INFO PACK

MASTER'S PROGRAM: **BIOLOGICALLY ACTIVE COMPOUNDS AND DRUGS**

SPECIALITY: **CHEMISTRY**

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

Master's program "**Biologically active compounds and drugs**" focuses on the study of the chemistry of biologically active compounds and the computer-aided prediction of their biological activities. The program also emphasizes the modern principles for a design and a synthesis of newly drugs. Additionally, it covers fundamental pharmacological concepts, including the basic processes of pharmacokinetics and pharmacodynamics, drug biotransformation, factors influencing drug action, and various drug interactions within the body.

Prerequisites

The Master's program is open to students holding a Bachelor's degree **in the fields of**:
4.2 *Chemical Sciences*, 1.3 *Chemistry and Physics Education*, 5.10 *Chemical Technologies*, or 5.12 *Food Technology*, or diploma with grades and credits in the core chemical disciplines.

A master's programme is a two year course of study

Objectives of the Master's Program

The training in the Master's program "Biologically Active Substances and Drugs" is aimed to prepare specialists in the field of pharmaceutical industry, research laboratories for the design of new drugs, laboratories for analysis and control, clinical laboratories, etc.

Areas of professional development

Graduates of the specialty can find employment in the following areas:

- 🕮 the pharmaceutical industry
- 🕮 research laboratories for the designing of drugs
- 🕮 laboratories for analysis and control
- 🕮 clinical laboratories
- 🕮 commercial companies specializing in the supply of medicines and biologically active substances.

List of positions from the National Classification of the Professions and Positions, suitable for graduated of the master's degree "**Biologically Active compounds and drugs**"

2113 6001 Chemist

2113 6011 Chemist, organic chemistry

2113 6022 Chemist, analysis of medicinal products

2113 6023 Chemist, biochemistry

2113 6024 Chemist, clinical chemistry

2113 6028 Chemist, medicinal chemistry

CONTENT OF THE CURRICULUM (II semesters)

№	SUBJECT	Assessment		ETCS credits	Auditorium				extra-auditorium work (hours)
		semester	form		total	lectures	seminars	practical exercises	
	I. COMPULSORY COURSES								
1.	Modern methods in organic synthesis	**I**	exam	**8**	60	45		15	180
2.	Rational drug design	**I**	exam	**8**	60	45		15	180
3.	Structural analysis of organic compounds	**I**	exam	**6**	45	30	15		135
4.	Medical Equipment	**I**	exam	**4**	45			45	75
5.	**Elective course (Group I)**	**I**	exam	**4**	30	30			90
	TOTAL :			**30**	**240**	**150**	**15**	**75**	**660**
6.	Medicinal chemistry	**II**	exam	**8**	60	45		15	180
7.	Fundamentals of Pharmacology and Toxicology	**II**	exam	**3**	30	30			60
8.	**Elective course (Group II)**	**II**	exam	**4**	30	30			90
9.	**Diploma thesis**	**II**	exam	**15**					450
	TOTAL :			**30**	**120**	**105**		**15**	**780**
	TOTAL: (Compulsory and elective courses)			**60**	**360**	**255**	**15**	**90**	**1440**
	II. ELECTIVE COURSES (in groups)								
	Group I								
1.	Natural products chemistry	**I**	exam	**4**	30	30			90

2.	Chemotherapy and modern chemotherapeutic agents	**I**	exam	**4**	30	30			90
3.	Clinical chemistry	**I**	exam	**4**	30	30			90
4.	Technology for medicines	**I**	exam	**4**	30	30			90
	TOTAL	**I**		**4**	**30**	**30**			**90**
	Group II								
1.	Biologically active compounds-nutrition and health	**II**	exam	**4**	30	30			90
2.	Basic of biotechnology	**II**	exam	**4**	30	30			90
3.	Financial Management in Healthcare	**II**	exam	**4**	30	30			90
4.	Sampling and sampling preparation of biologically active compounds	**II**	exam	**4**	30	30			90
	TOTAL	**II**		**4**	**30**	**30**			**90**

III. FACULTATIVE SUBJECTS

1. Students can be educated each elective course, taught at the University, regardless of Department, which organizes training (in accordance with Article 2, Paragraph 5 to the Regulations for the State Requirements for Acquiring Higher Education of the Educational and Qualification Degrees/ State Newspaper, No. 76/2002/.

The studied facultative subjects are recorded in the student's diploma.

IV. GRADUATION

1. Preparation and defense of a diploma thesis or state exam.

Notes to the curriculum:

1. The forms of control of students' academic performance (current and final) are described in the curricula.

2. The list of elective courses may be updated upon proposal of the Departmental Council.

3. The students are admitted to the development of a diploma thesis if they have an average grade from their studies not less than Very good (4.50).

COURSE DESCRIPTION

MODERN METHODS IN ORGANIC SYNTHESIS

ECTS credits: 8
Hours per week: 3l+0se+1le+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:

A large part of the course is relevant to the reactions, concerning the forming of carbon-carbon single and double bonds. Moreover, reactions providing methods for the functionalization of nonactivated methyl and methylene groups through intramolecular attack by free radicals should be discussed. The students should be introduced through scientific publications to the examples of application of the considered synthetic methods for preparation of some organic compounds. The planning of organic synthesis will be included in the course.

Course topics:

The aim of the course is to give the students thorough knowledge of some main 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 75% of the current control grade and 25% of the grade from the term 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:
Prof. Boris Shivachev, PhD: blshivachev@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 "Quantitative structure-activity relationship studies in drug design" 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+3le+pe+p
Form of knowledge evaluation: Examination
Examination type: written
Semester: I
Methodological guidance:
Department: "`EEA",
Technical Faculty
Lecturers:
Assoc. Prof. Dr., Eng. Filip Batalovl: batalov@swu.bg

Annotation:

The work program of the course is developed based on modern educational standards in the field of higher education in chemistry. The discipline is general professional, forming the basic level of knowledge of students in the specialty "Biologically active substances and medicinal products".

Brief description of the content. 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.

MEDICINAL CHEMISTRY

ECTS credits: 8
Hours per week: 3l+0se+1le+0pe+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
Assoc. Prof. Radoslav Chayrov, PhD: rchayrov@swu.bg

Annotation:

Subject of the course "Medicinal Chemistry-part II" includes 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.

Discussions are based on 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.

FUNDAMENTALS OF PHARMACOLOGY AND TOXICOLOGY

ECTS credits: 3
Hours per week: 2l+0se+0le+0pe+p
Form of knowledge evaluation: Examination
Examination type: written
Semester: II
Methodological guidance:
Department:"Department of Healthcare"
Faculty: Faculty of Public Health, Healthcare and Sport
Lecturer:
Prof. PhD Reni Kalfin MD: reni_kalfin@swu.bg

Annotation:

The course "Fundamentals of Pharmacology and Toxicology" examines the principles of interaction between medicinal substances and the human body, studies the adverse effects of drugs and chemicals on the body, and focuses on dose-response relationships and mechanisms of toxicity. The aim of the pharmacology and toxicology training for students of the specialty "Biologically Active Substances and Medicinal Products" in a course of the Professional direction "Chemical Sciences" is for the master students to become familiar with the basic principles of pharmacology and pharmacotherapy, and the basics of toxicology studying the influence of xenobiotics (chemicals foreign to the human body) in doses exceeding pharmacological ones. It is necessary for the students to understand the role of pharmacology as a therapeutic and prophylactic method in the complex of other therapeutic methods, and the role of toxicology as an applied biochemical science studying poisons and their effects on the body. In the training course, the students will form competencies regarding the need to apply medicinal products in various diseases and antidotes in acute and chronic poisoning. The tasks of the pharmacology and toxicology training include studying and mastering selected issues from general, special pharmacology and general toxicology. The teaching methods are passive and active forms of learning. Passive form of learning - lecture course of 30 hours. All lectures shall be delivered using multimedia and PowerPoint presentation. The active form of learning is tests, essays and participation in discussions.

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: I
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 MEDICINES

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 Substances " 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 Master'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.

FINANCIAL MANAGEMENT IN HEALTHCARE

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

Annotation:

The course on "Financial Management in Healthcare" has been developed in accordance with the general objectives of the training in the specialty "Biologically Active Substances and Medicinal Products". The goal of the course is to provide students with in-depth knowledge in the field of long-term financing and asset management of

healthcare and medical institutions, by introducing them to the basic financial instruments and methods, as well as the possibilities for their application in modern conditions.

The main tasks of the training are:

1) Acquiring knowledge and building skills for analyzing the financial condition of healthcare and medical institutions, with an emphasis on three main aspects - liquidity, solvency and profitability.

2) Acquiring knowledge and building skills to apply the basic methods of working capital management.

3) Acquiring knowledge and building skills to apply the basic methods for analyzing and assessing the effectiveness of investment projects.

4) Acquiring knowledge and building skills to use the main tools for long-term financing of health and medical institutions.

Expected results: After completing the course students must have acquired basic knowledge and skills for effective financial management of healthcare and medical institutions.

SAMPLING AND SAMPLE PREPARATION IN THE ANALYSIS OF BIOLOGICALLY 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:
Chief Assist. 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.