76.7%) 4 - Good - 3.84 - 4.16 (76.8% -83.3%) 4.5 – Very good - 4.17-4.50 (83.4% -90%) 5 - Excellent - above 4.50 (above 90%)
	Pharmacoepidemiology	Knows the principles of organization and financing of the healthcare system in the Republic of Poland and the role of the	**Lectures**: ▪ informative lecture (conventional),	The condition of passing the course is active participation in didactic classes and obtaining the appropriate number of points.

<table>
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<td>pharmacist in this system - K_E.W6
Knows and understands the principles of conducting and organizing research involving people, including descriptive and experimental research - K_E.W41
Knows and understands the importance of population health indicators -K_E.W42
Knows and understands the principles of monitoring the safety of medicinal products after placing them on the market - K_E.W43
Knows and understands the principles of health and safety at work - K_E.W44
Defines methodological differences between different types of epidemiological studies - K_E.U.19
Defines the basic concepts of epidemiology, including pharmacoepidemiology and clinical epidemiology - K_E.U.20
Describes the principles of conducting meta-analysis from experimental and descriptive research - K_E.U.21, K_E.U.29
Describes the basic errors appearing in epidemiological studies and participates in health promotion activities - K_E.U.22
Has a habit of using objective sources of information - K7</td>
<td>▪ problem lecture with the elements of multimedia presentations.
<u>Tutorials:</u>
▪ presentations,
▪ discussion and problem analysis</td>
<td><u>Tutorials:</u>
discussion, development of materials prepared by the seminar teacher.

<u>Lectures:</u>
Written exam-
5 descriptive questions 0-3 points,

<table>
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<td></td>
<td>Pharmacotherapy and drug information</td>
<td>Knows the possible risks associated with the independent use of drugs by patients, as well as possible ways to prevent them - K_E.W15
Knows the frequency and genesis of addiction to drugs and other substances, and skilfully defines the position and role of the pharmacist in combating addiction and the skilful use of indicators helpful in determining the health of the population - K_E.W16; K_E.W24
Knows the different stages of drug research, experimental research and involving people along with the definition of ethical and legal principles and the role of the pharmacist in conducting them - K_E.W22 K_E.W23
Knows the principles of monitoring the safety of medicinal products after placing them on the market - K_E.W26
Is able to efficiently use various sources of information about a drug by critically interpreting this information; accurately and quickly search for available scientific information on medicinal substances and products and prepare a pharmacotherapy monitoring plan based on them - K_E.U25, K_C.U34</td>
<td><u>Lecture</u>:
▪ informative lecture (conventional) with the elements of multimedia presentation
▪ problem lecture
<u>Tutorials:</u>
▪ assisted learning with a multimedia presentation
▪ teaching discussion method
▪ case studies
▪ analysis of texts with discussion
<u>Labs:</u>
▪ assisted learning with a multimedia presentation
▪ teaching discussion method
▪ case studies
▪ analysis of texts with discussion
<u>Practicals in the conditions of a hospital ward</u></td>
<td>The basis for passing the subject of Pharmacotherapy and drug information is compliance with the rules set out in the didactic regulations of the Department of Pharmacodynamics and Molecular Pharmacology.

Colloquia: test form, minimum passing threshold: 60% correct answer to the questions; the obligation to pass each colloquium entitles to pass this part of the subject and take the exam.
Final exam: The course ends with an exam. Descriptive form - 5-6 questions; minimum passing threshold: 60% of correct answers to questions.

The point values of individual grades are as follows:
<table>
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<tr><td>0-59%</td><td>Fail (2)</td></tr>
</table>
Colloquia: >60%
Final exam: >60%</td>
</tr>
</table>

		Is able to determine the methods and principles of assessing the effectiveness and safety of therapy and predict the impact of various factors on the pharmacokinetic and pharmacodynamic properties of drugs - K_E.U9, K_E.U16 Is able to independently propose optimal and individual pharmacotherapy for the patient and explain the individualization of drug dosage in the patient in clinical settings - K_E.U10, K_E.U-16 Is able to cooperate with employees of the healthcare system, including actively participating in the work of the therapeutic team and clinicians - K_E.U23 Is able to propose a plan for conducting clinical trials, in particular in the scope of supervising the quality of the investigational medicinal product, and monitoring the clinical trial, and skilfully proposes techniques for managing the management of medicinal products and medical devices intended for clinical trials; - K_E.U24 Is ready to establish correct interpersonal relations based on mutual respect and trust, including confidentiality regarding health, patient rights and principles of professional ethics - K1, K4	▪ case studies ▪ teaching discussion method	

<table>
<tr><td></td><td></td><td>Is ready to use the team potential to act to achieve successful tasks - K3
Uses objective sources of information in his daily duties including Evidence Based Medicine - K7
Is ready to make responsible decisions at work, guaranteeing the safety of himself and others - K10</td><td></td><td></td></tr>
<tr><td></td><td>History of Pharmacy</td><td>Knows the directions of development of professional and scientific pharmacy, as well as the development of historical philosophical thought and the ethical basis for resolving moral dilemmas related to the profession of pharmacist and medical professions. K_E.W27
Knows the psychological and sociological conditions of the functioning of the individual in society. K_A.W30; K_A.W31
Initiates and supports group activities, influences the formation of attitudes and assistance and remedial actions, and knows how to manage human teams. K_A.U19
Presents an ethical and moral attitude based on ethical norms and principles - K5</td><td><u>Lectures:</u>
▪ problem lecture with the elements of multimedia presentations</td><td>Lectures:

Mandatory presence. oral test - 3 descriptive questions 0-10 points, 4 descriptive questions 0-5 points, total> 60%.
<table><tr><th>Percentage of points</th><th>Grade</th></tr><tr><td>88-100%</td><td>Excellent (5)</td></tr><tr><td>81-87%</td><td>Very good (4.5)</td></tr><tr><td>74-80%</td><td>Good (4)</td></tr><tr><td>67-73%</td><td>Satisfactory (3.5)</td></tr><tr><td>60-66%</td><td>Acceptable (3)</td></tr><tr><td>0-59%</td><td>Fail (2)</td></tr></table></td></tr>
<tr><td></td><td>Pharmaceutical care</td><td>K_E.W8. Knows the idea of pharmaceutical care and concepts related to pharmaceutical care, in particular relating to problems and</td><td><u>Laboratories:</u>
▪ classic problem method
▪</td><td>Laboratories:
Graded credit.

Assessment criteria:
2 - Fail - up to 2.99 (up to 59.9%)</td></tr>
</table>

		needs associated with the use of medicines; K_E.W9. Knows the principles of monitoring the effectiveness and safety of patient's pharmacotherapy in the pharmaceutical care process; K_E.W10. Knows the principles of individualization of pharmacotherapy taking into account the differences in drug effects caused by physiological factors in disease states in clinical conditions; K_E.W11. Knows the basic scientific sources of information on medicines; K_E.W12. Knows the principles of therapeutic management based on evidence-based; K_E.W13. Knows therapeutic standards and guidelines for therapeutic management; K_E.W14. Knows the role of pharmacist and representatives of other medical professions in the therapeutic team; K_E.W30. Knows the principles of health promotion, its tasks and the role of a pharmacist in promoting a healthy lifestyle. K_E.U5. Is able to plan, organize and conduct pharmaceutical care; K_E.U6. Is able to conduct pharmaceutical consultations in the		3 - Acceptable - 3.0 - 3.49 (60% -69.9%) 3.5 - Satisfactory - 3.50 - 3.83 (70% - 76.7%) 4 - Good - 3.84 - 4.16 (76.8% -83.3%) 4.5 – Very good - 4.17-4.50 (83.4% -90%) 5 - Excellent - above 4.50 (above 90%)

		process of pharmaceutical care and pharmaceutical consulting; K_E.U7. Is able to cooperate with a doctor in the field of optimization and rationalization of therapy in closed and open treatment; K_E.U8. Is able to select over-the-counter medications for medical conditions that do not require medical consultation; K_E.U9. Is able to prepare a pharmacotherapy monitoring plan K_E.U10. Is able to perform and explain the individualization of drug dosage K_E.U11. Can choose the form of medicine for the patient, taking into account clinical recommendations, patient needs and product availability; K_E.U12. Can indicate the right way to handle the drug during its use by the patient and provide information about the drug; K_E.U16. Can predict the impact of various factors on the pharmacokinetic and pharmacodynamic properties of drugs K_E.U18. Is able to identify the risks associated with the use of pharmacotherapy in various groups of patients and plan preventive actions;		

		K_E.U26. Is able to participate in activities for the promotion of health and prevention; K_E.U31. Knows how to comply with the rights of the patient in the pharmacy; Is aware of social conditions and restrictions resulting from the disease and the need to promote health-promoting behaviors implemented as part of pharmaceutical care - K6 Has a habit of using information technologies to search and select information on medicines, side effects, interactions and current health recommendations during the implementation of the pharmaceutical care program - K8 Has the ability to work in a therapeutic team consisting of representatives of medical professions and patients - K3		
	Pharmaceutical Law	Knows the pharmacopoeial requirements of various drug forms and the principles of placing them on the market - K_C.W23 Knows the legal basis and principles of organization of the pharmaceutical market in the field of retail trade in the Republic of Poland and the functioning of public and hospital pharmacies - K_E.W1	**Lectures:** ▪ informative lecture (conventional) ▪ multimedia presentation **Tutorials:** ▪ classic problem method	**Lectures** Written exam **Tutorials** Graded credit **Assessment criteria:** 2 - Fail - up to 2.99 (up to 59.9%) 3 - Acceptable - 3.0 - 3.49 (60% -69.9%) 3.5 - Satisfactory - 3.50 - 3.83 (70% - 76.7%) 4 - Good - 3.84 - 4.16 (76.8% -83.3%)

		Understands the principles of organization and functioning of the retail and wholesale pharmaceutical market in the Republic of Poland - K_E.W2 Knows the rules for issuing, recording and implementing prescriptions and the rules for dispensing medicines from the pharmacy and other entities authorized to distribute medicines - K_E.W3 Knows the legal basis and principles of practicing the profession of pharmacist, including regulations regarding obtaining the right to practice the profession of pharmacist and the functioning of the pharmacy self-government - K_E.W4 Knows the organization of the production process of medicinal products and the legal regulations for their registration - K_E.W5 Understands the role of pharmacist in the health care system - K_E.W6 Distinguishes the rules of placing medicinal products on the market and the remaining range of pharmacies, i.e. medical devices, dietary supplements, foodstuffs for particular nutritional uses and cosmetics - K_E.W18 Is able to monitor and report adverse drug effects - K_E.U17		4.5 – Very good - 4.17-4.50 (83.4% -90%) 5 - Excellent - above 4.50 (above 90%)

<table>
<tr><td></td><td></td><td>Is able to identify the role and tasks of individual pharmacy self-government bodies as well as the rights and obligations of its members - K_E.U19
Is able to indicate the basic ethical problems related to modern pharmacy - K_E.U22</td><td></td><td></td></tr>
<tr><td></td><td><u>Propaedeutics</u> of Pharmacy</td><td>Knows the structure of pharmacopoeia and its importance for the quality, analytics and technology of medicinal products - K_C.W5
Knows the legal basis of the pharmaceutical market in Poland and the place of pharmacy in the healthcare system - K_E.W1
Distinguishes the workplace of pharmacists, the principles of their organization and impact on the health care system K_E.W2
Knows the principles of functioning of the pharmacy self-government and other organizations shaping the pharmaceutical market - K_E.W4
Is able to use the pharmacopoeia and search for scientific information on medicinal products - K_C.U34
Is able to identify the tasks of individual bodies of professional self-government - K_E.U19</td><td><u>Lectures:</u>
▪ informative lecture (conventional)
▪ multimedia presentation
<u>Seminars:</u>
▪ activating and problem methods, i.e. discussion, case method and classical problem method
▪ individual work</td><td>The condition of passing the course is active participation in didactic classes and obtaining the appropriate number of points.

Seminars: discussion, development of materials prepared by the seminar teacher.

<table><tr><th>Percentage of points</th><th>Grade</th></tr><tr><td>88-100%</td><td>Excellent (5)</td></tr><tr><td>81-87%</td><td>Very good (4.5)</td></tr><tr><td>74-80%</td><td>Good (4)</td></tr><tr><td>67-73%</td><td>Satisfactory (3.5)</td></tr><tr><td>60-66%</td><td>Acceptable (3)</td></tr><tr><td>0-59%</td><td>Fail (2)</td></tr></table></td></tr>
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<td></td>
<td>Clinical Pharmacy</td>
<td>Knows and understands therapeutic standards and therapeutic guidelines - K_E.W13
Understands the role of the pharmacist and representatives of other medical professions in the therapeutic team - K_E.W14
Knows and understands physiological, pathophysiological and environmental conditions affecting the course of pharmacokinetic processes - K_D.W6
Knows drug interactions in the pharmacokinetic, pharmacodynamic and pharmaceutical phase - K_D.W7
Knows and understands the basics of therapy monitored by the concentration of active substance and the principles of drug dosage changes in the patient - K_D.W8
Understands the importance of factors affecting the improvement of pharmaceutical and biological availability of the medicinal product - K_D.W10 Knows the factors affecting the effects of drugs in the pharmacodynamic phase, including hereditary factors and the assumptions of personalized therapy - K_D.W14
Knows the indications, contraindications and side effects</td>
<td><u>Lectures:</u>
▪ informative lecture (conventional)
▪ multimedia presentation
<u>Seminars:</u>
▪ assisted learning with a multimedia presentation
▪ teaching discussion method
▪ case studies
▪ analysis of texts with discussion

<u>Practicals in the conditions of a hospital ward</u>
▪ case studies
▪ method of didactic discussion</td>
<td>The condition of passing the course is active participation in didactic classes and obtaining the appropriate number of points.

The point values of individual grades are as follows:

<table>
<tr><th>Points</th><th>Grade</th></tr>
<tr><td>20-19</td><td>Excellent (5)</td></tr>
<tr><td>18-17</td><td>Very good (4.5)</td></tr>
<tr><td>16-15</td><td>Good (4)</td></tr>
<tr><td>14-13</td><td>Satisfactory (3.5)</td></tr>
<tr><td>12-11</td><td>Acceptable (3)</td></tr>
<tr><td>10-0</td><td>Fail (2)</td></tr>
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		specific for the drug and dose-dependent - K_D.W17 Knows the classification of adverse reactions - K_D.W18 Knows the rules of the correct association of drugs and types of drug interactions, factors affecting their occurrence and possibilities of avoiding them - K_D.W19 Understands the idea of pharmaceutical care and concepts related to pharmaceutical care, in particular those related to problems and needs associated with the use of medicines - K_E.W8 Knows the principles of monitoring the effectiveness and safety of patient pharmacotherapy in the pharmaceutical care process - K_E.W9 Knows the principles of individualization of pharmacotherapy taking into account the differences in drug effects due to physiological factors in disease states in clinical conditions - K_E.W10 Knows the basic scientific sources of information about medicines - K_E.W11 Knows the principles of therapeutic management based on scientific evidence - K_E.W12		

		Knows the risks associated with the independent use of drugs by patients - K_E.W15 Is able to cooperate with representatives of other medical professions in ensuring the safety and effectiveness of pharmacotherapy - K_D.U17 Is able to cooperate with a doctor in the field of optimization and rationalization of therapy in closed and open treatment - K_E.U7 Is able to select over-the-counter drugs in medical conditions that do not require medical consultation - K_E.U8 Is able to prepare a pharmacotherapy monitoring plan, specifying methods and principles for assessing the effectiveness and safety of therapy - K_E.U9 Is able to perform and explain the individualization of drug dosage in a patient in clinical settings - K_E.U10 Can. choose the form of medicine for the patient, taking into account clinical recommendations, patient needs and product availability - K_E.U11 Is able to indicate the correct way of handling the medicine during its use by the patient and provide information about the medicine - K_E.U12		

		Indicates the correct way of handling medicine by healthcare system employees - K_E.U13 Is able to carry out patient education related to the drugs they use and other problems related to their health and illness and to prepare individualized educational materials for the patient - K_E.U14 Is able to predict the impact of various factors on the pharmacokinetic and pharmacodynamic properties of drugs and solve problems regarding the individualization and optimization of pharmacotherapy - K_E.U16 Is able to monitor and report adverse drug reactions, implement preventive measures, provide information related to pharmacological complications to healthcare system employees, patients or their families - K_E.U17 Is able to identify the risks associated with the use of pharmacotherapy in various groups of patients and plan preventive actions - K_E.U18 Actively participates in the work of the therapeutic team, cooperating with employees of the healthcare system - K_E.U23		

		Actively participates in conducting clinical trials, in particular in the scope of supervising the quality of the investigational medicinal product, and monitoring the clinical trial and managing the management of medicinal products and medical devices intended for clinical investigations - K_E.U24 Is able to use various sources of information about the drug and critically interpret this information - K_E.U25 Recognizes and recognizes their own limitations, making self-assessments of deficits and educational needs - K1 Uses objective sources of information - K5 Is ready to respect the secret regarding health, patient rights and professional ethics - K4		
	Foreign language	Has language skills in the field of pharmaceutical sciences - K.E.U32 Communicates with the patient in one of the foreign languages at B2 + level of the European Language Education Description System - K_E.U32 Is aware of the need to constantly supplement language knowledge in the field of occupation and self-education - K2. Uses various sources of information about medicines,	**<u>Foregin language course:</u>** ▪ text analysis: reading, translation, pronunciation ▪ presentations ▪ papers ▪ conversations ▪ drama	The course ends with an exam. The condition of passing the exam is to obtain a minimum of 60% of correct answers. **The condition for passing the precticals is:** - - passing tests (over 60% of correct answers) - - attendance at a language course - - passing the paper - -passing the presentation

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<td>including in a foreign language, and interprets this information critically - K7.
Is ready to formulate conclusions from his own measurements and observations in a foreign language - K8</td>
<td></td>
<td><table>
<tr><th>Percentage of points</th><th>Grade</th></tr>
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<td></td>
<td>Latin language</td>
<td>Knows the basics of Latin grammar and syntax. Knows Latin chemical, botanical and pharmaceutical terms.
Knows the basic Latin terms and abbreviations used in medical prescriptions.
Knows the names of chemical elements and chemical compounds.
Uses Latin terms in the international pharmaceutical and medical nomenclature.
Can read, write and translate a prescription on their own.
Recognizes and understands words of Latin origin in Romance languages and in English in specialist literature.
Has the ability to work in a team.</td>
<td><u>Language course:</u>
▪ problem lecture with multimedia presentation;
▪ conversations, discussions.</td>
<td>The condition of passing the language course is:
- passing partial tests,
- activity,
- class attendance (1 unexcused absence permitted).

Absence from classes can be worked out by passing the appropriate topic of classes from the teacher in charge.

The semester ends with a final test. The condition of passing the test is to obtain a minimum of 60% of correct answers.
<table>
<tr><th>Percentage of points</th><th>Grade</th></tr>
<tr><td>92-100%</td><td>Excellent (5)</td></tr>
<tr><td>84-91%</td><td>Very good (4.5)</td></tr>
<tr><td>76-83%</td><td>Good (4)</td></tr>
<tr><td>68-75%</td><td>Satisfactory (3.5)</td></tr>
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<tr><td>0-59%</td><td>Fail (2)</td></tr>
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Research methodology and master's seminar</td>
<td>Specialized laboratory classes and research methodology</td>
<td>Has expanded knowledge in selected areas of pharmaceutical sciences - K_F.W1
Knows the research methods and techniques used within the framework of executed project - K_F.W1
Plans an experiment and discusses its purpose and expected results - K_F.U1
Interprets experimental data and relates them to the current state of knowledge in a given field of pharmacy - K_F.U2
Uses domestic and foreign scientific literature - K_F.U3
Independently conducts the experiment, interprets and documents the results of research - K_F.U4
Prepares their master's thesis in accordance with the rules for editing scientific works - K_F.U4
Presents research results - K_F.U5
Has a habit of using objective sources of information - K7
Draws and phrases conclusions from their own measurements and observations - K8</td>
<td>Tutorials:
▪ activating didactic methods,
▪ discussion</td>
<td>In the case of graded credit in writing, the points obtained are converted into grades on the following scale
<table><tr><th>Percent of points</th><th>Grade</th></tr><tr><td>92-100%</td><td>Excellent (5)</td></tr><tr><td>84-91%</td><td>Very good (4.5)</td></tr><tr><td>76-83%</td><td>Good (4)</td></tr><tr><td>68-75%</td><td>Satisfactory (3.5)</td></tr><tr><td>60-67%</td><td>Acceptable (3)</td></tr><tr><td>0-59%</td><td>Fail (2)</td></tr></table></td>
</tr>
<tr>
<td>Master's seminar</td>
<td>Has expanded knowledge in selected areas of pharmaceutical sciences - K_F.W1
Knows the research methods and techniques used within the</td>
<td>Tutorials:
▪ activating didactic methods,
▪ discussion</td>
<td>In the case of graded credit in writing, the points obtained are converted into grades on the following scale
:</td>
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<td>framework of executed project - K_F.W1
Plans an experiment and discusses its purpose and expected results - K_F.U1
Interprets experimental data and relates them to the current state of knowledge in a given field of pharmacy - K_F.U2
Uses domestic and foreign scientific literature - K_F.U3
Independently conducts the experiment, interprets and documents the results of research - K_F.U4
Presents research results - K_F.U5
Has a habit of using objective sources of information - K7
Draws conclusions from their own measurements and observations - K8</td>
<td></td>
<td>
<table>
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<tr>
<td>Practice</td>
<td>Practice in a community pharmacy</td>
<td>Knows the whole work in a public pharmacy, its organization, professional and administrative activities, rooms and equipment - K_E.W1

Is able to define the basic principles of dispensing medicines based on prescription and over the counter, familiarized with medicinal products and medical devices - K_E.W3
Draws conclusions from his own</td>
<td>Public pharmacy - preparation of prescription drugs, including aseptic drugs, computer pharmacy programs.

Professional literature and current legal acts and regulations regarding medicinal products that can be treated as</td>
<td>Implementation of the internship in accordance with the regulations and internship program. Constant supervision over the student by the internship supervisor on behalf of the pharmacy and control of the internship by the supervisor on behalf of the University.

Evaluation of the student's work by the internship supervisor.

Completion of the internship on the basis of the presence, implementation of the</td>
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</table>

		measurements and observations - K8 Has a habit of using information technologies to search and select information - K7 Is aware of social conditions and restrictions resulting from the disease and the need to promote health-promoting behaviors - K5	prescription raw materials.	regulations and internship program, colloquium and evaluation of the internship supervisor.
	Practice in a hospital pharmacy and in the pharmaceutical industry	Knows the principles of Good Manufacturing Practice specified in the regulations issued on the basis of art. 39 section 5 point 1 of the Act of 6 September 2001 - Pharmaceutical Law (Journal of Laws of 2019, item 499, as amended), including the principles of documenting technological processes - K_C.W33 Knows the legal basis and principles of organization of the pharmaceutical market in the field of retail trade in the Republic of Poland and the operation of hospital pharmacies - K_E.W1 Knows the rules for issuing, recording and implementing prescriptions and the rules for dispensing medicines from a hospital pharmacy - K_E.W3 Is able to determine the storage conditions of medicinal products, medical devices and dietary supplements, indicate products that	Hospital pharmacy - preparation of medicines made in a hospital pharmacy, including aseptic medicines, computer pharmacy programs. Professional literature and current legal acts and regulations regarding medicinal products that can be treated as prescription raw materials. Alternatively, in the case of an internship in a hospital pharmacy or industrial plant, additionally: Production plant - cooperation in the preparation of documentation related to	Implementation of the internship in accordance with the regulations and internship program. Constant supervision over the student by the internship supervisor on behalf of the pharmacy and control of the internship by the supervisor on behalf of the University. Evaluation of the student's work by the internship supervisor. Completion of the internship on the basis of the presence, implementation of the regulations and internship program, colloquium and evaluation of the internship supervisor.

		require special storage conditions, and control storage conditions in a hospital pharmacy - K_E.U4 Draws conclusions from his own measurements and observations - K8 Has a habit of using information technologies to search and select information - K7 Is aware of social conditions and restrictions resulting from the disease and the need to promote health-oriented behaviors - K5	the work of an industrial plant.	
	Six-month internship in a pharmacy	Knows the legal basis and principles of organization of the pharmaceutical market in the field of retail trade in the Republic of Poland and the functioning of public and hospital pharmacies - K_E.W1 Knows the rules for issuing, recording and implementing prescriptions and the rules for dispensing medicines from a public and hospital pharmacy - K_E.W3 Is able to conduct a critical analysis of publications on the effectiveness and safety of preparations issued to patients from the pharmacy - K_E.U28 Is able to comply with the principles of occupational deontology, including the Code of Ethics for the Pharmacist of the Republic of Poland - K_E.U30	Public pharmacy - preparation of prescription drugs, including aseptic drugs, dispensing of drugs, medicinal products, medical devices and dietary supplements, computer pharmacy programs, keeping pharmacy documentation. Hospital pharmacy - preparation of medicines made in a hospital pharmacy, including aseptic medicines, dispensing of pharmacy medicines to hospital	Double control of the internship by the internship supervisor on behalf of the University, during which the implementation of the internship program in accordance with the internship program is verified. Passing skills, confirmed by the signature of the internship supervisor, such as: – Dispensing of medicinal products and medical devices and providing information on medicines, – Applying special rules for dispensing highly potent drugs, psychotropics and narcotics, – Applying the principles of good pharmacy practice, – Consulting and providing information on medicines,

		Is able to respect the rights of the patient - K_E.U31 Draws conclusions from his own measurements and observations - K8 Has a habit of using information technologies to search and select information - K7 Is aware of social conditions and restrictions resulting from the disease and the need to promote health-oriented behaviors - K5	departments, pharmacy computer programs, pharmacy documentation. Professional literature and current legal acts and regulations regarding medicinal products that can be treated as prescription raw materials.	– Proper preparation of prescription and pharmacy medicines, – Proper preparation of medicines under aseptic conditions, – Evaluating the quality of the medicine form. – Interpersonal communication necessary for the implementation of pharmaceutical care, – Practical implementation of pharmaceutical care in a pharmacy, – Application of the principles of the code of professional ethics, provisions regarding the profession of pharmacist, running a pharmacy and labor law, – Application of the principles of distribution and storage of medicinal products and medical devices, – Applying the principles of work organization in a pharmacy, taking into account health and safety rules and regulations, – Keeping pharmacy documentation as well as handling and administration of pharmacy IT systems. Positive opinion of the internship supervisor from the pharmacy. Documenting in the placement diary that the placement lasted no less than 960 teaching hours (6 months).

Others	Elements of occupational health and safety and ergonomics	Recognizes situations threatening human health or life, applies qualified first aid principles and provides qualified first aid in situations of threat to health and life - A.U18 Can describe the procedure in the event of an accident and evacuation - A.U18 Is ready to promote health-oriented behavior - K6	**<u>E-learning lectures:</u>** ▪ problem lecture with multimedia presentation	Final written exam: e-learning test on the Moodle platform
Elective course module, e.g., university-wide courses or courses included in another field of study that are unrelated to a specific field of study	Elective course 1 year	Depending on the didactic offer of the units	Lecture Tutorials	Credit grade, colloquium
	Elective course 2 year	Depending on the didactic offer of the units	Lecture Tutorials	Credit grade, colloquium
	Elective course 3 year	Depending on the didactic offer of the units	Lecture Tutorials	Credit grade, colloquium
	Elective course 4 year	Depending on the didactic offer of the units	Lecture Tutorials	Credit grade, colloquium
	Elective course 5 year	Depending on the didactic offer of the units	Lecture Tutorials	Credit grade, colloquium
Physical Education Class	Physical education class	Has knowledge of the principles of health promotion, Has knowledge of human physical development, health and the principles of his hardening Has the ability to work in a team Is able to use various forms of activity promoting a healthy lifestyle Is aware of continuous training in its various aspects, including the care of its own efficiency	Viewing methods (demonstration with explanation, film, cinograms) Verbal methods (description, explanation, explanation) Methods of teaching movement: analytical, synthetic and global Methods of teaching technique in sports games: repetitive,	The condition of passing the course is: attendance at all classes (in the case of excused absence they must be completed at another time by the end of the semester), a positive assessment of the motor skills test, a positive assessment of the teacher. **Criteria for passing physical education** The attitude and activity of the student during classes is manifested in: 1 / willingness and commitment to performed exercises during classes

		Is able to support communities in the field of health promotion and their physical activity	Methods used to shape motor skills: Eniowa repetitive, low and medium loads, • peripheral, • peripheral - station, Forms of exercise: - team - frontal - individual Forms of teaching sport games: • tight, • game fragments, • school game, • proper game.	2 / attitude towards students - help, kindness, no aggression 3 / help in organizing accessories, places - positions for exercise, 4 / encouraging others to move, 5 / interest in developing own fitness, 6 / applying the rules of personal hygiene, 7 / inventory during classes, 8 / participation in the organization of sporting events - recreational, 9 / participation in selected sport sections KU AZS CM UMK, 10 / representing universities in the inter-university sports competition system (MP UM, AMP)
Internships				
Diploma project and/ or diploma examination				

Internships	
Duration of internships	The total number of internships for pharmacy students is 1,280 hours and includes: 160 hours summer internship after the third year of studies, 160 hours summer internship after the 4th year of studies and 960 hours internship after preparing the diploma thesis.
Form of internships	After the third year of studies, the student completes a one-month (160 hours) internship in a community pharmacy. After the fourth year of studies, the student completes a one-month (160-hour) internship in a hospital pharmacy. The student may complete part of this internship (not exceeding 80 hours) in enterprises from the pharmaceutical industry, drug control laboratories, sanitary-epidemiological stations, or hospital departments. After passing the fifth year of studies, the student completes a six-month internship in a generally accessible pharmacy, with the option of completing part not exceeding three months in a hospital pharmacy.
Rules of internships	Professional internships are used to achieve selected learning outcomes according to the syllabus.

	The aim of the internship **after the third year of studies** is to familiarize the student with all work in a general pharmacy, i.e., its organization, professional and administrative activities, rooms, and equipment. During the internship, the student must carefully and regularly keep a practice diary and documentation of the activities performed, emphasizing work related to the recipe. The practice includes: − becoming familiar with the arrangement and purpose of individual sections of the pharmacy, methods of storing medicines and raw materials; − becoming familiar with computer programs used in the pharmacy and administrative activities such as ordering medicines, dressing materials, and keeping books (drugs, spirits, and psychotropic drugs). − reading prescriptions, checking doses for children, describing prescription drugs; − preparation of a minimum of 70 prescriptions and a detailed description of 30 different forms of medicines prepared prescription; − dispensation of medicines, information for patients, familiarization with medicinal products and devices medical. After completing the internship, the student is obliged to pass it in the form of a colloquium with the internship supervisor - an academic teacher who supervises teaching. The student takes the final test by presenting the internship log with the opinion of the internship director and confirmation of the internship. The aim of the internship **after the fourth year of studies** is to familiarize the student with the overall work in a hospital pharmacy, i.e., its organization, professional and administrative activities, rooms, and equipment. Only a Master of Pharmacy with a specialization in pharmacy/hospital pharmacy or with extensive professional experience can supervise the internship. During the internship, the student is obliged to carefully and regularly keep an internship diary and documentation of the activities performed. The practice includes: − becoming familiar with administrative activities, circulation of hospital prescriptions and purchasing procedures by the pharmacy of medicines, auxiliary substances and medical materials; − rules for supplying hospital wards with prescription drugs and finished products by the pharmacy medicinal products and medical devices; − getting acquainted with computer programs used in the hospital pharmacy; − making at least 20 prescription drugs, preparing drugs in aseptic conditions; − becoming familiar with the procedure, apparatus and equipment necessary to prepare drug solutions anticancer and parenteral nutrition; − participation in the preparation of department first aid kits;

	After completing the internship, the student is obliged to pass it in the form of a colloquium with the internship supervisor - an academic teacher who supervises teaching. The student takes the final test by presenting the internship log with the opinion of the internship director and confirmation of the internship. A **six-month internship in a pharmacy** is an integral part of the education process and enables the acquisition of skills in the field of: organizing work in a pharmacy, preparing, storing and dispensing prescription and pharmacy drugs and medicinal products, providing information about drugs, providing pharmaceutical care, applying the principles of professional ethics and applicable law. During the internship, the student is obliged to carefully and regularly keep an internship diary and documentation of the activities performed.

Detailed allocation of ECTS credits

Academic or artistic disciplines, to which learning outcomes refer:

	Artistic or academic discipline	**ECTS**	
		Number	**%**
1.	**Pharmaceutical sciences**	**360**	**100**

Course modules	**Course**	**No of ECTS credits**	**No of ECTS credits in the discipline:** *(enter names of disciplines)*****				**No of ECTS credits for elective courses**	**No of ECTS credits obtained by the student in classes conducted with direct contact with the teacher or tutor**	**No of ECTS credits obtained by the student as a result of: courses related to academic activity within a discipline or disciplines, to which the field of study is**
			Pharmaceutical sciences						
Course module A **Biomedical and humanistic basis of pharmacy**	Anatomy	3	3					1,44	0,80
	Biochemistry	7	7					4,0	4,0
	Biology and genetics	5	5					2,64	2,60

	Molecular biology	3	3					1,36	2,16
	Botany	9	9					4,8	4,2
	Physiology	5	5					2,88	2,72
	History of Philosophy	2	2					1,28	0,68
	Immunology	2	2					1,36	1,00
	Advanced first aid	2	2					1,72	0,44
	Microbiology	5	5					3,32	2,60
	Pathophysiology	5	5					3,00	2,76
	Psychology	1	1					0,72	0,76
	Sociology	1	1					0,68	0,56
Course module B **Physicochemical basis of pharmacy**	Biophysics	4	4					2.08	2,00
	Analytical chemistry	12	12					7,00	8,60
	Physical chemistry	7	7					3,68	4,00
	General and inorganic chemistry	14	14					5,52	7,32
	Organic chemistry	14	14					7,68	7,80
	Mathemathics	3	3					1,84	1,52
	Statistics	4	4					1,60	1,60

	Information technology	2	2					1,28	0
Course module C **Analysis, synthesis and technology of drugs**	Pharmaceutical biotechnology	2	2					1,40	1,08
	Medicinal chemistry	14	14					10,16	8,68
	Pharmacognosy	8	8					6,08	6,52
	Synthesis and technology of therapeutic agents	6	6					3,88	3,20
	Pharmaceutical technology	9	9					6,20	7,17
	Pharmaceutical technology II	9	9					3,70	6,23
	Pharmaceutical technology III	3	3					2,13	2,32
Course module D **Biopharmacy and drug effects**	Biopharmacy	3	3					2,13	1,80
	Bromatology	5	5					3,28	3,08
	Pharmacokinetics	3	3					1,56	1,80
	Pharmacology with pharmacodynamics	3	3					1,96	1,60
	Pharmacology with pharmacodynamics II	11	11					6,50	7,50
	Medicines of natural origin	2	2					1,28	1,60
	Toxicology	5	5					3,80	3,24
Course module E	Professional ethics	2	2					1,48	0,00

Pharmaceutical Practice	Clinical Pharmacy	3	3					1,84	2,0
	Practical pharmacy	4	4					3,00	3,12
	Pharmacoeconomics	3	3					1,50	1,73
	Farmakoepidemiologia	2	2					1,47	1,80
	Pharmacotherapy and drug information	4	4					3,28	1,68
	History of Pharmacy	1	1					0,70	0,37
	Pharmaceutical care	2	2					1,50	1,50
	Pharmaceutical Law	3	3					2,16	2,40
	Pharmaceutical propedeutics	2	2					0,96	1,2
	Foreign Language	10	10				10	6,08	2,0
	Latin Language	5	5					1,88	1,0
Course module F **Research methodology and master's seminar**	Master's Thesis Seminar	7	7				7	3,0	7,0
	Specialized exercises and research methodology	29	29				29	19,0	29,0
Course module G **Internships**	Practice in a community pharmacy	6	6				6	6	0,0
	Practice in a hospital pharmacy and in the pharmaceutical industry	6	6				6	6	0,0

	Six-month internship in a pharmacy	60	60				60	38,40	0,0
Others	Elements of occupational health and safety and ergonomics	0	0					0,0	0,0
	Library preparation	0	0					0,0	0,0
A group of subjects to choose from, e.g. general university classes not related to the field of study or classes offered in another field of study	Elective courses 1 year	5	5				5	5,0	5,0
	Elective courses 2 year	4	4				4	4,0	4,0
	Elective courses 3 year	3	3				3	3,0	3,0
	Elective courses 4 year	5	5				5	5,0	5,0
	Elective courses 5 year	1	1				1	1,0	1,0
Physical education	Physical activity	0	0					0,0	0,0
IN TOTAL		**360,0**	**360,0**				**136 37,78%**	**230,19 63,94%**	**186,74 51,87%**

Course modules	**Course**	**Programme content**
Course module A Biomedical and humanistic basis of pharmacy	Anatomy	The Anatomy course is designed to help students master the basic knowledge of anatomy and provides a basis for further study of other general courses and major courses. The course is divided into six sections (systems): musculoskeletal system, circulatory system, respiratory system, digestive system, urinary and sexual systems, nervous system.
	Biochemistry	The content of the course is to provide basic information on the properties and biosynthesis of biomolecules (proteins, nucleic acids, sugars, fats), energy derivation and storage, and the basics of cell metabolism regulation and molecular genetics.

	Biology and Genetics	Classes Biology and Genetics at the Pharmacy programme are implemented in the first semester and include 21 hours of lectures and 33 hours of laboratories. The course covers issues that allow students to understand the main problems of medicine in the 21st century and to master the theoretical basis for further studies in a medical field. The main objective Biology and Genetics at the Pharmacy programme is to prepare students for their future profession. Knowledge of the basics of the molecular functioning of the organism, genetics, molecular biology and the action of antiparasitic drugs is essential in everyday professional practice. The subject course, together with other basic sciences, provides a foundation on which the student can build his/her further knowledge and improve practical skills.
	Molecular Biology	The aim of the Molecular Biology course is to familiarise students with the basic knowledge of the structure of the human genome and methods of nucleic acid analysis. The programme includes lectures and seminars to familiarise students with the basics of classical, population and molecular genetics .
	Botany	Botany includes knowledge of cytology, histology, organography and systematics of medicinal plants. of Botany is taught in lectures, laboratories, tutorials and field classes. Issues of anatomical and morphological structure of plants are used in further studies when studying pharmacognosy and drug formulation technology.
	Physiology	Physiology course enables the student to learn the basic concepts and understand the processes that regulate the functioning of individual organs as well as systems. In addition, it allows the student to understand the interrelationships between the various elements of the human body.
	History of Philosophy	The content of the course focuses on the fundamental philosophical issues and concepts that have shaped Western culture. It also discusses the philosophical concepts and stances that have had a significant impact on the development of scientific medicine.
	Immunology	The aim of the course is to familiarise students with the structure and functions of the human immune system, with particular emphasis on the basic mechanisms of the immune response. Students will learn about the proper functioning of defence mechanisms, as well as selected issues in immunopathology.
	Advanced First Aid	The subject of Advanced First Aid aims to teach the emergency response team how to deal with a medical emergency without the use of equipment or with the use of basic life-saving equipment and how to minimise the adverse effects before specialised medical assistance can be provided.
	Microbiology	Microbiology takes into account the characteristics of the natural microbiota of humans and their most common pathogens together with their morphology, biochemical properties, pathogenicity and antibiotic susceptibility. It includes lectures and laboratories to familiarise students with methods of identifying microorganisms and assessing their antibiotic susceptibility and mechanisms of antibiotic resistance, principles of aseptics, antisepsis and principles of working in a microbiological laboratory. In this course, students are introduced to the aetiology, epidemiology and diagnosis of selected systemic infections and methods of microbiological drug control.
	Pathophysiology	Pathophysiology is a pre-clinical science that explains the mechanisms of organismal dysfunction in various pathological states. It encompasses the detailed pathophysiology of cells, systems and

		organs, as well as issues relating to changes in the adaptive functions of the body, disorders of the body's regulatory mechanisms, metabolic disorders and the pathophysiology of cancer.
	Psychology	Basics of general psychology - a course which aims to introduce students to basic issues in psychology. The content of the classes is related to issues covered in psychology and psychiatry. It is advisable for students starting their education within this course to have a general, intuitive knowledge of psychological processes and basic concepts from the field of psychology.
	Sociology	The aim of the tutorials is to familiarise the student with the social causes and consequences of illness and disability. The student will learn about the psychosocial problems of the patient and his/her social environment. The aim of the classes is to prepare the student to take into account social factors in everyday practice of a pharmacist.
Course module B **Physicochemical basis of Pharmacy**	Biophysics	Introduction of the physical fundamentals describing the functioning of the body, identify the effects of the environment on the human body and learn the principles of medical diagnosis and therapy.
	Analytical Chemistry	Analytical Chemistry is the science of measurement and encompasses methods used in many fields of science, including medicine and pharmacy. The course Analytical Chemistry consists of lectures, tutorials (laboratory and auditorium) and seminars designed to familiarise students with methods for the detection, identification and determination of the content of components in a test sample, with particular emphasis on their applicability to quality control of medicinal products in the pharmaceutical industry. Mastery of Analytical Chemistry forms the basis for subjects taken in subsequent semesters, such as drug chemistry, drug formulation technology, biopharmaceutics.
	Physical Chemistry	Physical Chemistry classes in the Pharmacy programme are implemented in the third semester. The course comprises 30 hours of lectures, 60 hours of laboratories and 15 hours of seminars. Physical Chemistry covers macroscopic, atomic, subatomic and intermolecular phenomena in chemical and biochemical systems taking into account the laws and concepts of physic. The progressively familiarised rules formulated by physical chemistry, with their interrelation and quantitative presentation, form the basis for introducing the student to chemical apparatus analysis and all laboratory methods used in the synthesis and identity studies of active substances in drugs and plant raw materials. In addition, the mastery of the issues implemented in the Physical Chemistry course at the Pharmacy programme constitutes the basis for the courses implemented in the following semesters, such as: Medicinal Chemistry, Drug Form Technology, Pharmacology, Biopharmacy, and prepares students for independent work in an analytical laboratory. This course, together with other basic sciences, forms the foundation on which the student should build his/her further knowledge and improve cognitive-practical skills.
	General and Inorganic Chemistry	The course General and Inorganic Chemistry consists of lectures, laboratory exercises and seminars. Classes in the course are designed to familiarise the student with general chemistry and prepare him/her for laboratory work. Mastery of general and inorganic chemistry provides a foundation for the study of more complex chemical, biochemical and technological issues implemented in the

		higher semesters in the following courses: analytical chemistry, physical chemistry, biochemistry, drug chemistry and drug formulation technology.
	Organic Chemistry	The aim of Organic Chemistry course is to familiarise the student with organic chemistry issues related to the nomenclature, structure and reactions of organic compounds with a focus on drug structure. Acquire practical skills related to the synthesis and purity assessment of organic compounds. Assimilation of organic chemistry issues forms the basis for subjects taken in subsequent years, such as drug chemistry, drug formulation technology and pharmacology.
	Mathemathics	This course aims to familiarise students with the basic mathematical methods used in pharmacy based on differential and integral calculus.
	Statistics	Lectures in the Statistics course are designed to familiarise students with the elements of probability calculus, descriptive statistics and statistical inference. Tutorials in Statistics are designed to acquire practical skills in probability determination, analysis of distributions of continuous and discrete random variables, parameters of descriptive statistics and formulation of statistical hypotheses.
	Information Technology	This course is intended to familiarise students with the basic publicly available IT tools used for data analysis, presentation and visualisation; text formatting techniques used in the editing of large documents.
Course module C **Analysis, Synthesis and Technology of Drugs**	Pharmaceutical Biotechnology	The Pharmaceutical Biotechnology course addresses the detailed characterisation of the subject of cell lines and their division into primary and secondary, adherent and suspension etc. It tackles the basic activities performed in the field of cell lines, the design of experiments using cultures and the possibilities of their use in pharmacy. The course includes lectures and laboratories to familiarise students with the problems and hopes of using advanced cell culture techniques. During the course, students are introduced to the methods used in culture: trypsinization, passaging, freezing and thawing of cells in established lines, basics of drug cytotoxicity assays.
	Medicinal Chemistry	The aim of Medicinal Chemistry course is to discuss and teach the student the basic drugs used in pharmacotherapy and presented in the anatomical-therapeutic-chemical (ATC) system, taking into account international nomenclature and synonymous names. The medicines discussed have applications in disorders of the central and peripheral nervous system, vascular and cardiac systems, respiratory, gastrointestinal and excretory systems, hormone therapy, neoplastic disorders and those acting on pathogenic microorganisms. Medicinal Chemistry also addresses the relationship between chemical structure and drug action, and therefore issues relating to the therapeutic utility of drugs are discussed, mainly in terms of their biochemical mechanism of action, routes of administration, distribution in the body, biotransformation and resulting adverse and toxic effects. The didactic material also discusses basic issues in radiopharmacy.
	Pharmacognosy	General knowledge, basic definitions (raw material/plant substance, active compounds) synergism, antagonism, variation factors, origin, principles of raw material collection, methods of identity testing, standardisation, types of plant medicines, preparation methods, groups of compounds belonging to primary metabolites (carbohydrates, fats: oils, proteins: enzymes) and secondary (phenolic compounds, phenylpropanoids, coumarins, tannins, flavonoids, anthocyanins, quinones,

		terpenes, bitters, alkaloids, essential oils), determining the biological and pharmacological activity of plant raw materials, also at the molecular level, action and use of raw materials. Knowledge of side effects, toxicity, possible side effects, interactions of plant raw materials with plant and synthetic drugs, potential for addiction when used as a stimulant. Use of plant raw materials for purposes other than medicinal and prophylactic (cosmetic, food).
	Synthesis and Technology of Therapeutic Agents	The course subject includes learning and understanding of methods of searching for biologically active compounds, methods of obtaining selected therapeutic agents, synthesis of radiopharmaceuticals and their applications in therapeutics and diagnostics, as well as operation and application of biosensors. It also includes an introduction to the principles of patenting and the pharmaceutical industry in Poland and worldwide, problems of drug polyformism and physical operations and unit chemical processes used in the production of active pharmaceutical substances (APIs).
	Pharmaceutical Technology	Drug Form Technology is the science of methods of manufacturing and quality control of different drug forms. Drug Formulation Technology includes laboratories, and practical laboratory classes to familiarise students with the methods of manufacturing prescription drug forms and their requirements, particularly pharmacopoeial ones. Mastery of issues in Drug Formulation Technology forms the basis for the professional work of a pharmacist.
	Pharmaceutical Technology II	The course aims to familiarise students with industrial drug preparation - forms of industrially prepared drugs, unit technological processes, requirements, methods, technology, technological problems, control.
	Pharmaceutical Technology III	This course aims to familiarise students with modern and semi-solid drug forms and the excipients used in their manufacture.
Course module D **Biopharmacy and Drug effects**	Biopharmacy	Biopharmacy is a course designed to familiarise pharmacy students with the factors affecting the bioavailability of a medicinal substance administered as a pharmaceutical preparation.
	Bromatology	The course aims to provide the student with knowledge and understanding of the methods of studying the influence of food and nutrition on human health and on the selection, course and evaluation of the effects of pharmacotherapy in a human being. It also familiarises the student with the achievements of bromatology in the field of modern methods of prevention of diet-related civilisation diseases, especially in the context of optimisation of procedures, measures and costs of pharmacotherapy, and ways of identification of environmental hazards affecting the production of foodstuffs, as well as shaping pro-healthy dietary behaviours among the population contributing to the reduction of social costs of pharmacotherapy.
	Pharmacokinetics	Pharmacokinetics is the science dealing with the numerical description of changes in the amount (concentrations) of a medicinal agent in the blood, tissues, organs, as well as the amount metabolised and excreted over time.
	Pharmacology with Pharmacodynamics	In this course, students will learn about the processes of drug administration, distribution, absorption, metabolism and elimination. Students will gain knowledge of the basic mechanisms of

		therapeutic action as well as side effects of the drug, various types of interactions and learn what methods are used in drug testing; the majority of the tutorials will be devoted to various groups of antimicrobial drugs: including antibiotics, sulfonamides, quinolones.
	Pharmacology with Pharmacodynamics II	In this course, students will learn about the basic groups of drugs, their mechanisms of action, dosage, drug-drug interactions, drug-food interactions, and adverse effects accompanying therapy. Lectures will mainly focus on the pharmacological treatment of diseases related to the functioning of the nervous system, as this topic requires an in-depth explanation of the mechanisms by the lecturer. Tutorials will additionally cover drug groups used in infectious diseases, drugs acting through the receptors of the sympathetic and parasympathetic systems, drugs affecting smooth and skeletal muscles, non-steroidal anti-inflammatory drugs. Teaching emphasis will be on widely available over-the-counter (OTC) drugs, interactions between multiple prescription drugs and between prescription and OTC drugs. Laboratories will provide an understanding of the mechanisms of drug-protein and drug-drug interactions, drug and pro-drug metabolism, first-pass effects, the impact of a drug on overall changes in the body (metabolomics), and learning about new directions in pharmacology, i.e. reducing the side effects of chemotherapy and using drugs routinely used to treat a given disease entity as indicators of organ function.
	Medicines of Natural Origin	The course covers the principles of using medicines of natural origin (mainly herbal) in the prevention and treatment of various diseases due to their effects. The skills acquired in the course are indispensable for professional work in the distribution of products admitted to the pharmacy. Dispensing over-the-counter preparations of numerous herbal preparations requires advice from the pharmacist on the efficacy and safety of the drug.
	Toxicology	The aim of Toxicology course is to equip the student with knowledge of basic toxicological concepts, mechanisms of toxic action of xenobiotics and health hazards (acute and chronic poisoning, remote effects) posed by chemical substances. Particular attention is paid to the toxicity of therapeutic agents, and in particular to drugs, which are the most common cause of poisoning and addiction. In addition, issues concerning the interaction of toxic substances with drugs and the role of systemic metabolic systems, mainly microsomal enzymes, in the biotransformation of chemicals and the influence of these processes on the toxic effects of xenobiotics are presented. Students will learn about health and safety rules for working with toxic substances and biological material and how to provide first aid to poisoned persons, including the correct choice of antidotes and methods for assessing exposure to toxic substances.
Course module E **Pharmaceutical Practice**	Professional Ethics	In the Professional Ethics course the student is introduced to the basic concepts of general and professional ethics. He/she learns to recognise ethical problems that arise from the process of medicalisation and pharmaceuticalisation of social life. He/she learns to recognise ethical dilemmas arising from the marketing activities of pharmaceutical companies, becomes acquainted with current problems of bioethics, acquires the ability to think critically and the readiness to analyse moral dilemmas arising from the professional role of a pharmacist and acquires awareness of the obligations arising from the Code of Ethics of Pharmacists of the Republic of Poland.

	Clinical Pharmacy	The Clinical Pharmacy course extends students' knowledge gained in previous years on the mechanism of action and side effects of drugs and easier treatment regimen with different types of drugs.
	Practical pharmacy	The course is designed to prepare students for professional practice in a pharmacy as magister farmacji. To familiarise students with issues concerning the circulation of medicines, types of prescriptions, principles of their issuance, execution, control and recording, types of payment, and to prepare them thoroughly to apply this knowledge in practice. It aims to teach the use of various pharmacy computer programmes, impart knowledge related to the principles of operation of medical devices and diagnostic tests available in the pharmacy and teach how to educate the patient on their use.
	Pharmacoeconomics	The course aims to familiarise the student with the state's drug policy, basic methods of pharmacoeconomic analysis in the context of rationalisation of pharmacotherapy costs, to impart knowledge on the economic basis of pharmacy and pharmaceutical wholesaler operation and the principles of marketing in pharmacy.
	Pharmacoepidemiology	The course covers the concepts of health and illness and how to estimate health indicators. It aims to develop the ability to recognise health risk states, present the methodology of epidemiological studies and the methodology of results evaluation and risk estimation, present the role and tasks of epidemiological surveillance in preventing the spread of infectious diseases, present the epidemiological risks resulting from existing civilisation diseases. It covers safety in the use of medicines, as well as pharmacovigilance - monitoring adverse drug reactions. It presents of the role of pharmacists in monitoring the use of medicines in the population and principles of good clinical practice in drug testing.
	Pharmacotherapy and Drug Information	Pharmacotherapy and drug information is one of the leading courses in the Pharmacy programme. The course extends the knowledge acquired in previous years on the mechanisms of action and side effects of drugs and allows students to understand treatment regimens with individual drugs. Due to the complexity of the issues, students make use of the knowledge gained in other courses, i.e. Physiology, Biochemistry, Biology and others. Active participation in tutorials allows for discussion of a given topic, especially issues related to the mechanisms of drug action and the occurrence of drug resistance, which are the subject of continuous research and require updating of knowledge on the basis of scientific publications. The topics covered are mainly clinical issues, which are the most important problems from the point of view of civilisation diseases (cancer, cardiovascular diseases, diabetes).
	History of Pharmacy	The History of Pharmacy course addresses ten issues related to the formation and development of pharmacy (proto-pharmacy) from the earliest civilisations (c. 3000 - 2500 BC) to the early 20th century AD.
	Pharmaceutical Care	The concept of pharmaceutical care and practical aspects of providing pharmaceutical care in the conditions of the Polish health system.

	Pharmaceutical Law	The course aims to familiarise the student with the role and function of the law in the field of public health, to impart knowledge concerning legal acts in pharmacy, to act in an environment of respect and observance of the law and to act in the spirit of protection of intellectual property in pharmacy.
	Pharmaceutical Propedeutics	Introduction of the student to the subject matter of the studies they have undertaken and familiarisation with job opportunities after graduation.
	Foreign Language	Programme content dependent on the student's choice of course.
	Latin Language	The aim of the course is to: - to develop the linguistic proficiency to understand Latin texts, especially prescriptions, and to use professional terms; - to master the basics of grammar and vocabulary needed in pharmaceutical and medical sciences.
Course module F **Research Methodology and Master's Seminar**	Master's Thesis Seminar	The aim of the tutorials is to critically examine the results of the measurements made during the experimental part of the thesis.
	Specialized Tutorials and Research Methodology	The aim of the tutorials is to critically examine the results of the measurements made during the experimental part of the thesis.
Course module G **Work Placements**	Work Placement in a Community Pharmacy	Practical preparation for working in a community pharmacy. Organisation of pharmacy work, dispensing, formulation.
	Work Placement in a Hospital Pharmacy and in the Pharmaceutical Industry	Practical preparation for work in hospital pharmacy. Principles and requirements for work organisation, professional activities.
	Six-month Internship in a Pharmacy	Practical preparation for work in community and hospital pharmacy. Organisation of pharmacy work, dispensing, formulation.
Others	Elements of Occupational Health and Safety and Ergonomics	Within the framework of the education provided, topics in the field of popularisation of labour protection issues are addressed in accordance with human psycho-physical capabilities and the objectives of the University's activities in this field.
	Library Orientation	This class aims to familiarise the student with the Medical Library, its collections, databases and to present practical ways of using the sources.
A group of subjects to choose from, e.g. general university classes not related to the field of study or classes offered in another field of study		Curriculum content depending on the student's choice of course.
Physical Education		Curriculum content depending on the student's choice of discipline.