SPECIALTY "MEDICAL CHEMISTRY"

I. ANNOTATION

Graduates of the Bachelor's program in "Medicinal Chemistry" receive in-depth theoretical training and solid practical skills that meet European standards and requirements.

Students who have graduated from the specialty "Medicinal Chemistry" have good opportunities for employment in laboratories of pharmaceutical companies, clinical laboratories, laboratories for the creation of new drugs, analysis and control laboratories, doping laboratories, as well as opportunities for successful continuation of education at higher levels (master's and doctoral) in Bulgaria and abroad.

II.QUALIFICATION STANDARD

II.1. Field and scope of knowledge

The training of the future Bachelor of Medical Chemistry is aimed at the formation of intellectual-cognitive, motivational-value and practical-action competencies.

Graduates of the educational and qualification degree "Bachelor", specialty "Medical Chemistry", must possess general knowledge of:

• the basics of linear algebra and geometry, mathematical analysis and higher mathematics, as well as the possibilities for their application in solving chemical problems;

• the theoretical foundations of physics and its integrative connections with chemistry;

• the theoretical foundations of the main directions in chemistry (inorganic chemistry, organic chemistry, analytical chemistry, physical chemistry, biochemistry);

• the theories explaining the structure of substances and the mechanisms of chemical transformations.

• Practical habits and skills for laboratory work with analytical instruments.

Graduates of the educational and qualification degree "Bachelor", specialty Medical Chemistry, must possess specific knowledge of:

• the chemistry of drugs and the mechanisms of their action, general pharmacology and drug toxicology, the biochemistry of nutrition and health;

• instrumental methods for analysis, control and organization in pharmaceutical production laboratories, clinical and doping laboratories, as well as the principles of health management.

II.2. Area and scope of skills

Graduates of the specialty "Medicinal Chemistry" must possess skills for:

• applying the acquired theoretical knowledge in fundamental disciplines when solving specific practical tasks;

• planning, organizing and conducting experimental activities;

• working with scientific literature and other sources of information;

II. 3. Competencies

II.3.1. Personal competencies

• to have motivation for realization in the field of the chosen specialty
• to assess the social significance of the profession and the prospects for its development;
• to solve problems common to different types of professional activity (search and analysis of information, decision-making, organization of joint activities, etc.);
• to have skills for teamwork, readiness for cooperation, ability to resolve conflicts and social adaptation;
• to have the ability for written and oral communication and a high culture of communication;
• to master the basic methods of searching, finding and processing information and skills for working with a computer as a means of information management;
• to have skills for working on the Internet.

II.3.2. Professional competencies

In their direct professional activity, graduates of the specialty "Medicinal Chemistry" must be able to:
• apply the acquired theoretical knowledge in specific practical situations related to the need to make independent decisions;
• use in their practical activity the basic laws of general chemistry, the laws of chemical thermodynamics and kinetics, methods for the synthesis of biologically active substances and drugs and methods for the purification of substances;
• apply analytical and spectral methods for the study of drugs;
• work with modern equipment;
• conduct experimental studies according to a given methodology;
• process (interpret) the results of experimental activity;
• analyze and evaluate their own work;

III. Content of the curriculum

№	NAME OF THE COURSE	Evaluation		CREDIT	Classroom employment				Extracurricular activities / hours /
		semester	form		total	lectures	seminars	exercises	
	I. COMPULSORY COURSES								
1.	Human anatomy	I	exam	3	30	20		10	60
2.	General and inorganic chemistry –part I	I	exam	15	150	45		105	300
3.	Mathematics	I	exam	9,5	75	45	30		210
4.	Specialized foreign language – part I	I	o.e.	2,5	30		30		45
5.	Sport	I			30			30	90
	TOTAL :			**30**	**315**	**110**	**60**	**145**	**705**
6.	General and inorganic chemistry –part II	II	exam	15	150	60		90	300
7.	Physics	II	exam	10,5	75	45		30	240
8.	General microbiology	II	exam	2	30	25		5	30
9.	Specialized foreign language – part II	II	exam	2,5	30		30		45
10.	Sport	II	o.e.		30			30	90
	TOTAL :			**30**	**315**	**130**	**30**	**155**	**705**
11.	Bioinorganic chemistry	III	exam	7	75	45		30	135
12.	Organic chemistry – part I	III	exam	15	180	75		105	270
13.	Physical chemistry – part I	III	exam	8	90	45		45	150

	TOTAL :			**30**	**345**	**165**		**180**	**555**
14.	Physical chemistry – part II	IV	exam	9	90	45		45	180
15.	Organic chemistry – part II	IV	exam	16	180	75		105	300
16.	Structure of mather	IV	exam	5	45	30		15	105
	TOTAL :			**30**	**315**	**150**		**165**	**585**
17.	Analytical chemistry – part I	V	exam	14	120	45		75	300
18.	Bioorganic chemistry	V	exam	5	60	30		30	90
19.	Biophysicochemistry	V	exam	6	60	30		30	120
20.	Elective course 1 (from the first group)	V	exam	5	45	30		15	105
	TOTAL :			**30**	**285**	**135**		**150**	**615**
21.	Analytical chemistry – part II	VI	exam	12	135	45		90	225
22.	Introduction to instrumental analysis	VI	exam	9	60	45		15	210
23.	Molecular spectroscopy	VI	exam	6	45	30		15	135
24.	Research practice	VI	o.e.	3	15			15	75
	TOTAL :			**30**	**255**	**120**		**135**	**645**
25.	Biochemistry	VII	exam	8	60	30		30	180
26.	Chromatographic methods	VII	exam	5	45	30		15	105
27.	Quantitative dependencies chemical structure-biological action (QSAR)	VII	exam	7	60	45	15		150
28.	Elective course 2 (from the second group)	VII	exam	5	45	30		15	105
29.	Elective course 3 (from the third group)	VII	exam	5	45	30		15	105
	TOTAL :			**30**	**255**	**165**	**15**	**75**	**645**
30.	Chemistry of drugs	VIII	exam	7	60	45		15	150

31.	Clinical workshop	VIII	exam	3	45		45		45
32.	Elective course 4 (from the fourth group)	VIII	exam	5	45	30		15	105
33.	Elective course 5 (from the fifth group)	VIII	exam	5	45	30		15	105
34.	Written state exam or diploma thesis defense	VIII		10					300
	TOTAL :			**30**	**195**	**105**	**45**	**45**	**705**
	TOTAL (hours of compulsory and elective subjects - without classroom employment in sports)			**240**	**2220**	**1065**	**150**	**990**	**4980**
	TOTAL (hours of the obligatory and elective disciplines - with classroom employment in sports)			**240**	**2280**	**1065**	**150**	**1050**	**5160**
	II. ELECTIVE COURSES (by groups)								
	First group	V	exam	5	45	30		15	105
1.	Bioelectrochemical systems								
2.	Food additives								
3.	Ecological chemistry								
4.	Elements and compounds in plants and soils								
5.	STEM technology tools in the chemistry lab								
	Total number of credits and number of disciplines chosen by the first group	**V**	**exam**	**5**	**45**	**30**		**15**	**105**
	Second group	VII	exam	5	45	30		15	105
1.	Chemistry of enzymes								
2.	Biometrics								
3.	Chemical analysis in criminology								

	Total number of credits and number of courses in the disciplines chosen by the second group	**VII**	**exam**	**5**	**45**	**30**		**15**	**105**
	Third group	VII	exam	5	45	30		15	105
1.	Modeling of natural and synthetic biologically active substances								
2.	Hormones and neurotransmitters								
3.	Dangerous environmental pollutants								
	Total number of credits and number of subjects chosen by the third group	**VII**	**exam**	**5**	**45**	**30**		**15**	**105**
	Fourth group	VIII	exam	5	45	30		15	105
1.	Toxicochemistry								
2.	Doping agents and control								
3.	Biopolymers								
4.	Steroids								
	Total number of credits and hours of the disciplines chosen by the fourth group	**VIII**	**exam**	**5**	**45**	**30**		**15**	**105**
	Fifth group	VIII	exam	5	45	30		15	105
1.	Drug technology								
2.	Application of biotechnologies for the production of drugs								
3.	Fundamentals of cosmetic chemistry								
4.	Cytology								
	Total number of credits and hours of the disciplines chosen by the fifth group	**VIII**	**exam**	**5**	**45**	**30**		**15**	**105**

	Total number of credits and number of disciplines to be chosen			**25**	**225**	**150**		**75**	**525**
	III. OPTIONAL COURSES								
1.	Introduction to inorganic chemistry	I	**exam**	**2.0**	30				30
2.	Introduction to organic chemistry	II	**exam**	**2.0**	30				30
	Note: Each student can optionally study any discipline (compulsory or elective) in other specialties in which the University conducts training in existing courses and groups, with hours up to 10% of the total number of hours.								

IV. GRADUATION

The training ends with a written state exam or defense of a thesis.

Notes to the curriculum:

1. The forms of control over the success of students (current and final) are described in the curricula.

2. The curriculum is structured in three blocks - mandatory, elective and optional subjects. Elective subjects are separated into groups.

3. The list of elective subjects can be updated upon proposal of the Department Council, approved by the Faculty Council and ratified by the Academic Council.

4. The workload of students in "Sport" for the entire period of study is 60 hours of classroom work and 180 hours of extracurricular work (independent sports activities).

5. If the student chooses to complete his studies with a thesis, he may receive a topic for development after the VI semester, provided that he has an average grade of his studies to date of no less than good (4.00) and a grade of very good (4.50) in the field in which the thesis will be developed. An exception can be made only for students who have participated with their own developments in scientific forums. The assignment of a topic and the determination of the scientific supervisor are made by decision of the Department Council.

6. If desired, students may, for a fee, obtain the professional qualification "Chemistry Teacher", fulfilling the obligations arising from the curriculum for parallel training accompanying the present one.

ANNOTATIONS OF MANDATORY COURSES

GENERAL AND INORGANIC CHEMISTRY PART I

Semester: I

Type of course: lectures, laboratory exercises.

Hours per week: 3 hours of lectures, 7 hours of exercises

ECTS credits: 15

Lecturers: Assoc. Prof. Elitsa Chorbadzhiyska, PhD, Assist. Prof. Boyka Stoykova, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The course includes the study of the main issues of general chemistry such as: structure of the electron shell, atomic nucleus, periodic law and periodic table of elements, structure of molecules, structure of complex compounds, intermolecular interactions, chemical bonding in solids, valence of chemical elements, basic concepts in thermodynamics, chemical kinetics, chemical equilibrium, adsorption, catalysis, phase rule, physicochemical analysis, solubility of substances, theory of dilute solutions, electrolyte solutions, colloidal solutions, electrochemical processes and corrosion of metals.

Laboratory exercises further develop the lecture material through chemical experiments.

Course Aims: The objectives of the General and Inorganic Chemistry Part I program are:

1. Acquisition of chemical knowledge in general chemistry, based on knowledge related to the structure of matter, laws and regularities in nature.
2. Acquisition of dexterity and skills for conducting chemical experiments in a specialized chemical laboratory in inorganic chemistry.
3. Development of chemical thinking and independent work with chemical literature.

Teaching methods: lectures and exercises.

Assessment: written exam.

MATHEMATICS

Semester: I

Type of course: lectures, seminars

Hours per week: 3 hours of lectures

ECTS credits: 9.5

Teacher: Assoc. Prof. Ilinka Dimitrova, PhD, Assist. Prof. Boyana Garkova, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of " Mathematics and Physics "

Course Status: Mandatory

Short Description: The program is developed as an introduction to the main sections of higher mathematics and provides knowledge necessary for the study of modern theories in the field of chemistry and physics. It contains elements of: linear algebra - matrices, determinants, systems of linear equations and methods for solving them; analytical geometry – vectors, vector operations, linear dependence and linear independence of vectors, coordinates of vectors and points; mathematical analysis – functions of one real variable, limit of a function, derivative of a function, integral calculus; ordinary differential equations and probability theory.

Course Aims: After completing the course, students should be able to freely use basic mathematical concepts, apply theoretical knowledge to solve specific mathematical, chemical and physical problems.

Teaching methods: Lectures, seminars, consultations, homework, control tests.

Assessment: written exam

SPECIALIZED FOREIGN LANGUAGE - PART I

Semester: I

Type of course: seminars.

Hours per week: 2 hours of seminars.

ECTS credits: 2.5

Lecturers: Assoc. Prof. Radoslav Chayrov, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The training in the course includes the study of:

- specialized literature on chemistry;
- a short English grammar.

Course Aims: Students should become familiar with specialized terminology in the field of chemistry and related fields. To acquire knowledge of working with specialized texts, to be able to apply their knowledge and skills when working on projects where good language preparation is required.

Teaching methods: exercises.

Assessment: three current tests and a written exam.

SPORT

Semester: I, II

Type of course: exercises.

Hours per week: 2 hours of exercises.

ECTS credits: 0.0

Department: Department: South-West University “Neofit Rilski”, FPHHS, Department of “ Sports and Kinesitherapy”

Course Status: Mandatory

Short Description: Classes in the discipline "Sport" are intended for first-year students of the specialty "Medicinal Chemistry".

To satisfy sports interests and depending on the available base and available teachers, the following sports are offered:

1. Athletics;
2. Tourism;
3. Gymnastics;
4. Sports games;
5. Swimming - football;
6. Skiing - volleyball;
7. Tennis - basketball;
8. Table tennis - handball;
9. Fitness;
10. Therapeutic physical education;
11. Combat sports;
12. Sports improvement by type of sport.

The program mainly includes problems related to the mastered technique of the selected type of sport, some individual and group tactical actions necessary for its application, the competition rules, as well as work to improve
physical fitness.

Course Aims: The proposed sports are rich in content, the mastery of which will contribute and support the improvement of basic physical qualities, improvement of respiratory and cardiac activity, the nervous system, etc. The development of qualities and habits specific to the given type of sport will also be supported. Therefore, sports activities can be successfully used for recovery after various illnesses, i.e. they also have a healing effect. Last but not least, one should also take into account the great aesthetic impact of sports, associated with the harmonious development of the body, the beauty of movements, etc.

Teaching methods: exercises

Assessment: current assessment

GENERAL AND INORGANIC CHEMISTRY PART II

Semester: II

Type of course: lectures, laboratory exercises.

Hours per week: 4 hours of lectures, 6 hours of exercises

ECTS credits: 15

Lecturers: Assoc. Prof. Elitsa Chorbadzhiyska, PhD, Assist. Prof. Boyka Stoykova, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The curriculum for the course General and Inorganic Chemistry Part II includes lectures and laboratory exercises in the chemistry of the elements and their compounds.

The lecture material is divided into sections: distribution of chemical elements, hydrogen, water, hydrogen peroxide, chemical elements and their compounds from the first to the eighth main group and the corresponding subgroups of the periodic system. The sections cover: place of the chemical element in the periodic system and regularities in its structure and properties in the corresponding group and period, main features of the elements, chemical elements around us, compounds of chemical elements, electronic properties, physical properties of substances, crystallography, nuclear properties, biological action, application.

The laboratory exercises illustrate the lecture material through a chemical experiment in the chemistry of the elements and their compounds, including: physical and chemical properties,

basic methods for obtaining chemical substances and simple compounds in the individual groups of the periodic system.

Course Aims:

1. Obtaining a broad-based preparation in inorganic chemistry of elements and their compounds. for a bachelor's degree in the specialty of Medical Chemistry.
2. Formation of analytical thinking related to the regularities in the properties of elements and their compounds depending on the structure and place in the periodic system.
3. Obtaining specific knowledge about individual chemical elements, their compounds and their applications.

Teaching methods: lectures and exercises.

Assessment: written exam.

PHYSICS

Semester: II

Type of course: lectures, seminars

Hours per week: 3 hours of lectures, 2 hours of seminars

ECTS credits: 10.5

Lecturers: Assoc. Prof. Lyuben Ivanov, PhD, Assist. Prof. Pavel Chorbadzhiyski

Department: South-West University “Neofit Rilski”, FMNS, Department of “Mathematics and Physics”

Course Status: Mandatory

Short Description: The course “Physics” is mandatory for the specialty and has the task of providing basic knowledge in the field of experimental physics and creating a foundation for mastering the material taught in the main physical and chemical disciplines in the above courses.

Course Aims: The first part of the course examines the issues of kinematics and dynamics of a material point in inertial and non-inertial reference frames. The laws of conservation of energy and momentum, mechanics of an absolutely rigid body, mechanical oscillations and waves are discussed. The course also includes issues of fluid mechanics. The second part studies electrical and magnetic phenomena. When considering electrical phenomena, the electric field and Coulomb's law, electric dipole, dielectrics and conductors in an electric field are discussed. The part examining magnetic phenomena includes the magnetic field of a

moving charge and the Biot-Savart-Laplace law, Lorentz force, and Ampere's law. Practical classes enable students to experimentally investigate the basic physical phenomena and their application.

Teaching methods: lectures and exercises

Assessment: written exam

GENERAL MICROBIOLOGY

Semester: II

Type of course: lectures

Hours per week: 1.66 hours of lectures, 0.33 hours of exercises per week

ECTS credits: 2

Lecturers: Prof. Emilia Varadinova, PhD

Department: South-West University “Neofit Rilski”, FMNS, Department of “Geography, ecology and environmental protection”

Course Status: Mandatory

Short Description: The course "General Microbiology" examines basic concepts, concepts and research methods in microbiology as one of the leading biological sciences. During the training, emphasis is placed on the structural organization, physiology and biochemistry of the prokaryotic cell and eukaryotic microorganisms. Attention is paid to the forms of genetic exchange in bacteria and their variability. A place is given to the distribution of microorganisms in the environment and their role in the transformation of substances in nature, the ecology of microorganisms and the forms of relationships between them and other living organisms.

Course Aims: The aim of the course is to form in students knowledge and skills about the structure, functioning, systematics and ecology of biological microsystems and the possibilities for their practical application.

Teaching methods: lectures and exercises

Assessment: Current control and written final exam

SPECIALIZED FOREIGN LANGUAGE - PART II

Semester: II

Type of course: seminars

Hours per week: 2 hours of seminars

ECTS credits: 2.5

Lecturers: Assoc. Prof. Radoslav Chayrov, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The training in the course includes studying:

- Chemistry lessons in English;
- Specialized computer tests;
- Audio-visual system.

Course Aims: Students enrich the knowledge acquired in the winter semester for working with specialized literature.

Teaching methods: exercises

Assessment: three ongoing tests and a written exam

BIOINORGANIC CHEMISTRY

Semester: III

Type of course: lectures, laboratory exercises

Hours per week: 3 hours of lectures, 2 hours of exercises

ECTS credits: 7

Lecturers: Assoc. Prof. Elitsa Chorbadzhiyska, PhD, Assist. Prof. Boyka Stoykova, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The curriculum for the discipline Bioinorganic Chemistry includes lectures and laboratory exercises related to studying the role of metals and their compounds in biological processes in living organisms and in the environment at the molecular level. The program is a sequential development of the program for General and Inorganic Chemistry II, focusing on the preparation of chemical elements of varying purity and the inorganic synthesis of their compounds. The lecture material is divided into the following sections: Studying the interaction of metals (mainly biometals) with bioligands at the molecular level; Modeling biological and biochemical processes; Using the results of medicine: diagnosing

diseases, creating new drugs and establishing the mechanism of their action; Application in environmental protection, in agricultural technologies.

Course Aims: Obtaining a broad-profile preparation in bioinorganic chemistry aimed at studying the role of chemical elements in the emergence and development of physiological and pathological processes in the living organism.

Teaching methods: lectures and exercises

Assessment: written exam

ORGANIC CHEMISTRY PART I

Semester: III

Type of course: lectures and exercises

Hours per week: 5 hours of lectures and 7 hours of exercises

ECTS credits: 15

Lecturers: Assoc. Prof. Maya Chochkova, PhD, Assist. Prof. Kiril Chuchkov, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: Organic Chemistry Part I examines the basic theoretical concepts of the structure of molecules and ways to evaluate their properties based on the distribution of electron density in them. Types of reactions and reaction mechanisms, types of reagents through which compounds pass in the course of organic reactions. An idea of the Stereochemistry of organic compounds is created. In the last part of the course, the properties of different types of hydrocarbons, their halogen derivatives, organometallic compounds, hydroxyl derivatives and ethers are studied.

Course Aims: The course aims to provide students with basic knowledge of the composition, structure, properties and methods for obtaining organic compounds. Practical classes aim to help students perceive and comprehend the lecture material and to build a habit of creative application of knowledge, to form skills for experimental work in the field of organic chemistry.

Teaching methods: Lectures, laboratory exercises and seminars; solving problems; tests; outside the classroom.

Assessment: Conducting two tests during lectures related to the course content D1 and D2 (combined tests); Three ongoing assessments related to laboratory exercises (K1, K2 and K3);

PHYSICAL CHEMISTRY PART I

Semester: III

Type of course: lectures, seminars and exercises

Hours per week: 3 hours of lectures, 3 hours of exercises

ECTS credits: 8

Lecturers: Prof. Boris Shivachev, PhD, Assist. Prof. Vasilka Markova

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The training in the course includes the study of:

- Thermodynamic principles and their application to an ideal gas;
- Phase equilibria and solutions, state diagrams;
- Chemical kinetics and equilibrium.

Course Aims: Introduction to thermodynamic approaches for describing macro-systems. Application of thermodynamic methods to various systems; qualitative interpretation of known phenomena and quantitative estimates of important thermodynamic parameters.

Teaching methods: lectures, seminars, exercises and independent studies.

Prerequisites: knowledge of basic chemical elements and their properties;

stoichiometry; graphical representation of linear dependence; solving algebraic equations (I and II degree).

Teaching methods: Lectures, laboratory exercises

Assessment: test controls during the semester and a test exam

PHYSICAL CHEMISTRY PART II

Semester: IV

Type of course: lectures, seminars and exercises

Hours per week: 3 hours of lectures, 3 hours of exercises

ECTS credits: 9

Lecturers: Prof. Boris Shivachev, PhD, Assist. Prof. Vasilka Markova

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The training in the course includes studying:

- Electrochemistry: conductivity of electrolytes, galvanic cells;
- Kinetic theory of gases;
- Real gas, van der Waals equation;
- Elements of statistical thermodynamics.

Course Aims: Introduction to the electrical properties of electrolytes: conductivity, elementary concepts of counterionic atmosphere; elements of equilibrium electrochemistry, Nernst equation. Kinetic theory of gases; extension of the ideal gas model - van der Waals model for real gases. Elements of statistical thermodynamics; law of equilibrium energy distribution.

Teaching methods: lectures, seminars, exercises and independent studies

Assessment: test controls during the semester and a test exam

ORGANIC CHEMISTRY PART II

Semester: IV

Type of course: lectures and exercises

Hours per week: 5 hours of lectures / 7 hours of exercises

ECTS credits: 16

Lecturers: Assoc. Prof. Maya Chochkova, PhD, Assist. Prof. Kiril Chuchkov, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The curriculum for the discipline Organic Chemistry Part II includes lectures and laboratory exercises concerning the structure, reactivity, classification and properties of the main classes of organic compounds and natural biologically active compounds. The lecture material contains the sections: carbonyl, carboxylic compounds, nitrogen-containing, S-, P-, Si-containing organic compounds, heterocyclic and important biologically active compounds (carbohydrates, aminocarboxylic acids, peptides, nucleotides, lipids, isoprenoids, steroids and alkaloids).

Course Aims: The course aims to provide students with basic knowledge about the composition, structure, properties and methods for obtaining the most important classes of organic compounds. Practical classes in practical and seminar form aim to help students in perceiving and understanding the lecture material and to build a habit of creative application of knowledge, to form skills for experimental work in the field of organic chemistry.

Teaching methods: Lectures and laboratory exercises; solving problems; tests; extracurricular work.

Assessment: Three tests related to the course content D1, D2 and D3 (combined tests) conducted by the teacher; Three ongoing assessments related to laboratory exercises (K1, K2 and K3); Written exam (Exam) (two theoretical questions and three problems)

STRUCTURE OF MATTER

Semester: IV

Type of course: lectures and seminars

Hours per week: 2 hours of lectures, 1 hour of seminars

ECTS credits: 5

Lecturers: Prof. Boris Shivachev, PhD, Assist. Prof. Boyka Stoykova, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The course introduces students to modern - quantum concepts of the structure of atomic-molecular systems, types of chemical bonds and non-valent interactions. The course content is the basis of the theory and application of instrumental methods - primarily spectral methods for the analysis and determination of molecular structures. The course presentation is based on elements of quantum mechanics, which students are introduced to in the first part of the course.

Course Aims: The course aims to familiarize chemistry students with quantum-chemical concepts of the structure of substances (molecules, ions, radicals, ion-radicals, coordination compounds, solids, polymers), with the types of chemical bonds and non-valent interactions, the theory of the interaction between matter and energy, the theory of reactivity and transition states, etc.

Teaching methods: lectures and seminar

Assessment: according to current control, coursework and written exam

ANALYTICAL CHEMISTRY – PART I

Semester: V

Type of course: lectures, exercises

Hours per week: 3 hours of lectures and 5 hours of exercises

ECTS credits: 14

Lecturers: Assoc. Prof. Petko Mandjukov, PhD, Assoc. Prof. Petranka Petrova, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: Basic principles of analytical chemistry. Approaches to modeling equilibria in solutions and evaluation of parameters relevant to chemical analyses. Basic theoretical concepts of equilibria in solutions: acid-base equilibria, complexation processes, formation and dissolution of sparingly soluble compounds, oxidation-reduction processes. Methods for assessing the influence of various external factors on the considered equilibrium processes. The theory of classical qualitative analysis - systematic wet analysis. Basic methods for sampling and preliminary preparation of samples. Methods for detecting, determining, isolating and masking the components of the analyzed object.

Course Aims: The course aims to familiarize students with the basics of analytical chemistry and approaches to modeling and estimating parameters in equilibrium systems. Provides the basic knowledge necessary for considering classical methods of quantitative analysis and the basic instrumental methods of analysis.

Teaching methods: lectures, exercises and extracurricular work

Assessment: Two control papers K1 and K2; assessment of laboratory work L; written exam I.

BIOORGANIC CHEMISTRY

Semester: V

Type of course: lectures, laboratory exercises

Hours per week: 2 hours of ectures, 2 hours of exercises

ECTS credits: 5

Lecturers: Assoc. Prof. Radoslav Chayrov, PhD, Assist. Prof. Kiril Chuchkov, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The course "Bioorganic Chemistry" will examine the structure and biological action of the most important components of living matter - biological polymers (proteins and peptides, nucleic acids, polysaccharides, lipids, mixed-type biopolymers - glycoproteins, nucleoproteins, lipoproteins, glycolipids) and low-molecular bioregulators (alkaloids, steroids, vitamins, etc.). Main attention will be paid to the fundamental problem of bioorganic chemistry - clarification of the relationship between chemical structure and biological action.

Course Aims: Students will become familiar with the analogues of the components of living matter, with an emphasis on the application of these analogues in practice, especially in medicine.

Teaching methods: lectures and exercises

Assessment: written exam

BIOPHYSICOCHEMISTRY

Semester: V

Type of course: lectures and exercises

Hours per week: 2 hours of lectures and 2 hours of exercises

ECTS credits: 6

Lecturers: Prof. Boris Shivachev, PhD, Assist. Prof. Vasilka Markova

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The training in the course includes the study of:

- the principles of organization of chemical reactions in living systems;
- the kinetics of enzyme-catalytic reactions.
- various biological structures – membranes, cells, tissues and organs.
- the properties of model supramolecular lipid-protein structures and methods for their study.

Course Aims: Introduction to the quantitative study of biological structures and processes using the approaches and experimental methods of physical chemistry, as well as some important applications in medicine and pharmacy.

Teaching methods: lectures, exercises and independent study

Assessment: test controls during the semester and written exam

ANALYTICAL CHEMISTRY – PART II

Semester: VI

Type of course: lectures, exercises

Hours per week: 3 hours of lectures and 6 hours of exercise

ECTS credits: 12

Lecturers: Assoc. Prof. Petko Mandjukov, PhD, Assoc. Prof. Petranka Petrova, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: Basic principles of classical quantitative analysis. Weight analysis. **Volumetric analysis:** protonometry, complexometry, redoximetry, sedimentary volumetric analysis. Titration curves. Selection of a method for solving a specific analytical problem, selection of indicators and conditions for conducting the analysis. Evaluation of systematic and random errors caused by various factors and the accuracy of the overall analytical procedure. Basic instrumental methods of analysis - potentiometry and spectrophotometry. Registration of the equivalent point with instrumental methods.

Course Aims: The course aims to familiarize students with the variety of tools and methods of analytical chemistry, applicable depending on the goals set for the analysis, the characteristics of the object and the capabilities of the analytical laboratory, the place of classical methods of analysis in modern analytical chemistry. The issues of selecting a representative sample of different types of materials, preliminary preparation of the sample, the considerations on the basis of which the selection of an analytical method is carried out, methods for processing the obtained results and evaluating their main metrological characteristics are discussed.

Teaching methods: lectures, exercises and extracurricular work

Assessment: Two tests K1 and K2; assessment for laboratory work L; written exam I.

INTRODUCTION TO INSTRUMENTAL ANALYSIS

Semester: VI

Type of course: Lectures, exercise

Hours per week: 3 hours of lectures + 1 hour of exercises per week

ECTS credits: 9

Lecturers: Assoc. Prof. Petko Mandjukov, PhD, Assoc. Prof. Petranka Petrova, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: Basic stages of analysis using instrumental methods. Absolute and relative methods, calibration and basic metrological characteristics of instrumental methods. Principles of atomic spectral, electrochemical and radiochemical methods of analysis.

Course Aims: The course aims to familiarize students with the basic principles of the most commonly used instrumental methods for analyzing the elemental composition of various objects. The physical basis, advantages and limitations of the considered analytical methods are discussed. The aim is for students to acquire the knowledge necessary to select an appropriate analytical method for solving a specific analytical problem. Special attention is paid to the specifics of the analysis of trace elements.

Teaching methods: lectures, exercises and extracurricular work

Assessment: Course project K; assessment of laboratory work L; written exam I

MOLECULAR SPECTROSCOPY

Semester: VI

Type of course: lectures/exercises

Hours per week: 2 hrs. lectures; 1 hr. laboratory classes

ECTS credits: 6

Lecturers: Assos. Prof. Petranka Petrova, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The curriculum for the course Molecular Spectroscopy includes lectures and laboratory exercises related to some of the main instrumental methods for characterizing

organic compounds. The main characteristic bands of different classes of organic compounds are examined, which allows the use of the method for their characterization when solving specific tasks and problems.

Course Aims: The aim of the course is for students to acquire systematic knowledge and skills for identifying and characterizing the studied compounds and correct interpretation of the obtained results.

Teaching methods: Lectures are illustrated with various examples related to the analysis of simpler and more complex compounds. Multimedia PC systems and computers are used.

Assessment: Two ongoing tests (2 in lectures and 2 in exercises) and a written exam

BIOCHEMISTRY

Semester: VII

Type of course: lectures and exercises

Hours per week: 2 hours of lectures per week, 2 hours of exercises per week

ECTS credits: 8

Lecturers: Prof. Ivanka Stankova, PhD, Assoc. Prof. Radoslav Chayrov, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The course in biochemistry studies the complex multimolecular organization of living matter, the chemical processes and the main metabolic chains that occur in living organisms.

Enzymes, their chemical nature and their mechanism of action are studied, as well as biological oxidation, the supply and conversion of energy in the cell.

Course Aims: The course aims to provide students with knowledge of the basic biochemical processes that underlie metabolism, biological oxidation and the related energy conversion. An idea of the regulation, control and integration of biochemical processes in organisms is acquired. By obtaining generalized knowledge of biochemistry, students understand the studied material in chemistry from a general biological point of view.

Teaching methods: lectures, illustrated with schemes and figures, laboratory exercises, periodic tests

Assessment: two tests during the semester and a written exam

CHROMATOGRAPHIC METHODS

Semester: VII

Type of course: lectures and exercises

Hours per week: 2 hours of lectures; 1 hour of exercises

ECTS credits: 5

Lecturers: Assoc. Prof. Radoslav Chayrov, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The curriculum for the course Chromatographic Methods includes lectures and laboratory exercises related to thin-layer, column, gas and high-performance liquid chromatography. The main characteristics necessary for the correct selection of analytical equipment, its settings and the necessary consumables for obtaining an accurate result are considered.

Course Aims: The aim of the course is for students to acquire systematic knowledge and skills for identifying and characterizing the studied compounds using the methods of analysis using thin-layer, column, gas and high-performance liquid chromatography, as well as correct interpretation of the obtained results. The students' attention is focused on the problems that arise during the analysis, as well as methods for their quick and adequate elimination.

Teaching methods: Lectures and exercises

Assessment: Two tests (K1, K2) and a written exam

QUANTITATIVE DEPENDENCES CHEMICAL STRUCTURE – BIOLOGICAL ACTION (QSAR)

Semester: VII

Type of course: lectures and seminar

Hours per week: 3 hrs. lectures, 1 hrs. seminars

ECTS credits: 7

Lecturers: Prof. Boris Shivachev, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: This course introduces students from the Bachelor's program in Medicinal Chemistry to the basic concepts and approaches of one of the modern scientific directions in this field - the search for statistically reliable regression models of the relationship between the chemical structure, expressed through a set of descriptors, and the biological activity within a group of compounds. In the literature, this direction is known as QSAR (quantitative structure-activity relationships). The course introduces students to the basic theories of drug-receptor interaction, various molecular descriptors of this interaction, their calculation by quantum-chemical means, their use for building regression models and the interpretation of the found regression models.

Teaching methods: Lectures and seminars, multimedia PC systems and computers

Assessment: Development, defense of a coursework and exam

CHEMISTRY OF DRUGS

Semester: VIII

Type of course: lectures and exercises

Hours per week: 3 hours of lectures, 1 hour of exercises

ECTS credits: 7

Lecturers: Prof. Ivanka Stankova, PhD, Assist. Prof. Kiril Chuchkov, PhD

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The training in the course includes studying:

- principles for creating new basic drugs;
- the main groups of drugs;
- methods for their preparation;
- structure/biological activity relationship.

Course Aims: Students must acquire knowledge of the main groups of organic drugs. The subject of the course is the preparation of individually selected drugs used in modern medical practice, with particular attention paid to the mechanism of their action and the relationship between chemical structure and drug action, as well as the principles of creating new drugs.

Teaching methods: lectures and exercises

Assessment: written exam

CLINICAL PRACTICE

Semester: VIII

Type of course: seminars

Hours per week: 3 hours of seminars

ECTS credits: 3

Lecturers: Prof. Ivanka Stoyneva, DSc

Department: South-West University "Neofit Rilski", FMNS, Department of "Chemistry"

Course Status: Mandatory

Short Description: The "Clinical Practicum" course provides students with knowledge about the basic methods applied in clinical laboratory tests and the devices used for these tests. Attention is paid to the methods and devices used for hematological, general clinical, serological and immunological tests. Issues related to the control of clinical laboratory analyses are discussed in detail. During the exercises, most of which will be held in clinical laboratories, a clinical interpretation of the results obtained will be given. The course is based on the knowledge acquired by students from other disciplines such as organic chemistry, bioorganic chemistry, biochemistry, physical chemistry and prepares students for modern living and working conditions.

Course Aims: Methods and apparatus for laboratory work, washing and preparation of laboratory vessels, dosing, weighing, thermostating, centrifugation, processing of laboratory data, discussion of the results of clinical and diagnostic laboratory tests. The clinical practicum exercises will be conducted in the clinical and biochemical laboratory of the General Hospital - Blagoevgrad and will be related to hematological, biochemical, cytological and immunohematological tests of specific samples.

Teaching methods: lectures and exercises

Assessment: written exam/coursework