SOUTH-WEST UNIVERSITY „NEOFIT RILSKI“
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
DEPARTMENT OF CHEMISTRY
2700 Blagoevgrad, 66 Ivan Mihaylov Str.; 073 / 88 55 01;info@swu.bg; www.swu.bg

INFO PACK
/ECTS/

Ph.D. program in ORGANIC CHEMISTRY

FIELD OF HIGHER EDUCATION: **4. NATURAL SCIENCES, MATHEMATICS AND INFORMATICS**

PROFESSIONAL FIELD: **4.2 CHEMICAL SCIENCES**

PHD PROGRAMME: **ORGANIC CHEMISTRY**

ACADEMIC DEGREE: **PhD**
NQF* LEVEL: **8**

PROFESSIONAL QUALIFICATION: **RESEARCHER**
DURATION: **3 /three/ or 4 /four/ YEARS**

TYPE OF EDUCATION: **REGULAR / INDEPENDENT**

THE CURRICULUM HAS BEEN IN FORCE SINCE: **2019 ACADEMIC YEAR**

**National Qualifications Framework*

BLAGOEVGRAD, 2024

PhD DEGREE PROGRAM — ORGANIC CHEMISTRY

PROGRAM DESCRIPTION:

Department of Chemistry in the Faculty of mathematics and natural sciences at South-West University "Neofit Rilski" administers a doctoral program in Organic Chemistry.

The doctoral curriculum is developed in accordance with the Higher Education Act, the University's regulations, and the European Credit Transfer and Accumulation System (ECTS). It is classified at Level 8 of the National Qualifications Framework (NQF), fully aligned with the European Qualifications Framework (EQF), thereby ensuring consistency and recognition across academic institutions.

The duration of doctoral training depends on the mode of study: *Regular* (3 years) or *Independent* (4 years). To successfully complete the PhD program, a student must earn a total of 180 credits over the entire course. The curriculum comprises both compulsory and elective courses. The Ph.D. program in Organic Chemistry is designed to acquaint students with modern trends in organic field, to expand their theoretical knowledge, cultivate creativity, and enhance their research skills, along with promoting academic mobility in the area of organic chemistry. The Doctor of Philosophy (Ph.D.) degree is awarded upon the successful completion of all requirements outlined in the curriculum, including the conditions for admission to thesis defense.

I. COMPETENCES AND REQUIREMENTS

A doctoral student who successfully completes the Ph.D. program in Organic Chemistry should:

- 🕮 have systematic knowledge for conducting modern and purposeful organic synthesis, in accordance with the fundamental principles of Green Chemistry;
- 🕮 demonstrate knowledge directed toward carrying out original research;
- 🕮 acquire knowledge that supports the successful preparation and implementation of a research project.
- 🕮 have the ability to deepen the knowledge in the field of study, as well as its interactions with related scientific areas;
- 🕮 demonstrate and expresse knowledge through the level of complexity of the conducted and substantiated scientific research;
- 🕮 systematize and analyze literature data by using modern databases and global sources of scientific information;
- 🕮 skillfully applie approaches and methods for the synthesis, structure elucidation of biologically active compounds, and establishing the "structure–biological activity" relationship;

- acquire and successfully applies methods for studying the chemical stability of potential drug candidates;
- apply reliable qualitative and quantitative analyses in the determination of biologically active substances;
- have skills related to the effective management of a scientific research project;
- build upon standard models and approaches and develops innovative solutions in the creation of original strategies and technologies;
- develop skills for working with specialized software arising of quantitative relationships “structure–biological activity”;
- possess teamwork skills, manages time efficiently, and responsibly manages and resolves complex problems through new technological methods and tools;
- demonstrate creativity in planning and successfully conducting contemporary scientific research on current topics in the field of organic chemistry;
- demonstrate competencies in interpreting both personal research and reviewed viewpoints, showing the ability to broaden the scope of the studied scientific field;
- use scientific language and style, characterized by precise use of scientific terminology, clarity, and logical consistency in the presentation of facts and results.

II. QUALIFICATION AND REALIZATION

Doctoral Graduates who have successfully defended their doctoral dissertations can pursue careers in research institutions and universities in Bulgaria and abroad, as well as to be researchers and lecturers, experts in various organizations.

The acquired qualifications, knowledge, and skills give PhD student to be engaged in research and development of new technologies in pharmaceutical companies, clinical research organizations, and specialized testing laboratories. Graduates also can gain expertise as technical or sales specialists in companies supplying chemical equipment; to conduct chemical analyses and acquire a high level of expertise creativity in the area of organic chemistry.

CORE CURRICULUM of
the Ph.D. program in **Organic Chemistry**

№	COURSES AND ACTIVITIES	Tuition and form of education			Certification Format
		CREDIT POINTS	TUITION HOURS	lectures, seminars, laboratory sessions, independent studies, consultations, contribution, etc.	examination, ongoing evaluation, interview, certificate,report protocol, attestation, etc.
I.	**TUITION**				
1.	Compulsory course 1 (on the thematic focus of the dissertation)	**9.0**	270	30 c*/ 240 indep**	exam
2.	Compulsory course 2 (on the thematic focus of the dissertation)	**9.0**	270	30 c/ 240 indep	exam
3.	Project Preparation and Management	**3.0**	90	30 al***/ 60 indep	exam
4.	English language	**4.0**	120	60 al/ 60 indep	exam
5.	Elective course	**5.0**	150	30 c/ 120 indep	exam
	TOTAL:	**30.0**	**900**		
II.	**ACADEMIC RESEARCH**				
1.	Library research and referencing of academic sources. A statement of the main thesis objectives)	**15.0**	450	indep., c	report
2.	Presentation of a concept and the tools for the research	**5.0**	150	indep., c	report
3.	Performing of experimental/ theoretical studies related to the thematic focus of the dissertation	**15.0**	450	indep., c	report
4.	Annual probationary review assessment process for Ph.D. students	**3.0**	90	indep., c	report
5.	Presenting the experimental section as a partial dissertation fulfilment	**12.0**	360	indep., c	report
6.	Processing and analysis of research results	**15.0**	450	indep., c	report
7.	Systematization and discussion of the main scientific results in the dissertation	**30.0**	900	indep., c	report
8.	Participation in scientific forums	**10.0**	300	indep., c, participation	certificates (min. 2)
9.	Preparing and publishing a scientific manuscript	**15.0**	450	indep., c	certificates (min. 2)
10.	Thesis presentation and discussion in the Department Council	**5.0**	150	indep., c	report
11.	Completion of the PhD thesis and approbation	**5.0**	150	indep., c	report
	Total :	**130.0**	**3900**		

III.	**TEACHING**				
1.	Teaching seminars/ laboratory work in an academic discipline of the same professional field 4.2. "Chemical Sciences"	**1.0**	30	al, indep., c	protocol, report
2.	Consultations with students in an academic discipline on the same professional field 4.2. "Chemical Sciences"	**5.0**	150	indep., c	report
3.	Providing an academic help in correction and assessment of student examination papers	**4.0**	120	indep., c	report
4.	Consultations with diploma students in their thesis development	**5.0**	150	indep., c	protocol, report
	TOTAL :	**15.0**	**450**		
IV.	**MISCELANEOUS**				
1.	Participation of PhD students in Chemistry Department sessions	1.0	30	participation	protocol
2.	Participation of PhD students (as observer or contributor) in the scientific seminars of the Faculty and the Department, in Faculty, Department and University committees and other academic activities	1.0	30	participation	protocol
3.	Participation (as observer or contributor) in the University committees and other academic activities	3.0	90	participation	protocol
	TOTAL :	**1.0**	**30**	participation	protocol
	GRAND TOTAL (*for the entire period of study*)**:**	**180.0**	**5400**		

V.	**COMPULSORY COURSES**				
1.	Design and Biotransformations of Medicinal Products	**5.0**	150	30 c/ 120 indep.	exam
2.	Biometrics	**5.0**	150	30 c/ 120 indep.	exam
3.	Methods for isolation and purification of organic compounds	**5.0**	150	30 c/ 120 indep.	exam
4.	Modern methods for organic analysis	**5.0**	150	30 c/ 120 indep.	exam
5.	Modelling of radical-scavenging and antioxidant activities	**5.0**	150	30 c/ 120 indep.	exam

c* - consultations; indep. ** - independent studies; al*** - auditorium load.

** Note: The subjects "Foreign language" (English) and " Project Preparation and Management " are included in the curriculum of all doctoral students at SWU "Neofit Rilski", as mandatory by decision of the Academic Council.*

ANNOTATIONS OF SUBJECTS

COMPULSORY COURSES

The *individual curriculum includes two compulsory disciplines with a thematic focus of the title of dissertation, 9 credits are assigned for each of them*.

PROJECT PREPARATION AND MANAGEMENT

Lecturer:

Assoc.Prof. Ivan Todorov, PhD: ivank.todorov@swu.bg

/ Assoc.Prof. Maria Paskaleva, PhD: mariyapaskaleva@swu.bg

Annotation:

The course “Project Preparation and Management” introduces PhD students to the key aspects of project development, forming the foundation for the organization and management of projects, particularly in the context of applications for EU programs.

The aim of the course is to provide PhD students with comprehensive knowledge of effective project development, the management processes involved in project creation and implementation, and the preparation of project budgets.

The main objectives of the curriculum are:

To acquire theoretical knowledge of the essence, nature, content, and role of projects in the development of organizational activities;

To develop skills in reading and interpreting normative documents, which are essential for the preparation of a project proposal;

To gain practical skills in completing the primary documents required for project submission;

To become familiar with the organization of project implementation, including monitoring and control, reporting, and project evaluation.

ENGLISH LANGUAGE

Lecturer:

Assoc. Prof. Dafinka Kostadinova, PhD: dafinakostadinova@swu.bg

Assoc. Prof. Ivanka Sakareva, PhD: vanyasakareva@swu.bg

Assist. Prof. Yana Manova-Georgieva, PhD: yana_georgieva@swu.bg

Annotation:

According to Decision No. 21 of 04.09.2013 of the Academic Council, the English language course is mandatory for all PhD students in their first year of study across the doctoral programs in all faculties of South-West University "Neofit Rilski."The course is intensive, with 6 hours of instruction per day. It is usually held every year in the first month after the end of the summer semester, and its

duration may vary depending on the formation of groups according to language proficiency levels. The level of competence is determined through a placement test, based on which participants are divided into beginner, intermediate, and advanced groups, corresponding to levels A1, A2, B1, and B2–C1 of the Common European Framework of Reference for Languages (CEFR).

Aim of the course:

The aim of the course is to provide PhD students with practical training in English. At the lower levels, the focus is on acquiring basic knowledge of vocabulary and grammar, while at the higher levels the emphasis is on improvement, expansion of knowledge, and raising the level of language proficiency.The training is based on an integrative approach, in which the acquisition of new knowledge and skills is linked to the development of the four main skills: reading, writing, listening, and speaking. Special attention is given to the development of speaking and listening skills, as well as to mastering the principles of writing academic texts in English and developing skills for preparing presentations, CVs, abstracts, and articles in English.The English language course for PhD students necessarily includes the following modules: practical grammar, vocabulary, writing exercises, reading and listening comprehension, and conversation. Depending on the specific needs of students from the different faculties and specialties, specialized vocabulary for the field is also introduced, along with exercises in specialized and general translation.

For the purposes of training, recognized university didactic materials are used, as well as materials prepared by the lecturers to meet the specialized needs of the PhD students.The aim of the course is to provide the opportunity to acquire knowledge and skills for written and oral communication in English in an intercultural academic environment; to develop strategies that ensure successful intercultural communication across different fields of knowledge; and to build skills for long-term self-improvement and self-study in English.

Expected outcomes include the acquisition and development of PhD students' knowledge and skills for:

- 🕮 Understanding and interpreting scientific texts in English; Writing scientific texts in English; Mastering methods of problem formulation and analysis in English; Acquiring skills for the practical preparation of oral presentations in English;
- 🕮 Achieving personal communicative effectiveness in English in an intercultural environment; Paraphrasing and synthesizing scientific texts;
- 🕮 Understanding what plagiarism is and how to avoid it;
- 🕮 Rules for the use and citation of sources, including compiling a reference list.

DESIGN AND BIOTRANSFORMATIONS OF MEDICINAL PRODUCTS

Lecturer:

Prof. Ivanka Stankova, PhD, ivastankova@swu.bg

Annotation:

The course Design and Biotransformations of Medicinal Products includes lectures and laboratory exercises related to biologically active substances, medicinal products, their chemical structures, relations with biological activity, the biotransformations they undergo as well. The main methods for modeling drugs in order to obtain better efficacy and reduce toxicity are considered. The processing and analysis of the different classes of substances used, mechanism of action and consequences when taking higher than permissible doses is also reviewed.

The main tasks of the program in Design and Biotransformations of Medicines are:

1. Introducing students the main classes of medicine drugs;
2. Basic presentation about the usage of specific drug molecules and their side effects;
3. Acquisition of knowledge about the importance of the location and type of functional groups related to the basic structure of a drug, with accent of the structure-activity relationship.

Aim of the course:

The aim of the course is how the students to acquire systematic knowledge and skills for identifying the main drug classes. The change of activity accompanying the specific modeling of the molecule. It is essential for students to know the structure-activity dependion, as well as the damage that different metabolites do to the body.

BIOMETRICS

Lecturer:

Assoc. Prof. Petko Mandjukov, PhD, pmandjukov@swu.bg

Annotation:

Topics of the course: Descriptive statistics, distributions, Gaussian and robust statistical methods; Testing statistical hypotheses, interpretation of results; ANOVA; Regression analysis, uncertainty of calibration; Multiparametric optimization methods, experimental design; Multivariate statistics, cluster analysis.

Aim of the course:

The aim of the course is to introduce students to some of the basic methods of statistics and applied mathematics used in experimental data processing and the optimization of instrumental parameters. It provides information on the methods that allow obtaining additional information about the studied object or system.

METHODS FOR ISOLATION AND PURIFICATION OF ORGANIC COMPOUNDS

Lecturer:

Chief. Assist. Prof. Radoslav Chayrov, PhD, rchayrov@swu.bg

Annotation:

"Methods for isolation and purification of organic compounds" course includes lectures on thin-layer, column, gas and high-performance liquid chromatography (HPLC).

The course presents basic knoledge of chromatographic methods for analysis and purification. The main characteristics necessary for the correct selection of analytical equipment, setup and the necessary materials/consumables for obtaining the most accurate result are examined. Students are introduced to the properties and basic separation and derivatization techniques widely used in high-performance liquid chromatography. Emphasis is placed on the importance and correct selection of the necessary components for the preparation of mobile phases suitable for the respective analysis, as well as their adjacent stationary phases.

The main objectives of the are:

1. Introducing students to the application of chromatographic methods for qualitative and quantitative analysis;

2. Acquiring knowledge and skills for work in specialized analytical laboratories in sample preparation and analysis.

3. Developing engineering thinking and finding adequate solutions to problems that arise.

MODERN METHODS FOR ORGANIC ANALYSIS

Lecturer:

Prof. Ivanka Stoyneva, DSc: istoineva@yahoo.com

Annotation:

The course " Modern methods for organic analysis" within the Doctoral program in Organic chemistry aims to acquaint PhD students with basic theoretical questions concerning some of the main instrumental methods used for an analysis and structural characterization of various classes of organic compounds. The main characteristic principles of molecular spectroscopy (UV-, IR-, Raman), Nuclear Magnetic Resonance (NMR) and mass spectrometry analysis (MS) will be considered.

Aim of the course:

PhD students will develop advanced and systematic knowledge and skills necessary for the identification and characterization of studied organic compounds, applying a combination of analytical methods and accurately interpreting the results obtained.

MODELLING OF RADICAL-SCAVENGING AND ANTIOXIDANT ACTIVITIES

Lecturer:

Assoc. Prof. Zhivko Velkov, PhD: jivko_av@swu.bg

Annotation:

The current course will introduce PhD students with the radical processes that occur in the human body, the way radicals are formed in organisms, the mechanisms of their toxicity, and as well as the essence of antiradical processes and compounds.

The course will examine the main classes of antioxidants and their antioxidant activities, the antioxidant content in various foods and intake options.

Aim of the course:

The main goal of the course "Antioxidants" is to study the structural features responsible for the estimation of a substance as a generator or as a scavenger of active radicals.

Laboratory classes introduce students to analytical methods for determination of antioxidant and radical-scavenging activities of various compounds, by determination of total phenolic content in wine, fruit juices, tea. Students will also gain experience in the structural features of natural and synthetic antioxidants.