CHEMISTRY

I. ANNOTATION

Graduates of the Bachelor's program in Chemistry receive in-depth theoretical training and solid practical skills that meet European standards and requirements. Bachelors in Chemistry have good opportunities for realization as experts-chemists, as well as opportunities for successful continuation of their education in higher degrees (master's and doctoral) in Bulgaria and abroad.

Graduates of the bachelor's degree can work as chemists in the chemical, biotechnology and food industries, as well as in medical and scientific laboratories.

II. QUALIFICATION STANDARD

II.1. Area and scope of knowledge

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

Graduates of the Bachelor's degree in Chemistry must have a general knowledge of:

• 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, physicochemistry, biochemistry);

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

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

Graduates of the Bachelor's degree in Chemistry must have specific knowledge of:

• the structure of the atom; types of chemical bonds and mechanisms of formation; chemical processes and chemical equilibrium; kinetics and catalysis; types of solutions and ways to obtain them; basic properties of chemical elements and their compounds, methods of preparation;

• instrumental methods for analysis, control and organization in inorganic laboratories.

II.2. Area and scope of skills

Chemistry graduates must have skills in:

• application of the acquired theoretical knowledge in the fundamental disciplines in solving specific practical tasks;

• planning, organizing and conducting experimental activities;

• work with scientific literature and other sources of information;

III. 3. Competences

III.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.);

• have teamwork skills, willingness to cooperate, ability to resolve conflicts and social adaptation;

• have the ability for written and oral communication and a high culture of communication;

• to master the basic methods for searching, finding and processing information and computer skills, as a means of information management;

• have the ability to work on the Internet.

III.3.2. Professional competencies

In their direct professional activity, the graduates of the specialty "Chemistry" must be able to:

• to apply the acquired theoretical knowledge in specific practical situations related to the need to make independent decisions;

• to use in their practical activity the basic laws of general chemistry, the laws of chemical thermodynamics and kinetics, the methods for purification of substances;

• to apply analytical and spectral research methods;

• to work with modern equipment;

• to conduct experimental research according to a given methodology;

• to process (interpret) the results of the experimental activity;

• to analyze and evaluate their own work;

IV. CURRICULUM

№	NAME OF THE COURSE	Evaluation		CREDIT	Classroom employment				Extracurricular activities / hours /
		semester	form		total	lectures	seminars	semester	
	I. COMPULSORY COURSES								
1.	Mathematics - part I	I	exam	6,5	60	30	30		135
2.	General and inorganic chemistry –part I	I	exam	15	150	45		105	300
3.	Physics - part I	I	exam	6	45	30		15	135
4.	Foreign language – part I	I	o.e.	2,5	30		30		45
5.	Sport	I			30			30	90
	TOTAL :			**30**	**315**	**105**	**60**	**150**	**705**
6.	General and inorganic chemistry –part II	II	exam	15	150	60		90	300
7.	Mathematics - part II	II	exam	6	60	30	30		120
8.	Physics - Part II	II	exam	6,5	45	30		15	150
9.	Foreign language – part II	II	exam	2,5	30		30		45
10.	Sport	II	т.о.		30			30	90
	TOTAL :			**30**	**315**	**120**	**60**	**135**	**705**
11.	General and inorganic chemistry –part III	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	135	45		90	285
18.	Bioorganic chemistry	V	exam	5	60	30		30	90
19.	Colloid chemistry	V	exam	6	60	30		30	120
20.	Elective course 1 (from the first group)	V	exam	5	45	30		15	105
	TOTAL:			**30**	**300**	**135**		**165**	**600**
21.	Analytical chemistry – part II	VI	exam	10	135	45		90	165
22.	Istrumental methods of analysis – part I	VI	exam	7	75	45		30	135
23.	Elective course 2 (from the second group)	VI	exam	5	45	30		15	105
24.	Elective course 3 (from the third group)	VI	exam	5	45	30		15	105
25.	Research practice	VI	т.о.	3	15			15	75
	TOTAL :			**30**	**315**	**150**		**165**	**585**
26.	Biochemistry	VII	exam	9	60	30		30	210
27.	Istrumental methods of analysis – part II	VII	exam	11	90	45		45	240
28.	Elective course 4 (from the third group)	VII	exam	5	45	30		15	105
29.	Elective course 5 (from the third group)	VII	exam	5	45	30		15	105
	TOTAL :			**30**	**240**	**135**		**105**	**660**
30.	Chemical technologies	VIII	exam	10	45	30		15	255

31.	Elective course 6 (from the fourth group)	VIII	exam	5	45	30		15	105
32.	Elective course 7 (from the fourth group)	VIII	exam	5	45	30		15	105
33.	Written state exam or diploma thesis defense	VIII		10					300
	TOTAL:			**30**	**135**	**90**		**45**	**765**
	TOTAL (hours of compulsory and elective subjects - without classroom employment in sports)			**240**	**2205**	**1050**	**120**	**1035**	**4995**
	TOTAL (hours of the obligatory and elective disciplines - with classroom employment in sports)			**240**	**2280**	**1050**	**120**	**1110**	**5160**
	II. ELECTIVE COURSES (by groups)								
	First group	V	exam	5	45	30		15	105
1.	Electrochemical systems								
2.	Biologically active substances as food additives								
3.	Solid state chemistry								
4.	Computer simulation of structure and properties of molecules								
5.	STEM technological tools in the chemical laboratory								
	Total number of credits and number of disciplines chosen by the first group	**V**	exam	**5**	**45**	**30**		**15**	**105**
	Second group	VI	exam	5	45	30		15	105
1.	Chemistry of solar cells								
2.	High molecular weight compounds								
3.	Chemimetry								
4.	Sampling and sample preparation methods								

	Total number of credits and number of courses in the disciplines chosen by the second group	**VI**	exam	**10**	**90**	**60**		**30**	**210**
	Third group	VII	exam	5	45	30		15	105
1.	Environmental chemistry								
2.	Atomic emission spectral analysis								
3.	Chemistry of natural compounds								
4.	Kinetics and catalysis								
	Total number of credits and number of subjects chosen by the third group	**VII**	exam	**10**	**90**	**60**		**30**	**210**
	Fourth group	VIII	exam	5	45	30		15	105
1.	Steroids								
2.	Molecular spectral analysis								
3.	Chemistry of medicines								
4.	Fundamentals of biotechnology								
	Total number of credits and hours of the disciplines chosen by the fourth group	**VIII**	exam	**10**	**90**	**60**		**30**	**210**
	Total number of credits and number of disciplines to be chosen			**35**	**315**	**210**		**105**	**735**
	III. OPTIONAL COURSES								
	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.

DESCRIPTIONS OF THE COURSES

MATHEMATICS – PART 1

Semester: I

Type of the course: Lectures and seminars.

Hours per week: 2 lecture hours and 2 seminars.

ECTS credits: 6.5 credits

Lecturers: Assoc. Prof. Ilinka Dimitrova, PhD, Assist. Prof. Boyana Gyrkova, PhD.

Department: SWU “Neofit Rilski”, FMNS, Department of Mathematics and Phisics, e-mail: mathemaics-phisics@swu.bg

Course Status: mandatory.

Short Description: The course is an introduction into basic topics of mathematics necessary for learning of modern theories in chemistry. Topics related to sets theory, bases of linear algebra, analytical geometry, number sequences, differential calculus will be considered.

Course Aims:

The aim of the program is to acquire the basic knowledge mathematics.

Teaching Methods: Lectures and seminars.

Assessment: written exam.

GENERAL AND INORGANIC CHEMISTRY – PART 1

Semester: I

Type of the course: Lectures and laboratory exercises

Hours per week: 3 lecture hours and 7 laboratory exercises

ECTS credits: 15 credits

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

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description: The main topics to be considered: construction of the electronic shell; nucleus; periodic law and the periodic table of the elements, structure of molecules, coordination bonds and compounds, intermolecular bonds, chemical bond in solids, valences of the chemical elements, basic concepts in thermodynamics, chemical kinetics, chemical equilibrium, adsorption, catalysis, phase rule, chemical-physic analysis, the solubility of the substances, theory of the diluted solutions, electrolyte solutions, colloids and electrochemical processes of metal corrosion.

Laboratory exercises supports lectures by chemical experiment.

Course Aims:

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

1. Acquisition of chemical knowledge in general chemistry based on knowledge about the structure of matter, the laws and regularities in nature;
2. Acquisition of skill and ability to perform chemical experiments in chemical laboratory specialized itself in inorganic chemistry;
3. Developing chemical thinking and independent work with chemical literature.

Teaching Methods: lectures and exercises.

Assessment: written exam.

PHYSICS – PART 1

Semester: I

Type of the course: Lectures and laboratory exercises.

Hours per week: 2 lecture hours and 1 laboratory exercises.

ECTS credits: 6 credits

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

Department: SWU "Neofit Rilski", FMNS, Department of Mathematics and Phisics, e-mail: mathemaics-phisics@swu.bg

Course Status: mandatory.

Short Description:

The material is selected in accordance with the current workload, specifics of specialty and within a reasonable compromise between the theoretical and applied material. The priority is given to the technical and applied side of issues. To this end, are considered some specific issues that are not included in the curricula "General Physics" for other disciplines. The mathematical apparatus is consistent with the level of preparation of students in the 1st semester. The lectures are divided into the following sections: kinematics and dynamics of a material point, relativistic physics, rigid body dynamics, oscillations and waves,
fluid dynamics, fundamentals of thermodynamics and fundamentals of molecular-kinetic theory.

Course Aims:

To acquaint students with the fundamental natural laws governing the world, the causal links between them, the main research methods of physics (phenomenological and statistical) and basic physical concepts and ratios.

Teaching Methods: lectures and exercises.

Assessment: written exam.

ENGLISH – PART 1

Semester: I

Type of the course: seminars.

Hours per week: 2 hours.

ECTS credits: 2.5 credits

Lecturers: Assoc. Prof. Radoslav Chayrov, PhD

Department: Department of Chemistry, FMNS, SWU “Neofit Rilski”, e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Training course includes the study of:

- specialized literature on Chemistry
- specialized literature on Environmental chemistry
- brief English grammar

Course Aims:

Students should become familiar with the specialized terminology in chemistry and related fields, acquire knowledge to work with specialized texts, be able to apply their knowledge and skills in project work where good language skills.

Teaching Methods: seminars.

Assessment: written exam.

SPORT

Semester: I, II

Type of the course: exercises.

Hours per week: 2 hours exercises.

ECTS credits: 0.0 credits

Department: Sport, Faculty of Public Health and Sports, e-mail: fozs@swu.bg

Course Status: mandatory.

Short Description:

Activities in the course "Sport" are designed for students in first and second year of bachelor specialty "Chemistry". The program includes mainly issues related to the technique of the chosen sport, some individual and group tactical actions necessary for its application, competition rules and work to improve physical fitness.

Course Aims:

The proposed sports will improve the basic physical abilities, will improve respiratory and cardiac activity as well as the nervous system and the like. Will support the development of specific sport skills and habits. Not least, it should be borne in mind the large aesthetic impact of sports-related harmonious development of the body and the beauty of movement.

Teaching Methods: exercise.

Assessment: The assessment of the discipline of sports for all faculties is carried out in the following way:

1. During practical classes, the teacher conducts ongoing control over the mastery of the technique of the corresponding sport (tk).

2. At the end of each academic year (II, IV, VI semesters), a test is carried out to assess the students' fitness training (OK) according to a pre-specified test battery, including the tests: 50 m. high start; long jump from a place; two-handed shot put from below forward; 800 m. smooth running. The testing is carried out by a commission, which includes the deputy head of the Department of Sport and the leading teacher. Students are introduced to the test battery at the beginning of the first year (during the first two weeks). By the end of the third week of the first semester, testing is carried out on all freshmen in order to obtain information about the initial state of their fitness training.

3. At the end of each academic year, a current assessment is formed for each student according to the formula: TO = 0.6 TC + 0.4 OK, where TO - current assessment; TC - current control; OK - assessment of fitness training. The results of the current assessment are entered in the student's books, examination report and the material book.

4. The final assessment is formed based on the current assessments for each year according to the formula: Final assessment = TO 1 + TO 2 + TO 3 + ……., where TO 1, TO 2,
TO 3 etc. are the current assessments for the first, second, third etc. year respectively

GENERAL AND INORGANIC CHEMISTRY – PART 2

Semester: II

Type of the course: Lectures and laboratory exercises.

Hours per week: 4 lecture hours and 6 laboratory exercises.

ECTS credits: 15 credits

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

Department: Department of Chemistry, FMNS, SWU “Neofit Rilski”, e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Curriculum discipline General and Inorganic Chemistry Part II includes
lectures and laboratory work in chemistry of the elements and their compounds.
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

respective subsets in the Periodic system. The second part deals with: location of chemical element in the Periodic system and regularities in structure and properties in the group and period, main characteristics of the chemical element, the compounds of the chemical elements, electronic properties of element, physical properties of the chemical element, crystallography of the chemical element and its compounds, nuclear properties of the chemical element and use. Laboratory exercises illustrate lectures by chemical experiment and the properties of compounds, including: basic methods to obtain chemical substances and simple compounds in various groups of Periodic system.

Course Aims:

1. Receiving widespread knowledge in Inorganic Chemistry and Chemistry of elements.
2. Analytical thinking associated with regularities in the properties of the elements and their compounds, depending on their electronic structure and their place in the periodic system.
3. Acquiring specific knowledge about different elements and their compounds and their application.

Teaching Methods: lectures and exercises

Assessment: written exam.

MATHEMATICS – PART 1

Semester: II

Type of the course: Lectures and seminars.

Hours per week: 2 lecture hours and 2 seminars.

ECTS credits: 6 credits

Lecturers: Assoc. Prof. Ilinka Dimitrova, PhD, Assist. Prof. Bojana Gyrkova, PhD.

Department: SWU "Neofit Rilski", FMNS, Department of Mathematics and Phisics, e-mail: mathemaics-phisics@swu.bg

Course Status: mandatory.

Short Description:

Training course includes the study of:

- integral calculus (indefinite and definite integral of a function of one variable) and applications in the natural sciences;
- ordinary differential equations and applications;
- elements of probability theory and applications.

Course Aims:

Students should acquire basic knowledge in Mathematics - part 2 using integral calculus, some of ordinary differential equations and elements of probability theory to solve problems in the relevant sections and fields and their applications, as well as an idea of the modern PC models software training these guidelines.

Teaching Methods: lectures and seminars.

Assessment: written exam.

PHYSICS – PART 2

Semester: II

Type of the course: Lectures and laboratory exercises.

Hours per week: 2 lecture hours and 1 laboratory exercises.

ECTS credits: 6.5 credits.

Lecturers: Assoc. Prof. Ljuben Ivanov, PhD, Assist. Prof. Krasimir Damov, PhD.

Department: SWU "Neofit Rilski", FMNS, Department of Mathematics and Phisics, e-mail: mathemaics-phisics@swu.bg

Course Status: mandatory.

Short Description:

Physics - part II has a total workload 30 hours of lectures and 30 hours laboratory exercises and is mandatory for students from the specialization Chemistry. The material is selected in accordance with the current workload and specifics of specialty, and within a reasonable compromise between the theoretical and applied material. The priority is given to technical and applied side of issues. The lectures are divided into the following sections: electrostatics, steady electromagnetic field variable electromagnetic field, electromagnetic phenomena in substance, oscillations and waves and wave optics.

Practical sessions in the program allow students to acquire knowledge and experimental skills in modern physics laboratory.

Course Aims:

To give basic knowledge in the field of electromagnetic and optical phenomena and to deepen and specify the knowledge of students for them.

Teaching Methods: lectures and exercises.

Assessment: written exam.

ENGLISH – PART 2

Semester: II

Type of the course: seminars.

Hours per week: 2 hours.

ECTS credits: 2.5 credits

Lecturers: Assoc. Prof. Radoslav Chayrov, PhD

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Training course includes the study of:

- Chemistry lessons in English;
- Specialized computer testing;
- Audio Visual System.

Course Aims:

Students enrich their knowledge from the first semester to work with the specialized literature.

Teaching Methods: seminars.

Assessment: written exam.

GENERAL AND INORGANIC CHEMISTRY – PART 3

Semester: III

Type of the course: Lectures and laboratory exercises.

Hours per week: 3 lecture hours and 2 laboratory exercises.

ECTS credits: 7 credits

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

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

General and Inorganic Chemistry Part III includes lectures and laboratory exercises in Inorganic synthesis, Chemistry of elements and their compounds.

Program is a continuation of the program in General and Inorganic Chemistry - part II, with a stress on the chemical elements with different purity and inorganic synthesis of their compounds. Material is divided into sections: technique of inorganic synthesis, electrolytic

hydrogen and hydrogen from water, gas, fluorine and synthesis of fluorine compounds. Synthetic methods for the preparation of chlorine, bromine, iodine, sulfur, selenium, tellurium, nitrogen, phosphorus, arsenic, antimony, bismuth, carbon, silicon, germanies, tin, lead, boron, aluminum, gallium, indium, beryllium , magnesium, calcium, strontium, barium, silver, hall, copper, zinc and cadmium compounds.

Laboratory classes are an extension of the theoretical lectures in inorganic synthesis laboratory.

Course Aims:

1. Receiving widespread knowledge in inorganic chemistry directed towards inorganic synthesis for the bachelor level in specialty "Chemistry";
2. Entering in the foundations of the inorganic substances synthesis;
3. Acquisition of knowledge in inorganic compounds with varying purity.

Teaching Methods: lectures and exercises.

Assessment: written exam.

ORGANIC CHEMISTRY – PART 1

Semester: III

Type of the course: Lectures and laboratory exercises.

Hours per week: 5 lecture hours and 7 laboratory exercises.

ECTS credits: 15 credits

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

Department: Department of Chemistry, FMNS, SWU “Neofit Rilski”, e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

The basic course in Organic chemistry-part I deals with the structure, properties and composition of the organic molecules. In the first part of the course are included the main theoretical approaches for the relation between structure and properties of the organic molecules, the principals of stereochemistry, as far as the properties of different types of hydrocarbons, alcohols, ethers and organometallic compounds.

Course Aims:

The aim of the course is to give the students thorough knowledge about the compositions, structure, properties and methods for preparation of the most important organic compounds.

The practical exercises (labs + tutorials) seek to help the student by understanding and giving a meaning of the lectures, to acquire a habit of constructive application of knowledge, to build up skills in the field of organic chemistry.

Teaching Methods: lectures and exercises

Assessment: written exam.

PHYSICAL CHEMISTRY – PART 1

Semester: III

Type of the course: Lectures, seminars and laboratory exercises.

Hours per week: 3 lecture hours and 3 seminars and laboratory exercises.

ECTS credits: 8 credits

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

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Training course includes the study of:

- Thermodynamic principles and their application on the ideal gas;
- Phase equilibria and solutions, state diagram;
- Chemical kinetics and equilibrium.

Course Aims:

Introduction to the thermodynamic approaches to describe the macro-systems. Application of thermodynamic methods on different systems, qualitative interpretation of certain phenomena and quantitative assessments of important thermodynamic parameters.

Teaching Methods: lectures, seminars and exercises

Assessment: written exam.

PHYSICAL CHEMISTRY – PART 2

Semester: IV

Type of the course: Lectures, seminars and laboratory exercises.

Hours per week: 3 lecture hours and 3 seminars/laboratory exercises.

ECTS credits: 9 credits

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

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Training course includes the study of:

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

Course Aims:

Introduction to electrical properties of electrolytes: conduction, elementary notions of the anti-ionic atmosphere, elements of the equilibrium electrochemistry, the Nernst equation. Kinetic theory of gases; expansion of the ideal gas model - model of van der Waals for real gases. Elements of statistical thermodynamics, equilibrium and law of distribution.

Teaching Methods: lectures, seminars and exersises

Assessment: written exam.

ORGANIC CHEMISTRY – PART 2

Semester: IV

Type of the course: Lectures and laboratory exercises.

Hours per week: 5 lecture hours and 7 laboratory exercises.

ECTS credits: 16 credits

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

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

In Organic chemistry – part II are included knowledge for the carbonyl compounds, carboxylic acids, nitrogen containing compounds, heterocyclic compounds and different types of natural compounds.

Course Aims:

The aim of the course is to give the students thorough knowledge about the composition, structure, properties and methods for preparation of the most important organic compounds.

The practical exercises (labs + tutorials) seek to help the student by understanding and giving a meaning of the lectures, to acquire a habit of constructive application of knowledge, to build up skills in the field of organic chemistry.

Teaching Methods: lectures and exercises

Assessment: written exam.

STRUCTURE OF MATTER

Semester: IV

Type of the course: Lectures and seminars.

Hours per week: 2 lecture hours and 1 hour seminar.

ECTS credits: 5.0 credits

Lecturers: Assis. Boyka Stoykova, PhD

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

The course gives the microscopic aspect of the education in Physical Chemistry. It offers a brief review and extension of the basic quantum mechanical concepts and demonstrates their application to chemical objects. The major objective of the course is to provide fundamental and practice-oriented knowledge allowing design of molecular characteristics and interpretation of the molecular behavior of real systems.

Course Aims:

Students should understand the fundamental aspects of the quantum theory of atoms, molecules and different types of chemical bonds, and the mechanism of interaction between matter and electromagnetic radiation.

Teaching Methods: lectures and seminars.

Assessment: written exam.

ANALYTICAL CHEMISTRY – PART 1

Semester: V

Type of the course: Lectures and laboratory exercises.

Hours per week: 3 lecture hours and 6 laboratory exercises.

ECTS credits: 14 credits

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

Department: Department of Chemistry, FMNS, SWU “Neofit Rilski”, e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Basic principles of analytical chemistry. Approaches in modeling equilibria in solutions and evaluation of parameters related to the chemical analysis. Basic theoretical concepts of equilibria in solutions: acid-base equilibria; processes of complexation; formation and dissolution of low soluble compounds; oxidation - reduction processes. Methods to assess the impact of various external factors on the considered equilibrium processes. Theory of classical qualitative analysis - wet analysis. Basic methods of sampling and preparation of samples. Methods for detection, identification, separation and masking components of the analyzed object.

Course Aims:

The course aims to introduce students to the basics of analytical chemistry and approaches in modeling and evaluation of parameters in equilibrium systems. Provides basic knowledge necessary for the processing of the classical methods of quantitative analysis and fundamental instrumental methods of analysis.

Teaching Methods: lectures and exercises.

Assessment: written exam.

BIOORGANIC CHEMISTRY

Semester: V

Type of the course: Lecture and laboratory exercises.

Hours per week: 2 hours lecture and 2 hour exercises and seminars.

ECTS credits: 5 credits

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

Department: Department of Chemistry, FMNS, SWU “Neofit Rilski”, e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

The course is connected to that of Biochemistry and serves as an introduction to biochemistry, as the main content of bioorganic chemistry to any substantial extent the old notion' 'static" Biochemistry.

Course Aims:

To provide basic information on the problems and prospects of this modern science.

Teaching Methods: lectures and exercises.

Assessment: written exam.

COLLOID CHEMISTRY

Semester: V

Type of the course: Lectures and laboratory exercises.

Hours per week: 2 lecture hours and 2 laboratory exercises.

ECTS credits: 6 credits

Lecturers: Prof. Boris Shivachev, PhD

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Training course includes the study of:

- Capillary properties and phenomena;
- Adsorption;
- Electrical properties of colloidal systems.

Course Aims:

Understanding the properties of surfaces and in particular with the capillary properties (liquid surface), capillary pressure, wetting phenomena. Models of adsorption equilibrium; concept of surfactants (surface active agents), electrical properties of colloidal systems, electrokinetic phenomena, stability of hydrophobic colloids.

Teaching Methods: lectures, seminars and exercises.

Assessment: written exam.

ANALYTICAL CHEMISTRY – PART 2

Semester: VI

Type of the course: Lectures and laboratory exercises.

Hours per week: 3 lecture hours and 6 laboratory exercises.

ECTS credits: 10 credits

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

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Basic principles of classical quantitative analysis. Weight analysis. Volumetric analysis: protonometry, complexometry, redoximetry, residual volumetric analysis.

Titration curves. Selecting a method for solving a particular analytical task, selection of indicators and conditions for the analysis. Evaluation of systematic and random errors caused by various factors including the accuracy of the overall analytical procedure. Basic instrumental analytical methods - potentiometry and spectrophotometry. Registration of end-point with instrumental methods.

Course Aims:

The course aims to acquaint students with the variety of tools and methods of analytical chemistry applicable to the objectives of the analysis, the characteristics of the object and the possibilities of the analytical laboratory, the place of the classical methods of analysis in modern analytical chemistry.

Teaching Methods: lectures and exercises.

Assessment: written exam.

ISTRUMENTAL METHODS OF ANALYSIS – PART 1

Semester: VI

Type of the course: Lectures and laboratory exercises.

Hours per week: 3 lecture hours and 2 hours laboratory exercises.

ECTS credits: 7 credits

Lecturers: Assoc. Prof. Petko Mandjukov, PhD

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Main stages of the analysis using instrumental methods. Absolute and relative methods, calibration and main metrological characteristics of instrumental methods. Principles of atomic spectral, electrochemical and radiochemical methods.

Course Aims:

The course aims to introduce the students to the fundamental principles of most commonly used instrumental methods of analysis of the elemental composition of different objects.

The physical basis, the advantages and limitations of the basic instrumental analytical methods are discussed. The aim is to supply students with the information necessary to select the appropriate analytical method for solving a particular analytical task. Special attention is paid the specificity of the analysis of trace elements.

Teaching Methods: lectures and exercises.

Assessment: written exam.

BIOCHEMISTRY

Semester: VII

Type of the course: Lectures and laboratory exercises.

Hours per week: 2 lecture hours and 2 hours laboratory exercises.

ECTS credits: 9 credits

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

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

In the course is considered the complex organization of living matter, chemical processes and key metabolic pathway that occur in living organisms. Enzymes, their chemical nature and their mechanisms of action. Biological oxidation and energy conversion in the cells.

Course Aims:

The course aims to provide students with knowledge of basic biochemical processes that underlie the metabolism, biological oxidation and the related conversion of energy. Knowledge about the regulation, control and integration of biochemical processes in organisms.

Teaching Methods: Illustrated lectures and exercises.

Assessment: written exam.

ISTRUMENTAL METHODS OF ANALYSIS – PART 2

Semester: VII

Type of the course: Lectures and laboratory exercises.

Hours per week: 3 lecture hours and 3 hours laboratory exercises.

ECTS credits: 11 credits

Lecturers: Assoc. Prof. Petko Mandjukov, PhD

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Basic methods of molecular spectroscopy - UV and

visible, fluorescent, infrared and Raman spectroscopy. Magnetic chemical methods of analysis - mass spectrometry, nuclear magnetic resonance and electron paramagnetic resonance. Chromatographic methods for the separation and determination.

Course Aims:

The course aims to familiarize students with fundamental methods in molecular spectroscopy. Particularly attention is paid to the metrological aspects of the instrumental analysis – data treatment, metrological characteristics evaluation, validation, traceability etc.

The aim is to equip students with the knowledge necessary to select the appropriate analytical method to solve specific analytical task and evaluate the analytical results.

Teaching Methods: lectures and exercises.

Assessment: written exam.

CHEMICAL TECHNOLOGIES

Semester: VIII

Type of the course: Lectures and laboratory exercises.

Hours per week: 2 lecture hours and 1 hour laboratory exercises.

ECTS credits: 10 credits.

Lecturers: Assoc. Prof. Mitko Stoev, PhD.

Department: Department of Chemistry, FMNS, SWU "Neofit Rilski", e-mail: himia@swu.bg

Course Status: mandatory.

Short Description:

Students learn the processes and equipment which are the foundation of chemical technologies. Students learn the basic principles of fluid flow, heat transfer and processes of diffusion as well as the structures and facilities in which they occur. This course covers the principles of construction of chemical production in connection with the modern requirements. The application of these principles is illustrated by examples of inorganic and organic technologies which are well developed in the our country.

Course Aims:

To acquaint students with the theoretical foundations of the most widely used processes in the chemical technology and their application in the selection and definition of the facilities for their use.

Teaching Methods: lectures and exercises.

Assessment: written exam.