QUALIFICATION CHARACTERISTIC

SPECIALITY: **CHEMISTRY**

MASTER PROGRAMME: **BIOLOGICAL ACTIVE COMPOUNDS AND DRUGS**

EDUCATIONALAL-QUALIFICATION DEGREE: **MASTER**

PROFESSIONAL QUALIFICATION: **MASTER IN CHEMISTRY**

PERIOD OF STUDY: **1 YEAR (2 SEMESTERS)**

The current qualification characteristic of “Biological active compounds and drugs” defines the professional designation and realization of master specialists (Master in chemistry). The educational qualification degree "Master" is at level 7 of National- and European qualifications frameworks. The Master’s degree syllabus builds upon the knowledge acquired in the Bachelor’s degree programme in the same professional field 4.2. "Chemical Sciences"and the duration of training is 1 year.

SPECIALIST PROFILE

The training in Master’s degree programme "Biological active compounds and drugs" aims to prepare specialists in the field of pharmaceutical industry, scientific research laboratories for drugs discovery, laboratories for analysis and control, clinical laboratories, and others, in accordance with their acquired qualification. The wide coverage of the programme allow the participation in various administrative and management departments, international firms.

REQUIREMENTS FOR PREPARATION OF SPECIALIST

Masters of “Biological active compounds and drugs” to possess knowledge and skills for successful solution of chemistry tasks. They should be professionals with a profound general knowledge and with a solid fundamental training. In addition, they should be with linguistic competence and significant professional training, which should allow themselves to deepen their qualification and professional skills or to continue their study in a doctoral degree.

Acquired the qualification "master" degree of specialty must possess creativity, theoretically based approach and organizational techniques in application of experimental methods of the disciplines. Degree holders must acquire the ability to improve their qualification, learning the modern achievements in chemistry and to work successfully in the field of market economy.

The subject of the current Master's program is to study chemistry of biological active compounds, their mechanisms of action, as well as the synthesis, properties and principles of drug discovery.

Graduates in "Biological active compounds and drugs" will gain the depth of knowledge and skills in: modern methods of organic synthesis, pharmacology and drug toxicology, structural analysis of organic compounds, drugs chemistry and their mechanisms of action, biotechnology and etc. Additional knowledge they will have acquired through the elective courses: chemistry of heterocyclic compounds, biophysical-chemistry, basic microbiology and virology, biochemistry of nutrition and health, etc.

POSSIBILITIES FOR PROFESSIONAL REALIZATION

Graduates of a master's degree should realize in the field of:

- ✓ Pharmaceutical industry;
- ✓ Scientific research laboratories for drugs discovery;
- ✓ Laboratories for analysis and control;
- ✓ Clinical laboratories;
- ✓ Commercial companies supplying drugs and biological active compounds.

CURRICULUM

BIOLOGICAL ACTIVE COMPOUNDS AND DRUGS

Period of Study: 1year (2 semesters)

First semester	ECTS credits	Second semester	ECTS credits
Compulsory courses		**Compulsory courses**	
Some current methods in organic synthesis	8	Medicinal chemistry	8
Rational drug design	8	General Pharmacology and Toxicology	3
Structural analysis of organic compounds	6	Elective course (**Group II**)	4
Medical Equipment	4	Defense of BA Thesis in Chemistry	15
Elective course (Group I)	4	or	
		State Exam in Chemistry	
Elective courses group I *(Students choose one subject from each group)* **Group I** ☞ Natural products chemistry ☞ Chemotherapy and modern chemotherapeutic agents ☞ Clinical chemistry ☞ Technology of drugs		**Elective courses group II** *(Students choose one subject from each group)* **Group II** ☞ Biologicalyl active compounds- nutrition and health ☞ Basics of Biotechnology ☞ Healthcare Management ☞ Sampling and sample preparation in the analysis of biological active compounds	
	Total 30		Total 30

TOTAL FOR BOTH SEMESTERS: 60 credits

SOME CURRENT METHODS IN ORGANIC SYNTHESIS

ECTS credits: 8 **Hours per week:** 3l+0se+1le+pe+p
Form of knowledge evaluation: Examination **Examination type:** written
Semester: I
Methodological guidance:
Department:"Chemistry"
Faculty: Mathematics and Natural Sciences
Lecturers:
Assoc. Prof. Maya Chochkova, PhD**:** mayachochkova@swu.bg

Annotation:

A large part of the course is concerned with reactions, which lead to the formation of carbon-carbon single and double bonds. Other reactions discussed provide methods for the fictionalization of inactivated methyl and methylene groups through intramolecular attack by free radicals at inactivated carbon-hydrogen bonds. The students will be introduced through scientific publications to the concrete examples of application of the considered synthetic methods for preparation of some organic compounds. The planning of organic synthesis is also included in the course.

Course topics:

The aim of the course is to give the students thorough knowledge about some basic reactions, used in the current organic synthesis. The course is based on the knowledge, acquired in the course of organic chemistry.

Clearly, the whole field of synthesis could not be covered in the course, even in a cursory manner, and a selection has had to be made. The course seeks to extend the knowledge in the considered field, to development of self-dependence, creative and non-standard thinking of the students. The practical exercises 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 synthesis.

The final grade constitutes 40% of the periodical control grade and 60% of the grade from the semestrial examination according to developed and approved in Chemistry Department system of control and grading.

RATIONAL DRUG DESIGN

ECTS credits: 8 **Hours per week:** 3l+se+le+1pe+p
Form of knowledge evaluation: Examination **Examination type:** project defence
Semester: I
Methodological guidance:
Department:"Chemistry"
Faculty: Mathematics and Natural Sciences
Lecturers:
Assoc. Prof. Zhivko Velkov, PhD: jivko_av@swu.bg

Annotation:

On the base of ligand-receptor interaction mechanisms and the ability of the drug to disseminate in different organs and environments of the human body, the structural reasons of the drug action will be studied.
This course is based on the knowledge of the biochemical and physiological effects of drugs on organisms (pharmacodynamics) and the influence of the organism on the drug (pharmacokinetics), the dose-effect relationship, the benefits to the body, and the toxic effects.
The main tasks of the Rational Drug Design Program are:
- acquainting students with the qualitative and quantitative relationships between the structure of the drug and its action;
- acquiring skills to work with specialized software for calculating of specific structural descriptors.
- develop skills for skills for individual work.

Course topics:

The aim of this course is to raise general chemistry culture of students in assessing the role of the structure on the drug action. To gain experience in calculating different descriptors of drug molecule that are relevant to their effects on organisms.

STRUCTURAL ANALYSIS OF ORGANIC COMPOUNDS

ECTS credits: 6 **Hours per week:** 2l+1se+0le+0pe+p
Form of knowledge evaluation: Examination **Examination type:** written
Semester: I
Methodological guidance:
Department:"Chemistry"
Faculty: Mathematics and Natural Sciences
Lecturers:
Prof. Ivanka Stoyneva, DSc: istoineva@yahoo.com

Annotation:

The course "Structural analysis of organic compounds" is designed for students who have completed university disciplines such as organic chemistry and spectral methods, and have basic theoretical knowledge in these areas. The course is a prominent application oriented, aiming to increase the competence of the students to determine the structure of complex organic molecules.

Training begins with a brief overview on the modern concepts and techniques applied daily in the laboratory practice, and continue with progressive handling of spectral methods (UV, IR, NMR and MS) for structural analysis.

MEDICAL EQUIPMENT

ECTS credits: 4 **Hours per week:** 0l+0se+0le+3pe+p
Form of knowledge evaluation: Examination **Examination type:** written
Semester: I
Methodological guidance:
"`EEA", South-West University "Neofit Rilski"-Blagoevgrad, tel. (073) 8889132
Lecturers:
Assoc. Prof. Dr., Eng. Filip Batalov, e-mail: batalov@swu.bg

Annotation:

Modern chemistry is characterized by the application of high-tech methods and solutions based on fundamental physical principles and phenomena in order to improve analytical and diagnostic processes.

Knowledge of the methods, the availability of practical skills for working with modern high-tech and computer systems, as well as knowledge of the physical foundations of the functioning of modern medical and diagnostic equipment are becoming one of the most important constituent factors of the qualification characteristics of the modern worker.

The discipline aims to form in students-future chemists a complex of competencies in the following areas:

1) the foundations of modern bio-information technologies,
2) physical methods for research and diagnostics of biological systems,
3) the structure and principles of functioning of medical equipment.

The course is divided into 8 modules: The structure of laboratory practical classes in the discipline "Medical Equipment" includes mandatory solution of practical tasks using the studied methods and equipment. This allows to consolidate the formation of basic skills for practical application of the studied methodologies for high-tech diagnostics, therapy and analysis of medical and biological information.

1) Concept of modern medicine and medicine of the future.
2) Information technologies in medicine,
3) Diagnostic medical equipment,
4) Therapeutic medical equipment,
5) Visualization in medicine. Cybersecurity of medical information.
6) Fundamentals of medical informatics;
7) Fundamentals of registration and processing of biomedical signals;
8) Mathematical analysis of medical and biological information.

Goals, expected results and benefits for students of the specialty. In modern biomedicine, the latest achievements of modern electronic equipment are extremely widely integrated. No medical institution can do without the use of electronic devices and devices. Without knowledge in the field of the basics of electronics, it is impossible to understand the principles of operation of modern medical devices. In this regard, the purpose of this course is to familiarize students with the phenomena and

technologies underlying the design and principles of operation of electronic devices used in medicine, their main units. To become familiar with existing electronic medical devices and the methods of treatment and prevention in which they are applied.

Subject connections with other disciplines. For training in the proposed program, knowledge of chemistry is required, as well as good command of the material from the courses in biology, physics and mathematics. Computer skills and proficiency in English are also required and are developed within the framework of training in the program. The knowledge of the discipline "Medical Equipment" of the students of the specialty "Biologically Active Substances and Medicinal Products" is the basis for training in other disciplines in the curriculum such as: Hygiene and Ecology, Clinical Laboratory and Biochemistry, Health Promotion, etc.

MEDICINAL CHEMISTRY

ECTS credits: 8 **Hours per week:** 3l+0se+0le+1pe+p
Form of knowledge evaluation: Examination **Examination type:** project defence
Semester: II
Methodological guidance:
Department:"Chemistry"
Faculty: Mathematics and Natural Sciences
Lecturers:
Prof. Ivanka Stankova, PhD: ivastankova@swu.bg

Annotation:

Subject of the course "Medicinal Chemistry" are the main groups drugs used in modern medical practice, with particular emphasis on their mechanism of action, chemical structure, relationship structure - activity and the principles of drug design.

Discussed are basic knowledge in biochemistry, properties of the enzymes and metabolic processes. Information is given about receptors, mediators, antimetabolites, passage through cell membranes of biologically active compounds

The course is designed for chemists, whose future work will be linked to the creation of new biologically active compounds.

Practical exercises are related to synthesis of various drugs.

Course topics:

The course is aimed at understanding the content of the discipline as a science for create drugs based on traditional knowledge of pharmacology. It aims to examine stages in the development of new drugs.

Examining of the drugs on the basis on pharmacological effect makes possible to trace the logic of development of the drugs, and the relationship that exists between chemical structure and pharmacological effect.

Students must gain knowledge for the fundamental group drugs, principles for development of new drugs and achieve their realization in the pharmaceutical companies.

GENERAL PHARMACOLOGY AND TOXICOLOGY

ECTS credits: 4 **Hours per week:** 2l+0se+0le+0pe+p
Form of knowledge evaluation: Examination **Examination type:** written

Semester: II

Methodological guidance:

Faculty of Public Health, Health Care and Sports

Lecturer:

Professor PhD Reni Kalfin MD: reni_kalfin@abv.bg

Annotation:

In the course of *General Pharmacology and Toxicology* includes the study of general principles, related to fundamental processes of pharmacokinetics and pharmacodynamics of the drugs, drug biotransformation and factors, affecting drug action, as well as the drug interaction in the body. Will be study some basic principles of toxicology as drug side effects, toxic and carcinogenic effect of the drugs, drug objectionable (drug toxicomania), ect.

Course topics:

The course aim is to study the general principles of pharmacology and toxicology and basic processes of pharmacokinetics and pharmacodynamics of the drugs, drugs biotransformation and factors, affecting drug action, as well as the drug interaction in the body.

The students get an idea about regulating, monitoring and integrating of the pharmacological processes in the organism. Receiving a general knowledge of pharmacology and toxicology students reflect on the material studied chemistry, biochemistry, ect.

The seminars seek to help the students by understanding and giving a meaning of the lectures, to acquire a habit of constructive application of knowledge.

Teaching Methods: Lectures with demonstration of schemes and figures and seminars.

Requirements: Knowledge in Chemistry and Biochemistry

NATURAL PRODUCTS CHEMISTRY

ECTS credits: 4 **Hours per week:** 2l+0se+0le+0pe+p
Form of knowledge evaluation: Examination **Examination type:** written
Semester: I
Methodological guidance:
Department:"Chemistry"
Faculty: Mathematics and Natural Sciences
Lecturers:
Assoc. Prof. Maya Chochkova, PhD: mayachochkova@swu.bg

Annotation:

The course of *Natural products chemistry* covers a wide range of different aspects concerning the importance of chemistry of polyfunctional organic derivatives in living systems. In the current course some of the most important classes natural compounds such as: carbohydrates, nucleic acids, proteins, steroids and phenolic compounds will be discussed. Additional attention will be paid to their classification; structures, chemical properties, the role that they play in the living systems; the structure-activity relationship and unusually broad application areas will be shown.

Course topics:

The aim of the course is to prepare specialists, possessing the basic understanding of natural products chemistry, necessary for successful dissolving of the chemical tasks.

The course „ Natural products chemistry" is the vast part of Organic chemistry. The current discipline lies on the border of biological disciplines and is connected with other courses in the curriculum, such as Bioorganic, Biochemistry and Pharmaceutical Chemistry.

Expected results:

Students to become conversant with the following main aspects of discipline:

- to classify the natural compounds;
- to have good knowledge of the structural peculiarities of natural compounds and their basic chemical transformation *in vivo* and *in vitro*;
- to be familiar with the methods of isolation, purification and also with their synthetic methods;
- To have an idea of the effects of natural compounds in living organisms and their participation metabolism.

CHEMOTHERAPY AND MODERN CHEMOTHERAPEUTIC AGENTS

ECTS credits: 4 **Hours per week:** 2l+0se+0le+0pe+p
Form of knowledge evaluation: Examination **Examination type: written**
Semester: III
Methodological guidance:
Department:"Chemistry"
Faculty: Mathematics and Natural Sciences
Lecturers:
Professor Ivanka Stankova, PhD: ivastankova@swu.bg

Annotation:

In the curriculum, "Chemotherapy and modern chemotherapeutic agents" is presented modern approaches of new chemotherapeutic agents design.
Particular attention is paid to the drugs used in chemotherapy of cancer, viral, bacterial and fungal infections.
The chosen examples have to clarify general principles of farmaco-biochemistry.

Course content:

Teaching material covers theoretical tasks:

-Introduction into the basis for the development of antimetabolites for antibacterial, antifungal, antiviral and anticancer chemotherapy;

- Clarifying the biochemical mechanisms of drugs actions.

Teaching and assessment:

Lectures are provided for the students in the course of the education The lectures are held following the classical manner and are visualized by Power Point presentations.

The final grade consitutes 30% of the periodical control grade and 70% of the grade from the semestrial examination according to developed and approved in Chemistry Department system of control and grading students' competence.

CLINICAL CHEMISTRY

ECTS credits: 4
Hours per week: 2l+0se+0le+0pe+p
Form of knowledge evaluation: Examination
Examination type: written
Semester: I
Methodological guidance:
Department:"Chemistry"
Faculty: Mathematics and Natural Sciences
Lecturers:
Prof. Ivanka Stoyneva, DSc: istoineva@yahoo.com

Annotation:

The course in Clinical Chemistry comprises 30 hours. Clinical chemistry and molecular diagnostics are key components of modern clinical laboratory. The course aims to introduce students to the fundamentals of clinical chemistry and molecular diagnostics, applied according to the standards of good medical practice. The course outlines the main trends in modern clinical laboratory tests and reveals the nature of work in modern clinical, biochemical, microbiological, etc. laboratories.

The course provides basic knowledge on experimental work in research laboratories engaged in the search of biologically active compounds and the development of new drugs. The course will contribute to the understanding of the diagnostic set-ups, the application of certain principles and the subsequent interpretation of the results of diagnostic tests.

TECHNOLOGY OF DRUGS

ECTS credits: 4
Hours per week: 2l+0se+0le+0pe+p
Form of knowledge evaluation: Examination
Examination type: written
Semester: I
Methodological guidance:
Department:“Chemistry”
Faculty: Mathematics and Natural Sciences
Lecturers:
Prof. Ivanka Stoyneva, Dsc: istoineva@yahoo.com

Annotation:

The main objective of the course "Technology of Drugs" is to teach students of the basic theoretical questions of the pharmaceutical manufacture of drug substances. The main pharmaceutical terms and concepts of drug technology, historical review and technological objectives, classification and nomenclature of pharmaceutical forms will be discussed in detail. Understand the dosing methods, the requirements for packaging materials used to pack medicines, reflect the main biopharmaceutical factors affecting the bioavailability of drugs in specific dosage forms. The lecture material is divided into 3 modules.

Expected result

Students acquiring a Masters's degree course will acquire basic knowledge about the processes and devices used in the preparation of various dosage forms such as capsules, granules, ointments, injectable forms, etc. It is expected that their training in this discipline will be useful to them as professionals in various pharmaceutical companies.

BIOLOGICALLY ACTIVE COMPOUNDS - NUTRITION AND HEALTH

ECTS credits: 4
Hours per week: 2l+0se+0le+0pe+p
Form of knowledge evaluation: Examination
Examination type: written
Semester: II
Methodological guidance:
Department:“Chemistry”
Faculty: Mathematics and Natural Sciences
Lecturers:
Prof. Ivanka Stankova, PhD: ivastankova@swu.bg

Annotation:

The course on "Biologically active compounds - Nutrition and Health" aims to introduce students with the use of substances that are necessary for a balanced and healthy meal. Before our ancestors are received everything need for their body from the food which they are used.

In the last decade worldwide are observed that eating habits are increasingly moving away from the principles of balanced nutrition, leading to a shortage of biologically active substances, vitamins and minerals.
It is believed that the solution to this problem is the use of additional biological active compounds / BAC /. Today BAC rightly called the food of the 21st century.
In opinion of many leading scientists in the world, natural BAC that increasingly entering in market in developed countries that ensure a population all necessary substances such as vitamins, minerals and bioactive substances. The adoption of a BAC has optimal, preventive and quick healing effect.
The course will help to build an objective and contemporary glance of students
on the following functions of biologically active additives:
- Provide a body of necessary vitamins and minerals and all other biologically active substances, without adding unnecessary calories;
- There a preventive effect and will help to increase the duration of life;
- Improve performance and facilitate adaptation to the environment;
- Ensure the growth and development of children

Assessment: written examination / coursework

BASICS OF BIOTECHNOLOGY

ECTS credits: 4
Hours per week: 2l+0se+0le+0pe+p
Form of knowledge evaluation: Examination
Examination type: written
Semester: II
Methodological guidance:
Department:"Chemistry"
Faculty: Mathematics and Natural Sciences
Lecturers:
Prof. Ivanka Stoyneva, DSc: istoineva@yahoo.com

Annotation:

The aim of the course "Basics of Biotechnology“ is to provide students with a Master's program "Biologically Active Substances and Drugs" to gain new knowledge in the field of modern and fast-growing pharmaceutical biotechnology. This technology is based on the use of the catalytic potential of various biological agents and systems such as microorganisms, viruses, plant and animal cells and tissues as well as extracellular substances and cellular components.

Within the course the students will acquire the theoretical knowledge about the basic principles of protein and genetic engineering as well as the design of new drugs for prevention and therapy of the main diseases of our century. They will familiarize themselves with the chemical structure and the production of valuable bioproducts used in medicine, such as some new enzymes, hormones, antibodies, inhibitors, vaccines and genetically engineered preparations.

Students have obtained a Master's degree on the basis of new crafts and skills in this course can develop creative thinking and critical analysis of phenomena and processes in their realization as specialists in different pharmaceutical companies.

The course is based on the knowledge gained by students from the main disciplines such as organic chemistry, biochemistry, physicochemistry and prepares students for the modern methods of production in pharmacy, chemistry and food technology.

HEALTHCARE MANAGEMENT

ECTS credits: 4
Hours per week: 2l+0se+0le+0pe+p
Form of knowledge evaluation: Examination
Examination type: written
Semester: II
Methodological guidance:
Faculty of Economics
Lecturers:
Assoc. Prof. Desislava Stoilova, PhD : dstoilova@swu.bg

Annotation:
Course topics:

SAMPLING AND SAMPLE PREPARATION IN THE ANALYSIS OF BIOLOGICAL ACTIVE COMPOUNDS

ECTS credits: 4
Hours per week: 2l+0se+0le+0pe+p
Form of knowledge evaluation: Examination
Examination type: written
Semester: II
Methodological guidance:
Department:“Chemistry”
Faculty: Mathematics and Natural Sciences
Lecturers:
Assoc. Prof. Petranka Petrova, PhD: ppd@swu.bg
Annotation:

The course presents the basic concepts of the sampling and sample preparation in the analysis which are the weakest links in the chain in any analytical procedure. The main principle to be observed when selecting a sample for analysis is that the sample must be representative to the overall composition of the analysed object. If the sample does not accurately represent the population from which it is

drown, then an analysis, that is otherwise carefully conducted, will yield inaccurate results. Sample preparation is also of great importance for the accuracy and precision of analytical results.

Course topics:

The aim of the course is to introduce students to the design of sampling and sample preparation, as well as to the evaluation of random and systematic errors during the analysis. In this course we consider how the collection of the sample and the sample preparation for analysis can affect the accuracy and precision of our results.