# COURSES IN FOREIGN LANGUAGES for ERASMUS INCOMING STUDENTS

# at Sofia University for 2024/2025 academic year

**Faculty of Chemistry and Pharmacy**

**Faculty coordinator: Prof. Petko Petkov; ohpp@chem.uni-sofia.bg**

**Programme: BACHELOR PROGRAM CHEMISTRY**

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| CHC010413 O522 | **Polymers** | English | BS | Summer | 7 | 45 | 0 | 45 | Assoc. Prof. L. Hristov | christov@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction)**: An introductory course in polymer science as an important part of material science. With an emphasis on polymer chemistry and synthesis, the course explains some basic physical properties and the methods for characterization and processing of polymers.

**Requirements for enrollment: NO**

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| CHC010413 E122 | **Biocoordination chemistry** | English | BS | Summer | 5 | 30 | 0 | 30 | Assoc. Prof. A. Ahmedova | ahaa@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The modern bioinorganic (biocoordination) chemistry deals with the biological processes involving metalloenzymes and metalloproteins, focusing on the main structural and functional characteristics related to the presence of metal ion(s) in their active site. This involves deeper understanding of the properties of metal ions to form coordination compounds and the corresponding characteristics of their structure and reactivity that are directly connected with the biological activity. Another crucial subject of the bioinorganic chemistry is the application of metal complexes in medicine for diagnostics and therapy of wide range of diseases. The unique properties of the metal complexes and the knowledge about the structure-reactivity-biological activity relationship hold out the opportunity for intelligent design of metallopharmaceuticals with target properties and activity. That is why the subjects in the present teaching course will evolve from the fundamental coordination chemistry knowledge to the direct pharmaceutical applications of metal complexes as therapeutic or diagnostic agents including quickly developing field of radiopharmaceuticals. The students will have the opportunity to synthesize by themselves the first metal-based chemotherapeutics, the cisplatin, during the practical work of this course.

**Requirements for enrollment: NO**

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) Lectures | Exercises/ Seminars | Practical work | Lecturer/s's name | Lecturer/s's e-mail/s |
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| **CHC010413 E421** | **Methods for dating of archaeological and geological materials** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Assoc. Prof. Petya Kovacheva** | nhpk@wmail.chem.uni-sofia.bg |

**Short description of the course:** The course acquaints the students with the methods for absolute and relative dating of different archeological finds (bones, wood, charcoal, ceramics, textile, paper) and geological materials (rocks, minerals, stalactites, stalagmites). Among the methods discussed are: potassium-argon method, radiocarbon, radiocalcium, uranium series, thermoluminiscence, fission track method, racemization of aminoacids, isochron dating, dendrochronology, archaeomagnetism, obsidian hydration dating etc. The principle of each method, requirements for sampling, sample preparation and measurement techniques are described. General possibilities and limits of the dating methods are discussed. Examples of dated popular archaeological and geological objects are given to illustrate the applicability of the methods.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) Lectures | Exercises/ Seminars | Practical work | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHC010413 E241** | **Molecular Design** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. A. Tadjer** | tadjer@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** Molecular systems with predefined physical and chemical characteristics and/or biological activity are intensively sought both experimentally and theoretically. The course introduces the main classes of materials of interest for modern technologies, cosmetics, and pharmacy. The rules and schemes of QSPR are presented with accent on the design of compounds with potential for utilization into technology, pharmacy, and ecology. During the computational practicum each student is assigned an individual project aimed at modelling of a prospective compound from one of the above-mentioned groups. Specialized software and a wide range of computational methods are applied. The results are discussed and summarized into a term project, which is presented and defended in front of a professional audience at the end of the semester.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHC010413 E211** | **Molecular Modelling of Functional Materials** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. G. Madjarova** | **gmadjarova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course focuses on the application of quantum chemical methods for description of the relationships between the structure and properties of modern functional materials at the molecular level. The lectures introduce students to the mechanisms responsible for the specific characteristics of functional materials and outline the techniques for modelling them theoretically. Using Density Functional Theory, a set of quantities required for assessment of various physical and chemical molecular properties are calculated. The results obtained during the computational practicum for an individually assigned molecule are summarized into a written term project, which is submitted at the end of the semester. The knowledge obtained from the course enables students to perform directed molecular modelling of new more efficient, cheaper, more environmentally friendly, and durable materials.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHC010413 E251** | **Quantum Chemistry** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. A. Tadjer** | **tadjer@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course acquaints students with the contemporary methods of quantum chemistry and their capacity for application to estimate molecular properties. The methods allowing theoretical determination of molecular characteristics such as geometry, electron density, and energy spectrum are presented. The theoretical foundation and the basic formalism of the methods are summarized and the areas of applicability are discussed. Appropriate illustrative examples are included. Both the lectures and the computational exercises are practically oriented. Each student is assigned an individual term project, which is summarized, submitted in writing and presented orally at the end of the semester. After completing the course students are able to carry out independently a basic computational study of a particular chemical or theoretical problem and to analyze adequately the obtained numerical data using the appropriate specialized software.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHC010413 O211** | **Structure of Matter** | **English** | **BS** | **Winter/Summer** | **6** | **45** | **0** | **30** | **Prof. G. Madjarova** | **gmadjarova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course is offered in several versions containing different numbers of academic hours and of credits assigned. It encompasses the part of chemistry, which addresses the description of chemical characteristics at the microscopic level. The lectures introduce basic concepts and terms of quantum mechanics and demonstrate their application to chemical objects. The knowledge, which allows prediction of chemical characteristics and theoretical interpretation of the behaviour of real discrete systems is presented. The topics include: energy spectra of atoms and molecules; nature of chemical bonding; molecular structure and electron density; intermolecular forces, hydrogen bonds, modulating effects of the environment, etc. The symmetry apparatus is taught and practiced. During the computational practicum students acquire hands-on experience with basic computational software by using it to calculate molecular properties of an individually assigned molecule. All results are summarized at the end of the semester and presented and discussed during a written test. After completing the course students are familiar with the fundamental concepts of the structure of matter, are able to apply them for interpreting chemical properties at the molecular level, and understand and discuss the outcome of simple molecular simulations.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHC010413 E212** | **Application of Statistics in Molecular Modelling** | **English** | **BS** | **Winter/Summer** | **5** | **45** | **0** | **15** | **Prof. A. Ivanova** | **aivanova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course enables students to apply basic approaches for statistical analysis to datasets obtained from molecular modelling. The lectures introduce basic concepts of molecular modelling with focus on collection and processing of numerical data yielded by multiple-step molecular simulations. The main goal is presentation of the techniques for statistical analysis of such data arrays. The sources of and methods for estimation of statistical errors are reviewed. The exercises are oriented towards practical mastering of these techniques. Software products for statistical analysis are learned and competences for evaluation of molecular properties by statistical assessment are developed. After completing the course students are able to apply methods for statistical analysis on temporal and other datasets, to extract characteristics of chemical objects and to interpret the physical meaning of the obtained numerical estimates.

**Requirements for enrollment: NO**

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHC010413 E322** | **Optical properties of functional organic compounds** | **English** | **BS** | **Summer** | **5** | **30** | **30** | **0** | **Assoc. Prof. St. Stoyanov** | **ohss@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course gives the students an opportunity to expand their knowledge on the fundamental rules which connect the optical properties of organic compounds and their structure. The main approaches towards designed synthesis of organic compounds with desired photophysical properties are discussed along with theoretical and practical training in some of the most powerful "state-of-the-art" spectroscopic techniques and photochemical methods. Special attention will be paid on the reflectance spectroscopy and perception of color, and also on the real-life applications of specific structures for optical sensing, light harvesting, etc. In summary, the course aims at building bridges between the most common spectroscopic methods, the organic compounds' structure, the fine tuning of their optical properties, and their hi-tech applications.

**Requirements for enrollment: NO**

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHC010413 E321** | **Organic Photochemistry** | **English** | **BS** | **Winter** | **5** | **45** | **15** | **0** | **Assoc. Prof. St. Stoyanov** | **ohss@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction)**

The course aims at getting the students acquainted with the structural specifics and reactivity of organic molecules in their electronically excited state, as well as some applications of the light-matter interactions. The main accent is the comparison between thermal and light induced activation in the case of different classes of organic compounds, e.g. carbonyls, alkenes, dienes, arenes, etc. The pros and cons of using UV/Vis light as initiator of reactions without analog in the "classic" organic synthesis are also discussed.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHC010413 E112** | **Chemometrics** | **English** | **BS** | **Summer** | **5** | **45** | **30** | **0** | **Prof. S. Tsakovski** | **STsakovski@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course focuses on the application of traditional methods of classical and multivariate statistics as a tool for assessment, classification, interpretation and modelling of data sets obtained from chemical, environmental and clinical studies. The practical exercises are based on real-life data sets and include assessment of analytical procedures, design of experiments, exploratory and modelling analysis.
The results are discussed and summarized into a term project, which is defended at the end of the course.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| **CHC010413 O122** | **Modern Instrumental Methods for Analysis - Molecular Spectroscopy and Magnetic Methods** | **English** | **BS** | **Summer** | **7** | **60** | | **45** | **Prof. G. Gencheva** | **ahgg@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The aim of this course is to give a theoretical and practical introduction into selected instrumental analytical methods (UV-Vis and molecular fluorescence spectroscopy, Fourier Transform Infrared (FT-IR) and Raman spectroscopy, circular dichroism, magnetic resonance spectroscopy: NMR and ESR) as well as to present the opportunities for their contemporary application in structural and quantitative characterization of chemicals, bio-molecules and bio-conjugates, polymers, materials, surfaces, etc. The goal of the course is to equip students with practical skills for interpretation of spectra and data and thus to enable them in using of the presented methods in their research work.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHC010413 E122** | **Vibrational Spectroscopy – methods and application (elective)** | **English** | **BS** | **Summer** | **4** | **30** | | **30** | **Prof. G. Gencheva** | ahgg@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** In-depth course on the principal of vibrational spectroscopy: Fourier Transform Infrared (FT-IR) spectroscopy, IR-Microscopy, FT-Raman spectroscopy and their use in solving problems of structural, functional and quantitative analysis of organic, organometallic and inorganic compounds.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHC010413 E251** | **Quantum Chemistry and Molecular Mechanics** | **English** | **BS** | **Winter/Summer** | **5** | **45** | **0** | **15** | **Prof. G. Madjarova** | gmadjarova@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The course acquaints students with the modern methods of quantum chemistry and molecular mechanics that allow theoretical determination of molecular characteristics: conformational search, geometry, electronic densities, energy spectrum. The program includes a general introduction of the main classes of modern quantum-chemical methods and discusses their application limits. The potential functions and parameters of the molecular mechanical force field are also discussed. Specific illustrative examples are provided.

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| Lectures and exercises are practically oriented. Each student receives an individual course project. |
| **Requirements for enrollment: NO** |

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHC010413 O212** | **Modern Instrumental Methods of Analysis – Atomic Spectroscopy and Chromatographic Methods** | **English** | **BS** | **Winter** | **7** | **60** | | **45** | **Assoc. Prof. V. Lyubomirova** | **vlah@chem.uni-sofia.bg** |

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| **Short description of the course (done in the language of instruction):** The aim of the course is to give a theoretical and practical introduction into atomic spectroscopic (AAS, ICP-AES, ICP-MS, XRF) and chromatographic methods (GC, LC, IC). The students are introduced to the basic theory, specific interferences, advantages and disadvantages of the atomic spectroscopic methods and their application for quantitative analysis of the elemental composition of samples (gas, liquid, or solid). The course presents the theory and the possibilities for application of modern chromatographic methods for the analysis of organic compounds. It includes practical exercises to train different approaches for sample preparation, instrument optimization, calibration, analysis and data processing. |
| **Requirements for enrollment: NO** |

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM050424E 252** | **Informatics Computers Statistics** | **English** | **BS/MS** | **Summer** | **7** | **30** | **75** | **0** | **Dr. M. Avramov** | mavramov@chem.uni-sofia.bg |

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| **Short description of the course (done in the language of instruction):**<br>**Course Overview:** The objective of this course is to equip students with a comprehensive quantitative methodology for processing experimental |

measurement results. The course places significant emphasis on the general process of modelling experimental objects, exploring various options for model selection and evaluation. It delves into the analysis of factors
that influence experimentally measurable results, with a primary focus on distinguishing between random (stochastic) and systematic components in measured quantities. Students will learn methods for optimal experiment planning, including strategies for minimizing errors and maximizing data reliability. The course also covers principles of experimental and numerical optimization, as well as time series analysis, providing a solid foundation for understanding temporal data patterns.

**Software and Technology Integration:** An integral part of the course is familiarization with general-purpose software systems used in data analysis and modelling. Students will explore issues related to the structure and operation of the global information network, gaining practical skills in accessing and utilizing necessary information resources effectively.

**Practical Application:** To reinforce theoretical knowledge, the course includes problem-solving sessions in a computer laboratory setting. Seminar exercises are designed to enhance proficiency in software tools for analytical and numerical problem-solving. Laboratory sessions complement the lecture material by providing hands-on experience. The practical sessions are conducted in a computer lab and culminate in a course project at the end of the semester, allowing students to apply learned concepts to real-world scenarios.

The results are discussed and summarized into a term project, which is defended at the end of the course.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM050424E253** | **Microprocessor systems in measurement and control of technological devices** | **English** | **BS/MS/PhD** | **Summer** | **5.5** | **30** | **30** | **0** | **Dr. M. Avramov** | mavramov@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):**

Over the past years, the cost of manual labor—even domestically—has risen to match expenses associated with automated data processing and computerized control of technological processes. This shift underscores a primary strategic goal in both software and hardware engineering over the last 15-20 years: achieving widespread automation in everyday devices and industrial operations. Today, microprocessor control is a fundamental feature, embedded in nearly every household device produced in the last decade, from washing machines to air conditioners.

In contrast, scientific and industrial technology has lagged, often relying on equipment and methods 10-20 years old. Due to the longevity of existing equipment, its full replacement may take another 5-10 years, but as analog devices become obsolete, there is an increasing need for specialists who can bridge this technological gap. Such experts require deep understanding of measurement parameters, data accuracy, and the integration of modern hardware and software for precise control and measurement.

This course prepares students for a future in embedded systems (embedded systems) by exploring key themes from a holistic perspective. Students will gain a foundational culture in the field, covering topics from sensor technology and microprocessor interfaces to real-time system integration. They will be equipped to design and implement systems that automate and optimize technological measurements and controls, meeting the evolving needs of modern scientific and industrial environments.

**Learning Objectives:** Graduates will be proficient in designing cost-effective microprocessor systems, integrating sensors, and building interfaces, with a focus on precise control and real-time data handling for various technological applications.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM050424E 253** | **Data and image processing** | **English** | **BS/MS/PhD** | **Summer** | **5.5** | **30** | **30** | **0** | **Dr. M. Avramov** | mavramov@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):**

The "Data and Image Processing" course offers a foundation in the use of intelligent devices and systems for automated measurement, control, and real-time data handling in various domains, including IoT (Internet of Things) and IIoT (Industrial Internet of Things). As these technologies become essential in both industrial and laboratory environments, this course introduces students to signal and image processing methodologies relevant to IoT/IIoT applications, where devices interact, share data, and improve operational efficiencies.

The course emphasizes the significance of digital signal processing for the automation of physical measurements and control processes, covering the types of signals, digitalization, and error management. Additionally, laboratory automation is addressed, with a focus on integrating sensors, data acquisition, and image processing in lab settings. From ultrasonic measurements and optical systems to calibration techniques and stereoscopic vision, students will explore how automated systems manage and analyze data streams, contributing to the advancement of laboratory technology.

By completing this course, students will be equipped with the essential skills to work with advanced image and data processing applications for IoT/IIoT and laboratory automation, gaining practical experience in signal analysis, data integration, and sensor applications in automated workflows.

**Requirements for enrollment: NO**

| Course code | | | Course | Semester | EC | Workload (hours) | | |
|---|---|---|---|---|---|---|---|---|

| | **Course Title** (in English) | **Language of instruction** | **offered to BA/BS, MA/MS, PhD** | **(winter/ summer)** | | **Lectures** | **Exercises/ Seminars** | **Practical work** | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHC010424 E253** | **Physical Chemistry II** | **English** | **BS/MS** | **Summer** | **9** | **60** | **60** | **0** | **Dr. M. Avramov** | mavramov@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):**

Physical Chemistry II is a dynamic and engaging course designed to deepen your understanding of how physical principles shape chemical phenomena. Building on prior knowledge in mathematics, general physics, and introductory physical chemistry, this course empowers you to explore a broad range of fascinating topics: from the behavior of electrolyte solutions and the kinetic theory of gases to chemical kinetics, surface phenomena, and colloid-dispersed systems. By combining theory with real-world applications, you will see how fundamental concepts translate into cutting-edge techniques used in research and industry.

A key highlight of this course is the laboratory practicum, which offers hands-on experience with modern experimental methods—such as electrical conductivity measurements, optical techniques, and refractometry—alongside a glimpse into emerging tools and technologies for investigating surfaces and dispersions. You will not only practice classical experiments but also get introduced to contemporary approaches relevant to nanotechnology, pharmacy, and computational chemistry.

By the end of this program, you will possess a solid foundation in physical and colloid chemistry principles, ready to tackle complex scientific problems independently. Whether you aspire to join a research team, contribute to the pharmaceutical industry, or push boundaries in computational chemistry, Physical Chemistry II will give you the knowledge, lab skills, and problem-solving mindset to excel.

**Requirements for enrollment: NO**

**Programme: BACHELOR PROGRAM ECO CHEMISTRY**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| CHE010413 E122 | Biocoordination chemistry (elective) | English | BS | Summer | 5 | 30 | 0 | 30 | Prof. A. Ahmedova | ahaa@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The modern bioinorganic (biocoordination) chemistry deals with the biological processes involving metalloenzymes and metalloproteins, focusing on the main structural and functional characteristics related to the presence of metal ion(s) in their active site. This involves deeper understanding of the properties of metal ions to form coordination compounds and the corresponding characteristics of their structure and reactivity that are directly connected with the biological activity. Another crucial subject of the bioinorganic chemistry is the application of metal complexes in medicine for diagnostics and therapy of wide range of diseases. The unique properties of the metal complexes and the knowledge about the structure-reactivity-biological activity relationship hold out the opportunity for intelligent design of metallopharmaceuticals with target properties and activity. That is why the subjects in the present teaching course will evolve from the fundamental coordination chemistry knowledge to the direct pharmaceutical applications of metal complexes as therapeutic or diagnostic agents including quickly developing field of radiopharmaceuticals. The students will have the opportunity to synthesize by themselves the first metal-based chemotherapeutics, the cisplatin, during the practical work of this course.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| CHE010413 E422 | Methods for dating of archaeological and geological materials | English | BS | Winter/Summer | 5 | 30 | 0 | 30 | Assoc. Prof. Petya Kovacheva | nhpk@wmail.chem.uni-sofia.bg |

**Short description of the course:** The course acquaints the students with the methods for absolute and relative dating of different archeological finds (bones, wood, charcoal, ceramics, textile, paper) and geological materials (rocks, minerals, stalactites, stalagmites). Among the methods discussed are: potassium-argon method, radiocarbon, radiocalcium, uranium series, thermoluminiscence, fission track method, racemization of aminoacids, isochron dating, dendrochronology, archaeomagnetism, obsidian hydration dating etc. The principle of each method, requirements for sampling, sample preparation and measurement techniques are described. General possibilities and limits of the dating methods are discussed. Examples of dated popular archaeological and geological objects are given to illustrate the applicability of the methods.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHE010413 E242** | **Molecular Design** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. A. Tadjer** | **tadjer@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** Molecular systems with predefined physical and chemical characteristics and/or biological activity are intensively sought both experimentally and theoretically. The course introduces the main classes of materials of interest for modern technologies, cosmetics, and pharmacy. The rules and schemes of QSPR are presented with accent on the design of compounds with potential for utilization into technology, pharmacy, and ecology. During the computational practicum each student is assigned an individual project aimed at modelling of a prospective compound from one of the above-mentioned groups. Specialized software and a wide range of computational methods are applied. The results are discussed and summarized into a term project, which is presented and defended in front of a professional audience at the end of the semester.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
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| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHE010413 E211** | **Molecular Modelling of Functional Materials** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. G. Madjarova** | **gmadjarova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course focuses on the application of quantum chemical methods for description of the relationships between the structure and properties of modern functional materials at the molecular level. The lectures introduce students to the mechanisms responsible for the specific characteristics of functional materials and outline the techniques for modelling them theoretically. Using Density Functional Theory, a set of quantities required for assessment of various physical and chemical molecular properties are calculated. The results obtained during the computational practicum for an individually assigned molecule are summarized into a written term project, which is submitted at the end of the semester. The knowledge obtained from the course enables students to perform directed molecular modelling of new more efficient, cheaper, more environmentally friendly, and durable materials.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| CHE010413 E241 | Quantum Chemistry | English | BS | Winter/Summer | 5 | 30 | 0 | 30 | Prof. A. Tadjer | tadjer@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The course acquaints students with the contemporary methods of quantum chemistry and their capacity for application to estimate molecular properties. The methods allowing theoretical determination of molecular characteristics such as geometry, electron density, and energy spectrum are presented. The theoretical foundation and the basic formalism of the methods are summarized and the areas of applicability are discussed. Appropriate illustrative examples are included. Both the lectures and the computational exercises are practically oriented. Each student is assigned an individual term project, which is summarized, submitted in writing and presented orally at the end of the semester. After completing the course students are able to carry out independently a basic computational study of a particular chemical or theoretical problem and to analyse adequately the obtained numerical data using the appropriate specialized software.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| CHE010413 O211 | Structure of Matter | English | BS | Winter/Summer | 5 | 30 | 0 | 30 | Prof. G. Madjarova | gmadjarova@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The course is offered in several versions containing different numbers of academic hours and of credits assigned. It encompasses the part of chemistry, which addresses the description of chemical characteristics at the microscopic level. The lectures introduce basic concepts and terms of quantum mechanics and demonstrate their application to chemical objects. The knowledge, which allows prediction of chemical characteristics and theoretical interpretation of the behaviour of real discrete systems is presented. The topics include: energy spectra of atoms and molecules; nature of chemical bonding; molecular structure and electron density; intermolecular forces, hydrogen bonds, modulating effects of the environment, etc. The symmetry apparatus is taught and practiced. During the computational practicum students acquire hands-on experience with basic computational software by using it to calculate molecular properties of an individually assigned molecule. All results are summarized at the end of the semester and presented and discussed during a written test. After completing the course students are familiar with the fundamental concepts of the structure of matter, are able to apply them for interpreting chemical properties at the molecular level,

| and understand and discuss the outcome of simple molecular simulations. |
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| **Requirements for enrollment: NO** |

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
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| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHE010413 E322** | **Optical properties of functional organic compounds** | **English** | **BS** | **Summer** | **5.5** | **30** | **30** | **0** | **Assoc. Prof. St. Stoyanov** | **ohss@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course gives the students an opportunity to expand their knowledge on the fundamental rules which connect the optical properties of organic compounds and their structure. The main approaches towards designed synthesis of organic compounds with desired photophysical properties are discussed along with theoretical and practical training in some of the most powerful "state-of-the-art" spectroscopic techniques and photochemical methods. Special attention will be paid on the reflectance spectroscopy and perception of color, and also on the real-life applications of specific structures for optical sensing, light harvesting, etc. In summary, the course aims at building bridges between the most common spectroscopic methods, the organic compounds' structure, the fine tuning of their optical properties, and their hi-tech applications.

**Requirements for enrollment: NO**

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** | |
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| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | | |
| **CHE0104113 O122** | **Modern Instrumental Methods for Analysis - Molecular Spectroscopy and Magnetic Methods** | **English** | **BS** | **Summer** | | **7** | **45** | **0** | **45** | **Prof. G. Gencheva** | **ahgg@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The aim of this course is to give a theoretical and practical introduction into selected instrumental analytical methods (UV-Vis and molecular fluorescence spectroscopy, Fourier Transform Infrared (FT-IR) and Raman spectroscopy, circular dichroism, magnetic resonance spectroscopy: NMR and ESR) as well as to present the opportunities for their contemporary application in structural and quantitative characterization of chemicals, bio-molecules and bio-conjugates, polymers, materials, surfaces, etc. The goal of the course is to equip students with practical skills for interpretation of spectra and data and thus to enable them in using of the presented methods in their research work.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHE010413 E122** | **Vibrational Spectroscopy – methods and application** | **English** | **BS** | **Summer** | **4** | **30** | | **30** | **Prof. G. Gencheva** | **ahgg@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** In-depth course on the principal of vibrational spectroscopy: Fourier Transform Infrared (FT-IR) spectroscopy, IR-Microscopy, FT-Raman spectroscopy and their use in solving problems of structural, functional and quantitative analysis of organic, organometallic and inorganic compounds.

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| **CHE010413 E221** | **Quantum Chemistry and Molecular Mechanics** | **English** | **BS** | **Winter/Summer** | **5** | **45** | **0** | **15** | **Prof. G. Madjarova** | **gmadjarova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course acquaints students with the modern methods of quantum chemistry and molecular mechanics that allow theoretical determination of molecular characteristics: conformational search, geometry, electronic densities, energy spectrum. The program includes a general introduction of the main classes of modern quantum-chemical methods and discusses their application limits. The potential functions and parameters of the molecular mechanical force field are also discussed. Specific illustrative examples are provided.

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| Lectures and exercises are practically oriented. Each student receives an individual course project. |
| **Requirements for enrollment: NO** |

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHE010413 E212** | **Application of Statistics in Molecular Modelling** | **English** | **BS** | **Winter/Summer** | **5** | **45** | **0** | **15** | **Prof. A. Ivanova** | **aivanova@chem.uni-sofia.bg** |

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| **Short description of the course (done in the language of instruction):** The course enables students to apply basic approaches for statistical analysis to datasets obtained from molecular modelling. The lectures introduce basic concepts of molecular modelling with focus on collection and processing of numerical data yielded by multiple-step molecular simulations. The main goal is presentation of the techniques for statistical analysis of such data arrays. The sources of and methods for estimation of statistical errors are reviewed. The exercises are oriented towards practical mastering of these techniques. Software products for statistical analysis are learned and competences for evaluation of molecular properties by statistical assessment are developed. After completing the course students are able to apply methods for statistical analysis on temporal and other datasets, to extract characteristics of chemical objects and to interpret the physical meaning of the obtained numerical estimates. |
| **Requirements for enrollment: NO** |

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Course code** | **Course Title** (in English) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Lectures** | **Exercises/Seminars** | **Practical work** | | |
| **CHC010416 E122** | **Modern Instrumental Methods of Analysis – Atomic Spectroscopy** | **English** | **BS** | **Winter** | **7** | **60** | | **45** | **Assoc. Prof. V. Lyubomirova** | **vlah@chem.uni-sofia.bg** |

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|---|---|---|---|---|---|---|---|---|---|---|
| | **and Chromatographic Methods** | | | | | | | | | |

**Short description of the course (done in the language of instruction):** The aim of the course is to give a theoretical and practical introduction into atomic spectroscopic (AAS, ICP-AES, ICP-MS, XRF) and chromatographic methods (GC, LC, IC). The students are introduced to the basic theory, specific interferences, advantages and disadvantages of the atomic spectroscopic methods and their application for quantitative analysis of the elemental composition of samples (gas, liquid, or solid). The course presents the theory and the possibilities for application of modern chromatographic methods for the analysis of organic compounds. It includes practical exercises to train different approaches for sample preparation, instrument optimization, calibration, analysis and data processing.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | | ECTS | Workload (hour) Lectures | Exercises/ Seminars | Practical work | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHE010424E123** | **Advanced Inorganic Chemistry** | **English** | **BS** | **Winter/Summer** | **3** | **45** | **0** | **0** | *Assoc. Prof.* **J. Romanova**<br>*Assoc. Prof.* **B. Donkova** | **jromanova@chem.uni-sofia.bg**<br>**nhbd@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The *Advanced Inorganic Chemistry* course is built on concepts trained in the *General* and *Inorganic Chemistry* modules. The course will demonstrate the relationship between structure and properties of compounds, as well as how the chemical bonding and electronic structure give rise to useful properties, relevant to industry, technology, medicine, biology and chemistry. It is organized in three topics starting from atoms through molecules to coordination compounds and supramolecular structures. In the first two topics, the course extends the students' knowledge in modern theories of the structure of atom, the nature of chemical bond in diatomic and polyatomic molecules and fragments, and of electrochemical activity of elements and their species. The focus of the third topic are transition-metal complexes: their nomenclature, theories for description of the binding of ligands, isomerism, optical and magnetic properties, thermodynamic and kinetic stability, as well as various types of reactions involving coordination compounds. The third topic covers also supramolecular metal-organic compounds: their nomenclature, structure, host-guest interactions, functions and useful applications. The lecture notes are supported by many examples, which facilitates the perception and comprehension of the subject.

**Requirements for enrollment: NO**

**Programme BACHELOR PROGRAM COMPUTER CHEMISTRY**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM010413 E122** | **Biocoordination chemistry (elective)** | **English** | **B. Sc./ MSi** | **Summer/ Winter** | **5** | **30** | **0** | **30** | **Prof. A. Ahmedova** | **ahaa@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The modern bioinorganic (biocoordination) chemistry deals with the biological processes involving metalloenzymes and metalloproteins, focusing on the main structural and functional characteristics related to the presence of metal ion(s) in their active site. This involves deeper understanding of the properties of metal ions to form coordination compounds and the corresponding characteristics of their structure and reactivity that are directly connected with the biological activity. Another crucial subject of the bioinorganic chemistry is the application of metal complexes in medicine for diagnostics and therapy of wide range of diseases. The unique properties of the metal complexes and the knowledge about the structure-reactivity-biological activity relationship hold out the opportunity for intelligent design of metallopharmaceuticals with target properties and activity. That is why the subjects in the present teaching course will evolve from the fundamental coordination chemistry knowledge to the direct pharmaceutical applications of metal complexes as therapeutic or diagnostic agents including quickly developing field of radiopharmaceuticals. The students will have the opportunity to synthesize by themselves the first metal-based chemotherapeutics, the cisplatin, during the practical work of this course.\

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| **CHM010413 E421** | **Methods for dating of archaeological and geological materials** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Assoc. Prof. Petya Kovacheva** | **nhpk@wmail.chem.uni-sofia.bg** |

**Short description of the course:** The course acquaints the students with the methods for absolute and relative dating of different archeological finds (bones, wood, charcoal, ceramics, textile, paper) and geological materials (rocks, minerals, stalactites, stalagmites). Among the methods discussed are: potassium-argon method, radiocarbon, radiocalcium, uranium series, thermoluminiscence, fission track method, racemization of aminoacids, isochron dating, dendrochronology, archaeomagnetism, obsidian hydration dating etc. The principle of each method, requirements for sampling, sample preparation and measurement techniques are described. General possibilities and limits of the dating methods are discussed. Examples of dated popular archaeological and geological objects are given to illustrate the applicability of the methods.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM010413 E241** | **Molecular Design** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. A. Tadjer** | **tadjer@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** Molecular systems with predefined physical and chemical characteristics and/or biological activity are intensively sought both experimentally and theoretically. The course introduces the main classes of materials of interest for modern technologies, cosmetics, and pharmacy. The rules and schemes of QSPR are presented with accent on the design of compounds with potential for utilization into technology, pharmacy, and ecology. During the computational practicum each student is assigned an individual project aimed at modelling of a prospective compound from one of the above-mentioned groups. Specialized software and a wide range of computational methods are applied. The results are discussed and summarized into a term project, which is presented and defended in front of a professional audience at the end of the semester.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM010413 E211** | **Molecular Modelling of Functional Materials** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. G. Madjarova** | **gmadjarova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course focuses on the application of quantum chemical methods for description of the relationships between the structure and properties of modern functional materials at the molecular level. The lectures introduce students to the mechanisms responsible for the specific characteristics of functional materials and outline the techniques for modelling them theoretically. Using Density Functional Theory, a set of quantities required for assessment of various physical and chemical molecular properties are calculated. The results obtained during the computational practicum for an individually assigned molecule are summarized into a written term project, which is submitted at the end of the semester. The knowledge obtained from the course enables students to perform directed molecular modelling of new more efficient, cheaper, more environmentally friendly, and durable materials.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM010413 E242** | **Quantum Chemistry** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. A. Tadjer** | **tadjer@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course acquaints students with the contemporary methods of quantum chemistry and their capacity for application to estimate molecular properties. The methods allowing theoretical determination of molecular characteristics such as geometry, electron density, and energy spectrum are presented. The theoretical foundation and the basic formalism of the methods are summarized and the areas of applicability are discussed. Appropriate illustrative examples are included. Both the lectures and the computational exercises are practically oriented. Each student is assigned an individual term project, which is summarized, submitted in writing and presented orally at the end of the semester. After completing the course students are able to carry out independently a basic computational study of a particular chemical or theoretical problem and to analyse adequately the obtained numerical data using the appropriate specialized software.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM010413 O231** | **Theoretical Chemistry** | **English** | **BS** | **Winter/Summer** | **7** | **45** | **0** | **45** | **Assist. Prof. Jasmina Petkova** | **fhjp@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course encompasses the part of Physical chemistry related to the properties of microscopic systems. It presents a short overview of basic concepts and ideas of quantum mechanics and demonstrates their application to chemical objects. The main objective of the course is to provide fundamental and applied knowledge for prediction of molecular characteristics and interpretation of the behaviour of real systems. Concepts such as nature of chemical bonding, geometry of molecules, electron density distribution, and energy spectra are clarified. A separate chapter is devoted to the description of weak intermolecular interactions, hydrogen bonds, environment effects. The role of symmetry for solving chemical problems is outlined. The computational exercises comprise practice with software products to calculate molecular properties. Each student is assigned an individual molecule, the results for which are summarized and submitted as a term project at the end of the semester.

Upon completion of the course students consolidate and broaden their knowledge on atomic structure, nature and specifics of chemical bonds, structure-property relationships, influence of the environment and capabilities for molecular modelling of processes and materials. The basic logics of software products for molecular simulations is familiar.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| **CHM010413 O512** | **Bioorganic Chemistry** | **English** | **BS** | **Summer** | **8** | **60** | **45** | **0** | **Prof. Todor Dudev** | **t.dudev@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course is intended to provide a general knowledge on the structure and properties of the basic bioorganic molecules such as proteins, nucleic acids, carbohydrates, lipids, hormones/neurotransmitters and vitamins. Special attention will be given to the processes regulating the vital processes in the cell such as respiration, food assimilation, signal transduction, protein synthesis, muscle contraction, blood coagulation and enzyme activation.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM010413** O552 | Instrumental Methods for Analysis | English | BS | Summer | 6 | 45 | 30 | 0 | Prof. Todor Dudev | t.dudev@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The students will acquire basic knowledge and skills in applying instrumental methods in solving various problems in chemistry and pharmaceutical chemistry. Methods such as UV/VIS, Fluorescence, Infrared, Raman, NMR spectroscopy and Mass spectrometry are included. As a result of the successful completion of the course students will be able to perform both quantitative and qualitative analyses of the samples of interest as well as choose the most appropriate approach to solve the analytical problem.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| **CHM010413 O522** | **Quantitative structure-activity relationship (QSAR)** | **English** | **BS** | **Summer** | **6** | **30** | **45** | **0** | **Assoc. Prof. Diana Cheshmedzhieva** | **dvalentinova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The Quantitative Structure-activity relationship (QSAR) modeling is one of the major computational tools employed in medicinal chemistry and rational drug design. In the course students are introduced to some Molecular modeling methods that are relevant to drug design and 2D – and 3D – QSAR approaches. The students will learn how to build a QSAR model, how to choose between different models and how to interpret the data.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM010413 E322** | **Optical properties of functional organic compounds** | **English** | **BS** | **summer** | **5** | **30** | **30** | **0** | **Assoc. Prof. St. Stoyanov** | **ohss@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course gives the students an opportunity to expand their knowledge on the fundamental rules which connect the optical properties of organic compounds and their structure. The main approaches towards designed synthesis of organic compounds with desired photophysical properties are discussed along with theoretical and practical training in some of the most powerful "state-of-the-art" spectroscopic techniques and photochemical methods. Special attention will be paid on the reflectance spectroscopy and perception of color, and also on the real-life applications of specific structures for optical sensing, light harvesting, etc. In summary, the course aims at building bridges between the most common spectroscopic methods, the organic compounds' structure, the fine tuning of their optical properties, and their hi-tech applications.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM010413 O111** | **Chemometrics** | **English** | **BS** | **Winter/Summer** | **6** | **45** | **30** | **0** | **Prof. S. Tsakovski** | **STsakovski@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course focuses on the application of traditional methods of classical and multivariate statistics as a tool for assessment, classification, interpretation and modelling of data sets obtained from chemical, environmental and clinical studies. The practical exercises are based on real-life data sets and include assessment of analytical procedures, design of experiments, exploratory and modelling analysis.

The results are discussed and summarized into a term project, which is defended at the end of the course.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| **CHM010413 E122** | **Vibrational Spectroscopy – methods and application** | **English** | **BS** | **Summer** | **5** | **30** | **0** | **30** | **Prof. G. Gencheva** | **ahgg@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** In-depth course on the principal of vibrational spectroscopy: Fourier Transform Infrared (FT-IR) spectroscopy, IR-Microscopy, FT-Raman spectroscopy and their use in solving problems of structural, functional and quantitative analysis of organic, organometallic and inorganic compounds.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM010413 E251** | **Quantum Chemistry and Molecular Mechanics** | **English** | **BS** | **Winter/Summer** | **5** | **45** | **0** | **15** | **Prof. G. Madjarova** | gmadjarova@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The course acquaints students with the modern methods of quantum chemistry and molecular mechanics that allow theoretical determination of molecular characteristics: conformational search, geometry, electronic densities, energy spectrum. The program includes a general introduction of the main classes of modern quantum-chemical methods and discusses their application limits. The potential functions and parameters of the molecular mechanical force field are also discussed. Specific illustrative examples are provided. Lectures and exercises are practically oriented. Each student receives an individual course project.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHM010413 E212** | **Application of Statistics in Molecular Modelling** | **English** | **BS** | **Winter/Summer** | **5** | **45** | **0** | **15** | **Prof. A. Ivanova** | aivanova@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The course enables students to apply basic approaches for statistical analysis to datasets obtained from molecular modelling. The lectures introduce basic concepts of molecular modelling with focus on collection and processing of numerical data yielded by multiple-step molecular simulations. The main goal is presentation of the techniques for statistical analysis of such data arrays. The sources of and methods for estimation of statistical errors are reviewed. The exercises are oriented towards practical mastering of these techniques. Software products for statistical analysis are learned and competences for evaluation of molecular properties by statistical assessment are developed. After completing the course students are able to apply methods for statistical analysis on temporal and other datasets, to extract characteristics of chemical objects and to interpret the physical meaning of the obtained numerical estimates.

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| **Requirements for enrollment: NO** |

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| ??? | **Modern Instrumental Methods of Analysis – Atomic Spectroscopy and Chromatographic Methods** | English | BS | Winter | 7 | 60 | | 45 | Assoc. Prof. V. Lyubomirova | vlah@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The aim of the course is to give a theoretical and practical introduction into atomic spectroscopic (AAS, ICP-AES, ICP-MS, XRF) and chromatographic methods (GC, LC, IC). The students are introduced to the basic theory, specific interferences, advantages and disadvantages of the atomic spectroscopic methods and their application for quantitative analysis of the elemental composition of samples (gas, liquid, or solid). The course presents the theory and the possibilities for application of modern chromatographic methods for the analysis of organic compounds. It includes practical exercises to train different approaches for sample preparation, instrument optimization, calibration, analysis and data processing.

**Requirements for enrollment: NO**

**Programme BACHELOR PROGRAM CHEMICAL ENGINEERING AND CONTEMPORARY MATERIALS**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| CHG010413 E122 | **Biocoordination chemistry** | English | BS | Summer/ Winter | 4 | 30 | 0 | 30 | Prof. A. Ahmedova | ahaa@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The modern bioinorganic (biocoordination) chemistry deals with the biological processes involving metalloenzymes and metalloproteins, focusing on the main structural and functional characteristics related to the presence of metal ion(s) in their active site. This involves deeper understanding of the properties of metal ions to form coordination compounds and the corresponding characteristics of their structure and reactivity that are directly connected with the biological activity. Another crucial subject of the bioinorganic chemistry is the application of metal complexes in medicine for diagnostics and therapy of wide range of diseases. The unique properties of the metal complexes and the knowledge about the structure-reactivity-biological activity relationship hold out the opportunity for intelligent design of metallopharmaceuticals with target properties and activity. That is why the subjects in the present teaching course will evolve from the fundamental coordination chemistry knowledge to the direct pharmaceutical applications of metal complexes as therapeutic or diagnostic agents including quickly developing field of radiopharmaceuticals. The students will have the opportunity to synthesize by themselves the first metal-based chemotherapeutics, the cisplatin, during the practical work of this course.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHG010413 E241** | **Molecular Design** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. A. Tadjer** | **tadjer@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** Molecular systems with predefined physical and chemical characteristics and/or biological activity are intensively sought both experimentally and theoretically. The course introduces the main classes of materials of interest for modern technologies, cosmetics, and pharmacy. The rules and schemes of QSPR are presented with accent on the design of compounds with potential for utilization into technology, pharmacy, and ecology. During the computational practicum each student is assigned an individual project aimed at modelling of a prospective compound from one of the above-mentioned groups. Specialized software and a wide range of computational methods are applied. The results are discussed and summarized into a term project, which is presented and defended in front of a professional audience at the end of the semester.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHG010413 E421** | **Methods for dating of archaeological and geological materials** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Assoc. Prof. Petya Kovacheva** | **nhpk@wmail.chem.uni-sofia.bg** |

**Short description of the course:** The course acquaints the students with the methods for absolute and relative dating of different archeological finds (bones, wood, charcoal, ceramics, textile, paper) and geological materials (rocks, minerals, stalactites, stalagmites). Among the methods discussed are:

potassium-argon method, radiocarbon, radiocalcium, uranium series, thermoluminiscence, fission track method, racemization of aminoacids, isochron dating, dendrochronology, archaeomagnetism, obsidian hydration dating etc. The principle of each method, requirements for sampling, sample preparation and measurement techniques are described. General possibilities and limits of the dating methods are discussed. Examples of dated popular archaeological and geological objects are given to illustrate the applicability of the methods.

**Requirements for enrollment: NO**

<table>
<tr><th rowspan="2">Course code</th><th rowspan="2">Course Title (in English)</th><th rowspan="2">Language of instruction</th><th rowspan="2">Course offered to BA/BS, MA/MS, PhD</th><th rowspan="2">Semester (winter/ summer)</th><th rowspan="2">ECTS</th><th colspan="3">Workload (hours)</th><th rowspan="2">Lecturer/s's name</th><th rowspan="2">Lecturer/s's e-mail/s</th></tr>
<tr><th>Lectures</th><th>Exercises/ Seminars</th><th>Practical work</th></tr>
<tr><td>CHG010413 E211</td><td>Molecular Modelling of Functional Materials</td><td>English</td><td>BS</td><td>Winter/Summer</td><td>5</td><td>30</td><td>0</td><td>30</td><td>Prof. G. Madjarova</td><td>gmadjarova@chem.uni-sofia.bg</td></tr>
</table>

**Short description of the course (done in the language of instruction):** The course focuses on the application of quantum chemical methods for description of the relationships between the structure and properties of modern functional materials at the molecular level. The lectures introduce students to the mechanisms responsible for the specific characteristics of functional materials and outline the techniques for modelling them theoretically. Using Density Functional Theory, a set of quantities required for assessment of various physical and chemical molecular properties are calculated. The results obtained during the computational practicum for an individually assigned molecule are summarized into a written term project, which is submitted at the end of the semester. The knowledge obtained from the course enables students to perform directed molecular modelling of new more efficient, cheaper, more environmentally friendly, and durable materials.

**Requirements for enrollment: NO**

<table>
<tr><th rowspan="2">Course code</th><th rowspan="2">Course Title (in English)</th><th rowspan="2">Language of instruction</th><th rowspan="2">Course offered to BA/BS, MA/MS, PhD</th><th rowspan="2">Semester (winter/ summer)</th><th rowspan="2">ECTS</th><th colspan="3">Workload (hours)</th><th rowspan="2">Lecturer/s's name</th><th rowspan="2">Lecturer/s's e-mail/s</th></tr>
<tr><th>Lectures</th><th>Exercises/ Seminars</th><th>Practical work</th></tr>
<tr><td>CHG010413 E241</td><td>Quantum Chemistry</td><td>English</td><td>BS</td><td>Winter/Summer</td><td>5</td><td>30</td><td>0</td><td>30</td><td>Prof. A. Tadjer</td><td>tadjer@chem.uni-sofia.bg</td></tr>
</table>

**Short description of the course (done in the language of instruction):** The course acquaints students with the contemporary methods of quantum chemistry and their capacity for application to estimate molecular properties. The methods allowing theoretical determination of molecular characteristics such as geometry, electron density, and energy spectrum are presented. The theoretical foundation and the basic formalism of the methods are summarized and the areas of applicability are discussed. Appropriate illustrative examples are included. Both the lectures and the computational exercises are practically oriented. Each student is assigned an individual term project, which is summarized, submitted in writing and presented orally at the end of the semester. After completing the course students are able to carry out independently a basic computational study of a particular chemical or theoretical problem and to analyse adequately the obtained numerical data using the appropriate specialized software.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHG010413 O211** | **Structure of Matter** | **English** | **BS** | **Winter/Summer** | **4** | **45** | **0** | **15** | **Prof. A. Ivanova** | **aivanova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course is offered in several versions containing different numbers of academic hours and of credits assigned. It encompasses the part of chemistry, which addresses the description of chemical characteristics at the microscopic level. The lectures introduce basic concepts and terms of quantum mechanics and demonstrate their application to chemical objects. The knowledge, which allows prediction of chemical characteristics and theoretical interpretation of the behaviour of real discrete systems is presented. The topics include: energy spectra of atoms and molecules; nature of chemical bonding; molecular structure and electron density; intermolecular forces, hydrogen bonds, modulating effects of the environment, etc. The symmetry apparatus is taught and practiced. During the computational practicum students acquire hands-on experience with basic computational software by using it to calculate molecular properties of an individually assigned molecule. All results are summarized at the end of the semester and presented and discussed during a written test. After completing the course students are familiar with the fundamental concepts of the structure of matter, are able to apply them for interpreting chemical properties at the molecular level, and understand and discuss the outcome of simple molecular simulations.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHG010413 E322** | **Optical properties of functional organic compounds** | **English** | **BS** | **Summer** | **5** | **30** | **30** | **0** | **Assoc. Prof. St. Stoyanov** | **ohss@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course gives the students an opportunity to expand their knowledge on the fundamental rules which connect the optical properties of organic compounds and their structure. The main approaches towards designed synthesis of organic compounds with desired photophysical properties are discussed along with theoretical and practical training in some of the most powerful "state-of-the-art" spectroscopic techniques and photochemical methods. Special attention will be paid on the reflectance spectroscopy and perception of color, and also on the real-life applications of specific structures for optical sensing, light harvesting, etc. In summary, the course aims at building bridges between the most common spectroscopic methods, the organic compounds' structure, the fine tuning of their optical properties, and their hi-tech applications.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
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| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHG010413 E122** | **Modern Instrumental Methods for Analysis - Molecular Spectroscopy and Magnetic Methods** | **English** | **BS /MS** | **Summer** | **5** | **30** | **0** | **30** | **Assoc. Prof. G. Gencheva** | **ahgg@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The aim of this course is to give a theoretical and practical introduction into selected instrumental analytical methods (UV-Vis and molecular fluorescence spectroscopy, Fourier Transform Infrared (FT-IR) and Raman spectroscopy, circular dichroism, magnetic resonance spectroscopy: NMR and ESR) as well as to present the opportunities for their contemporary application in structural and quantitative characterization of chemicals, bio-molecules and bio-conjugates, polymers, materials, surfaces, etc. The goal of the course is to equip students with practical skills for interpretation of spectra and data and thus to enable them in using of the presented methods in their research work.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHG010413 E251** | **Quantum Chemistry and Molecular Mechanics** | **English** | **BS** | **Winter/Summer** | **5** | **45** | **0** | **15** | **Prof. G. Madjarova** | **gmadjarova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course acquaints students with the modern methods of quantum chemistry and molecular mechanics that allow theoretical determination of molecular characteristics: conformational search, geometry, electronic densities, energy spectrum. The program includes a general introduction of the main classes of modern quantum-chemical methods and discusses their application

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| limits. The potential functions and parameters of the molecular mechanical force field are also discussed. Specific illustrative examples are provided. Lectures and exercises are practically oriented. Each student receives an individual course project. |
| **Requirements for enrollment: NO** |

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHG010413 E212** | **Application of Statistics in Molecular Modelling** | **English** | **BS** | **Winter/Summer** | **5** | **45** | **0** | **15** | **Prof. A. Ivanova** | **aivanova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course enables students to apply basic approaches for statistical analysis to datasets obtained from molecular modelling. The lectures introduce basic concepts of molecular modelling with focus on collection and processing of numerical data yielded by multiple-step molecular simulations. The main goal is presentation of the techniques for statistical analysis of such data arrays. The sources of and methods for estimation of statistical errors are reviewed. The exercises are oriented towards practical mastering of these techniques. Software products for statistical analysis are learned and competences for evaluation of molecular properties by statistical assessment are developed. After completing the course students are able to apply methods for statistical analysis on temporal and other datasets, to extract characteristics of chemical objects and to interpret the physical meaning of the obtained numerical estimates.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| **???** | **Modern Instrumental Methods of Analysis – Atomic Spectroscopy and Chromatographic Methods** | **English** | **BS** | **Winter** | **7** | **60** | | **45** | **Assoc. Prof. V. Lyubomirova** | **vlah@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The aim of the course is to give a theoretical and practical introduction into atomic spectroscopic (AAS, ICP-AES, ICP-MS, XRF) and chromatographic methods (GC, LC, IC). The students are introduced to the basic theory, specific interferences, advantages and disadvantages of the atomic spectroscopic methods and their application for quantitative analysis of the elemental composition of samples (gas, liquid, or solid). The course presents the theory and the possibilities for application of modern chromatographic methods for the analysis of organic compounds. It includes practical exercises to train different approaches for sample preparation, instrument optimization,

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| calibration, analysis and data processing. |
| **Requirements for enrollment:  NO** |

**Programme BACHELOR PROGRAM NUCLEAR CHEMISTRY**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHA010413 E122** | **Biocoordination chemistry** | **English** | **BS** | **Summer** | **5** | **30** | **0** | **30** | **Prof. A. Ahmedova** | ahaa@chem.uni-sofia.bg |
| **Short description of the course (done in the language of instruction):** The modern bioinorganic (biocoordination) chemistry deals with the biological processes involving metalloenzymes and metalloproteins, focusing on the main structural and functional characteristics related to the presence of metal ion(s) in their active site. This involves deeper understanding of the properties of metal ions to form coordination compounds and the corresponding characteristics of their structure and reactivity that are directly connected with the biological activity. Another crucial subject of the bioinorganic chemistry is the application of metal complexes in medicine for diagnostics and therapy of wide range of diseases. The unique properties of the metal complexes and the knowledge about the structure-reactivity-biological activity relationship hold out the opportunity for intelligent design of metallopharmaceuticals with target properties and activity. That is why the subjects in the present teaching course will evolve from the fundamental coordination chemistry knowledge to the direct pharmaceutical applications of metal complexes as therapeutic or diagnostic agents including quickly developing field of radiopharmaceuticals. The students will have the opportunity to synthesize by themselves the first metal-based chemotherapeutics, the cisplatin, during the practical work of this course. | | | | | | | | | | |
| **Requirements for enrollment:  NO** | | | | | | | | | | |

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHA010413 E421** | **Methods for dating of archaeological and** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Assoc. Prof. Petya** | nhpk@wmail.chem.uni- |

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| | **geological materials** | | | | | | | | **Kovacheva** | sofia.bg |

**Short description of the course:** The course acquaints the students with the methods for absolute and relative dating of different archeological finds (bones, wood, charcoal, ceramics, textile, paper) and geological materials (rocks, minerals, stalactites, stalagmites). Among the methods discussed are: potassium-argon method, radiocarbon, radiocalcium, uranium series, thermoluminiscence, fission track method, racemization of aminoacids, isochron dating, dendrochronology, archaeomagnetism, obsidian hydration dating etc. The principle of each method, requirements for sampling, sample preparation and measurement techniques are described. General possibilities and limits of the dating methods are discussed. Examples of dated popular archaeological and geological objects are given to illustrate the applicability of the methods.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) Lectures | Workload (hours) Exercises/ Seminars | Workload (hours) Practical work | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHA010413 E242** | **Molecular Design** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. A. Tadjer** | tadjer@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** Molecular systems with predefined physical and chemical characteristics and/or biological activity are intensively sought both experimentally and theoretically. The course introduces the main classes of materials of interest for modern technologies, cosmetics, and pharmacy. The rules and schemes of QSPR are presented with accent on the design of compounds with potential for utilization into technology, pharmacy, and ecology. During the computational practicum each student is assigned an individual project aimed at modelling of a prospective compound from one of the above-mentioned groups. Specialized software and a wide range of computational methods are applied. The results are discussed and summarized into a term project, which is presented and defended in front of a professional audience at the end of the semester.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) Lectures | Workload (hours) Exercises/ Seminars | Workload (hours) Practical work | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHA010413 E211** | **Molecular Modelling of Functional Materials** | **English** | **BS** | **Winter/Summer** | **5** | **30** | **0** | **30** | **Prof. G. Madjarova** | gmadjarova@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The course focuses on the application of quantum chemical methods for description of the relationships between the structure and properties of modern functional materials at the molecular level. The lectures introduce students to the mechanisms responsible for the specific characteristics of functional materials and outline the techniques for modelling them theoretically. Using Density Functional Theory, a set of quantities required for assessment of various physical and chemical molecular properties are calculated. The results obtained during the computational practicum for an individually assigned molecule are summarized into a written term project, which is submitted at the end of the semester. The knowledge obtained from the course enables students to perform directed molecular modelling of new more efficient, cheaper, more environmentally friendly, and durable materials.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHA010413 E252** | **Quantum Chemistry** | **English** | **BS** | **Summer** | **5** | **30** | **0** | **30** | **Prof. A. Tadjer** | **tadjer@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course acquaints students with the contemporary methods of quantum chemistry and their capacity for application to estimate molecular properties. The methods allowing theoretical determination of molecular characteristics such as geometry, electron density, and energy spectrum are presented. The theoretical foundation and the basic formalism of the methods are summarized and the areas of applicability are discussed. Appropriate illustrative examples are included. Both the lectures and the computational exercises are practically oriented. Each student is assigned an individual term project, which is summarized, submitted in writing and presented orally at the end of the semester. After completing the course students are able to carry out independently a basic computational study of a particular chemical or theoretical problem and to analyse adequately the obtained numerical data using the appropriate specialized software.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHA010413 O211** | **Quantum Chemistry and Chemical Bonding** | **English** | **BS** | **Winter/Summer** | **4** | **45** | **0** | **0** | **Prof. A. Ivanova** | **aivanova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course provides combined basic knowledge from quantum mechanics and quantum chemistry. The first part is devoted to the basic postulates, approximations, and computational methods for solving Schrödinger's equation. The main classes of quantum chemical methods are summarized. The second part focuses on the theoretical description of specific molecular

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| characteristics and in particular on the nature of chemical bonding in various molecular systems. Symmetry point groups are introduced and the role of symmetry for simplification of selected problems is discussed. Upon completion of the course students are familiar with the basic concepts and methods of quantum chemistry and with the description of the main types of chemical bonds and are able to interpret fundamental properties of atoms and molecules. |
| **Requirements for enrollment: NO** |

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHA010413 E131** | **Radioactive methods in medicine** | **English** | **BS** | **Winter** | **4** | **30** | **30** | **0** | **Assoc. Prof. B. Todorov** | **B.Todorov@chem.uni-sofia.bg** |

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| **Short description of the course (done in the language of instruction):** Aim of the course is to acquaint students with the use of radioactive isotopes in nuclear medicine and their application for diagnostic and therapeutic radiopharmaceuticals. The basic methods for producing of radioactive isotopes, molecular imaging probes and synthesis of the radiopharmaceuticals are included. Mentioned above methods are discussed with their theoretical bases and examples are given. The lectures are illustrated with practical tasks. |
| **Requirements for enrollment: NO** |

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHA010413 E322** | **Optical properties of functional organic compounds** | **English** | **BS** | **Summer** | **5** | **30** | **30** | **0** | **Assoc. Prof. St. Stoyanov** | **ohss@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course gives the students an opportunity to expand their knowledge on the fundamental rules which connect the optical properties of organic compounds and their structure. The main approaches towards designed synthesis of organic compounds with desired photophysical properties are discussed along with theoretical and practical training in some of the most powerful "state-of-the-art" spectroscopic techniques and photochemical methods. Special attention will be paid on the reflectance spectroscopy and perception of color, and also on the real-life applications of specific structures for optical sensing, light harvesting, etc. In summary, the course aims at building bridges between the most common spectroscopic methods, the organic compounds' structure, the fine tuning of their optical properties, and their hi-tech applications.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHA010413 O321** | **Organic Chemistry part 2** | **English** | **BS** | **Winter** | **7** | **45** | **45** | **0** | **Assoc. Prof. St. Stoyanov** | **ohss@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The aim of the course is to provide students with knowledge on the structure and reactivity of the most important classes of organic compounds. The syllabus for part 2 includes carbonyls, carboxylic acids and their derivatives, amines and amino acids, heterocycles, and natural compounds - carbohydrates, proteins, lipids and nucleic acids. The practicum is divided in laboratory classes and seminars. Laboratory classes aim to train the basic skills required for experimental work in the field of organic chemistry. The seminars help the students to better understand the most important reactions and their mechanisms by means of problem solving and discussions.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHA010413 O122** | **Modern Instrumental Methods for Analysis** | **English** | **BS /MS** | **Summer** | **7** | **60** | **0** | **30** | **Prof. G. Gencheva** | **ahgg@chem.uni-sofia.bg** |

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|---|---|---|---|---|---|---|---|---|---|---|
| | **- Molecular Spectroscopy and Magnetic Methods** | | | | | | | | | |

**Short description of the course (done in the language of instruction):** The aim of this course is to give a theoretical and practical introduction into selected instrumental analytical methods (UV-Vis and molecular fluorescence spectroscopy, Fourier Transform Infrared (FT-IR) and Raman spectroscopy, circular dichroism, magnetic resonance spectroscopy: NMR and ESR) as well as to present the opportunities for their contemporary application in structural and quantitative characterization of chemicals, bio-molecules and bio-conjugates, polymers, materials, surfaces, etc. The goal of the course is to equip students with practical skills for interpretation of spectra and data and thus to enable them in using of the presented methods in their research work.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHA010413 E122** | **Vibrational Spectroscopy – methods and application** | **English** | **BS** | **Summer** | **5** | **30** | **0** | **30** | **Prof. G. Gencheva** | **ahgg@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** In-depth course on the principal of vibrational spectroscopy: Fourier Transform Infrared (FT-IR) spectroscopy, IR-Microscopy, FT-Raman spectroscopy and their use in solving problems of structural, functional and quantitative analysis of organic, organometallic and inorganic compounds.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |

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| **CHA010413 E251** | **Quantum Chemistry and Molecular Mechanics** | **English** | **BS** | **Winter/Summer** | **5** | **45** | **0** | **15** | **Prof. G. Madjarova** | gmadjarova@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The course acquaints students with the modern methods of quantum chemistry and molecular mechanics that allow theoretical determination of molecular characteristics: conformational search, geometry, electronic densities, energy spectrum. The program includes a general introduction of the main classes of modern quantum-chemical methods and discusses their application limits. The potential functions and parameters of the molecular mechanical force field are also discussed. Specific illustrative examples are provided. Lectures and exercises are practically oriented. Each student receives an individual course project.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHA010413 E212** | **Application of Statistics in Molecular Modelling** | **English** | **BS** | **Winter/Summer** | **5** | **45** | **0** | **15** | **Prof. A. Ivanova** | aivanova@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The course enables students to apply basic approaches for statistical analysis to datasets obtained from molecular modelling. The lectures introduce basic concepts of molecular modelling with focus on collection and processing of numerical data yielded by multiple-step molecular simulations. The main goal is presentation of the techniques for statistical analysis of such data arrays. The sources of and methods for estimation of statistical errors are reviewed. The exercises are oriented towards practical mastering of these techniques. Software products for statistical analysis are learned and competences for evaluation of molecular properties by statistical assessment are developed. After completing the course students are able to apply methods for statistical analysis on temporal and other datasets, to extract characteristics of chemical objects and to interpret the physical meaning of the obtained numerical estimates.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |

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|---|---|---|---|---|---|---|---|---|---|---|
| **???** | **Modern Instrumental Methods of Analysis – Atomic Spectroscopy and Chromatographic Methods** | **English** | **BS** | **Winter** | **7** | **60** | | **45** | **Assoc. Prof. V. Lyubomirova** | **vlah@chem.uni-sofia.bg** |
| **Short description of the course (done in the language of instruction):** The aim of the course is to give a theoretical and practical introduction into atomic spectroscopic (AAS, ICP-AES, ICP-MS, XRF) and chromatographic methods (GC, LC, IC). The students are introduced to the basic theory, specific interferences, advantages and disadvantages of the atomic spectroscopic methods and their application for quantitative analysis of the elemental composition of samples (gas, liquid, or solid). The course presents the theory and the possibilities for application of modern chromatographic methods for the analysis of organic compounds. It includes practical exercises to train different approaches for sample preparation, instrument optimization, calibration, analysis and data processing. | | | | | | | | | | |
| **Requirements for enrollment: NO** | | | | | | | | | | |

**Programme MASTER PROGRAM COMPUTATIONAL CHEMISTRY**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHU212413 O241** | **Quantum Chemistry for Molecular Systems** | **English** | **MS** | **Winter** | **8** | **60** | **45** | **0** | **Prof. A. Tadjer** | tadjer@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The main goal of the course is to familiarise the students with the modern quantum chemical methods (Hartree-Fock, post-HF, DFT, etc.). The course is aimed at: introducing the students to the methods allowing theoretical estimation of molecular characteristics – structure, electron density, energy spectra, etc.; serving as background of the solid state theory; laying the basis for the lectures in molecular spectroscopy and hybrid QM/MM methods. The seminars include derivation of some quantum chemical formalistic details. Analytical solving of selected problems is aimed at enabling the students to handle alone specific theoretical problems. Both lectures and seminars are application oriented. Upon completion of the course the students should be able to solve particular scientific problems by means of quantum chemical software packages.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHU212413 O222** | **Applied Computational Chemistry** | **English** | **MS** | **Summer** | **9** | **30** | **0** | **105** | **Prof. G. Madjarova** | fhgm@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The practicum is set up as a series of theoretical instructions followed by practical assignments aiming at acquainting the students with the tricks and tips in working with professional scientific software in the area of computational chemistry. The topics covered include: preparation of input files; discrimination between versions of the computational procedures; external data sources and import format for non-implemented input; detailed discussion of possible I/O formats; output print options, etc. Various approaches for analysis of molecular characteristics and functions are presented. The advantages and disadvantages of different commercial software packages are outlined and the possibilities for their extension are described. The accumulated skills and the obtained results are presented orally by each student on a weekly basis

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| **CHU212413 O252** | **Molecular Dynamics and Monte Carlo Simulations** | **English** | **MS** | **Summer** | **6** | **45** | **0** | **30** | **Prof. A. Ivanova** | aivanova@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The main goal of the course is to acquaint the students with the theoretical foundation of the two main methods of statistical mechanics, which are applied for molecular modelling of atomic and molecular systems with large number of degrees of freedom. Students should also master practical skills for computational modelling of diverse processes and phenomena from the field of statistical mechanics and thermodynamics and for statistical description of complex systems by classical (atomic and molecular liquids, polymers, micelles, membranes, colloids) and quantum (atoms, spin lattices) methods. Special attention is paid to the methods of analysis of the simulation results, the typical pitfalls of simulating finite-size systems, and the ways of extrapolation of numerical data to physically meaningful macroscopic properties. The course is paralleled by practical exercises, which include typical examples for application of the methods, students' work with professional program packages, practicing of typical computational techniques and protocols. The purpose is the development of skills for analysis of large numerical arrays and rationalization of theoretical estimates of physical properties.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHU212413 O211** | **Molecular Mechanics** | **English** | **MS** | **Winter** | **5** | **30** | **0** | **30** | **Prof. A. Ivanova** | aivanova@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The course introduces the main potential functions for molecular-mechanical (MM) description of molecules. Their use is illustrated by specific examples. The main classes of molecular mechanics force fields for biostructures are presented. The lectures and especially the lab classes are application-oriented.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHU212413 O811** | **Quantitative structure-activity relationships (QSARs) of bioactive compounds** | **English** | **MS** | **Winter** | **5** | **30** | **0** | **30** | **Prof. I. Tsakovska** | ITsakovska@biomed.bas.bg |

**Short description of the course (done in the language of instruction):** QSAR – quantitative structure-activity relationships - emerged on the basis of advances in quantum chemistry, molecular mechanics, mathematical statistics, and the study of the interaction of molecular ligands and cell receptors. The development of QSAR, on the other hand, became a basis for the appearance of new branches of medicinal chemistry: pharmacophore design, lead structure determination, and docking methods. All these approaches are introduced and their specificities are discussed. The application of these methods leads now to saving huge resources in the development of new drugs and compounds with specific properties. The variety of molecular descriptors employed in 2D QSAR is defined. The most important methods in 3D QSAR are also presented. The key statistical methods employed in QSAR are considered. The course content includes also the basic mechanisms of the interaction between molecular ligands and cell receptors. The laboratory exercises help the students in acquiring practical skills to work with advanced specialized software for QSAR studies.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHU212413 O961** | **Programming** | **English** | **MS** | **Winter** | **6** | **30** | **0** | **45** | **Dr. Yasen Velkov** | yassen_v@yahoo.com |

**Short description of the course (done in the language of instruction):** The programming language FORTRAN is still preferred for the purposes of scientific programming due to the huge number of existing codes and the tastes of the community. The language and its application for studying various models is the main goal of the course. In view of the orientation of the master degree program basic models, such as the Ising model, random walks, step motions on crystal surfaces, etc., are used throughout the course. The programming language tools and some elementary applications are introduced during the lecture classes, while the practical assignments end with working procedures. Students are expected to write programs alone neglecting the usage of ready-made products. Compilers, translators and debuggers are introduced in the practical assignments. Skills for working with files, finding extrema, working with vectors, matrices, finding eigenvalues spectra, numerical differentiation, numerical integration, numerical solution of ordinary and partial differential equations, and dealing with data from computer experiments are pursued.

| Requirements for enrollment: NO | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHU212413 O312** | **Modelling of periodic systems and nanostructures** | **English** | **MS / PhD** | **Summer** | **4** | **30** | **0** | **30** | **Prof. H. Aleksandrov** | **haa@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The scope of the course is the introduction of the main methods for modelling of periodic systems and nanostructures. The band theory of crystals will be considered for rationalization of the electronic structure. Using the information obtained from the density of states (DOS) and crystal orbital overlap population (COOP), we will analyze how highly delocalized molecular orbitals of solids can be decomposed into the molecular (atomic) orbitals they are constructed of. It will be shown how the concept of interactions between the frontier orbitals can be applied for explanation of properties related to solid state systems and interactions of adsorbates with surfaces. The students will be trained to work with one of the most commonly used program packages for modelling of periodic systems and nanostructures: Vienna Ab initio Simulation Package (VASP). The application of methods and programs for modelling of periodic systems and nanostructures and assessment of their properties will be demonstrated using suitable examples and scenarios.

**Requirements for enrollment: NO**

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHU21213 O352** | **Hybrid (QM/MM) Methods** | **English** | **MS** | **Summer** | **4** | **30** | **0** | **30** | **Prof. P. Petkov** | **ohpp@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The first part of the course describes the necessity of hybrid methods for modelling of complex chemical systems. The isolated cluster approach is also considered and its relevance, features, limitations and applicability are discussed. The next part includes continuum approaches for accounting of the effect of the solvent (environment) on solute molecule. The discrete (atomistic) methods for modelling of complex systems based on combination of quantum chemical and molecular mechanical methods (QM/MM) are presented. The second half of the course is directed towards the application of the hybrid methods to typical examples of complex systems – solutions, different types of organic systems (molecules, transition metal complexes with organic ligands, peptide chains and other biomolecules, etc.), metal oxides, silicates, zeolites. The course includes also exercises and a course project.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHU212413 E312** | **Introduction to programming in Linux shells and data processing** | **English** | **MS** | **Summer** | **4** | **30** | **0** | **30** | **Prof. P. Petkov** | **ohpp@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The aim of the course is to introduce the students to shell scripting for Linux. During the course the students will become familiar with the need to write scripts for Linux environments and their use for data processing. The students in computational chemistry usually deal with quantum-chemistry or molecular dynamics calculations. As a result, a large amount of data could be generated. The processing of voluminous data is a time-consuming process that can be automated to facilitate analysis by means of scripts created for specific types of data processing. At the end of the course the students will be able to extract and post-process data from large files and to automate the process of creating input files for quantum chemistry or statistical physics software.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHU212413 O512** | **Computational Methods in Spectroscopy** | **English** | **MS** | **Summer** | **4** | **45** | **0** | **45** | **Prof. Todor Dudev** | **t.dudev@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course will acquaint the students with the theoretical methods used as basis for the creation of algorithms and programs for prediction and analysis of molecular spectra. Applications in the three most broadly used spectroscopic methods are included: IR spectroscopy, UV/visible spectroscopy and NMR spectroscopy. The course comprises practical work with various software products used in molecular spectroscopy.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHU212413 P211** | **Research Practicum** | **English** | **MS** | **Winter** | **10** | **0** | **0** | **300** | **All teachers from the Master Programme** | [aivanova@chem.uni-sofia.bg](mailto:aivanova@chem.uni-sofia.bg) |

**Short description of the course (done in the language of instruction):** The practicum is set up as a series of regular (individual, if needed) training activities during which the students will learn how to solve a specific research problem by using theoretical calculations under the guidance of an individual tutor. First, each student is taught how to find information for the particular research problem in specialized portals for scientific journals and/or data bases, how to extract the necessary data thereof, and how to summarize it. Next, the trainees are acquainted with particular functionalities of the software packages, which they need to solve the assigned research task. Then, employing the skills acquired previously in the courses of the M.Sc. programme, the students carry out the planned calculations largely independently. In parallel with that they learn how to organize and discuss numerical results in compliance with the contemporary good scientific practices.

**Requirements for enrollment: NO**

**Programme MASTER PROGRAM MODERN SPECTRAL AND CHROMATOGRAPHIC ANALYTICAL METHODS**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHS212415 O512** | **Computational Methods in Spectroscopy** | **English** | **MS** | **Summer** | **7** | **45** | **0** | **45** | **Prof. Todor Dudev** | **t.dudev@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course will acquaint the students with the theoretical methods used as basis for the creation of algorithms and programs for prediction and analysis of molecular spectra. Applications in the three most broadly used spectroscopic methods are included: IR spectroscopy, UV/visible spectroscopy and NMR spectroscopy. The course comprises practical work with various software products used in molecular spectroscopy.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| **CHS212415 O122** | **Modern Instrumental Methods for Analysis - Molecular Spectroscopy and Magnetic Methods** | **English** | **BS /MS** | **Summer** | **4** | **30** | **0** | **30** | **Prof. G. Gencheva** | **ahgg@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The aim of this course is to give a theoretical and practical introduction into selected instrumental analytical methods (UV-Vis and molecular fluorescence spectroscopy, Fourier Transform Infrared (FT-IR) and Raman spectroscopy, circular dichroism, magnetic resonance spectroscopy: NMR and ESR) as well as to present the opportunities for their contemporary application in structural and quantitative characterization of chemicals, bio-molecules and bio-conjugates, polymers, materials, surfaces, etc. The goal of the course is to equip students with practical skills for interpretation of spectra and data and thus to enable them in using of the presented methods in their research work.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/Seminars | Practical work | | |
| **CHS212415 E122** | **Vibrational Spectroscopy – methods and application** | **English** | **MS** | **Summer** | **4** | **30** | **0** | **30** | **Prof. G. Gencheva** | **ahgg@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** In-depth course on the principal of vibrational spectroscopy: Fourier Transform Infrared (FT-IR) spectroscopy, IR-Microscopy, FT-Raman spectroscopy and their use in solving problems of structural, functional and quantitative analysis of organic, organometallic and inorganic compounds.

**Requirements for enrollment: NO**

**Programme MASTER PROGRAM PHARMACY**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHP212423 O858** | **Mathematics (Calculus)** | **English** | **MS** | **Winter** | **6** | **30** | **0** | **45** | **Dr. Svetoslav Anachkov** | **sa@lcpe.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The goal of the course is to get the students acquainted with the basis of the calculus (differential & integral calculus and linear algebra) and to train them to carry out analytical transformations and computer calculations. The course includes elementary functions; sequences and series; derivatives of functions; maxima and minima of functions; indefinite and definite integrals; basic knowledge on complex numbers; systems of linear equations; ordinary differential equations – examples for chemical reaction of first order; harmonic oscillator, etc.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
The students are expected to have a basic knowledge in mathematics at a high-school (gymnasium) level. Students, whose entry level in mathematics is not satisfactory, are strongly advised to attend the parallel preparatory course "Basic mathematics for chemists".

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHP212423 O821** | **Biology** | **English** | **MS** | **Winter** | **5** | **30** | **0** | **30** | **Assoc. Prof. Tanya Topuzova** | **topouzova@biofac.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The main goal of the course "Biology" is to represent the essence and hierarchy of living matter on a morpho-physiological basis. The role of information-carrying molecules and their functioning as well as the synthesis of molecular complexes are discussed. The basic life processes, the processes of informational exchange and the flow of energy at the cellular, tissue, organism and supra-organism levels are pointed. Special attention is paid to the basic laws of inheritance of traits and basic laws and concepts in genetics. A summary review of human tissue organization is made. Students are acquainted with modern methods applicable in biomedical research and diagnosis.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:** The course is based on the knowledge and skills students have acquired in biology and chemistry in high school (secondary school level).

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHP212423 O411** | **General and Inorganic Chemistry 1** | **English** | **MS** | **Winter** | **6** | **30** | **0** | **45** | **Prof. Georgi Tsvetkov** | nhgtz@chem.uni-sofia.bg |

**Short description of the course (in the language of instruction):**
The main objective of the General and Inorganic Chemistry Course is to introduce the basic principles and methodologies of Chemistry to create a sound starting point for the study and comprehension of the correlation between structure and the properties of materials which students will have to study in more detail in the following years.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic notions in chemistry, physics and mathematics acquired in the secondary school.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHP212423 O871** | **Latin** | **English** | **MS** | **Winter** | **5** | **30** | **30** | **0** | **Elina Boeva** | elinaboevata@gmail.com |

**Short description of the course (in the language of instruction):**
The Pharmaceutical Latin course aims to make students familiar with Latin and Greek terms and grammar rules, which is necessary for understanding and correct use of medical and pharmaceutical professional language.

**Requirements for enrollment: NO**
**If any, please describe the specific requirements:**

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Seminars | Practical work | | |
| **CHP212423 O861** | **English** | **English** | **MS** | **Winter** | **5** | **0** | **60** | **0** | **Lidiya Aleksandrova** | **lidia_aleksandrova@yahoo.com** |

**Short description of the course (in the language of instruction):**
It is a 60-hour upper-intermediate course teaching both General English and English for Pharmacy Students. The course includes studying chemistry and pharmacy terminology, reading, analysing and translating pharmacy articles, watching a documentary film (3 one-hour episodes) about the history of pharmacy and answering comprehension questions, giving presentations about chemical elements and medicinal plants, doing grammar and vocabulary exercises, taking part in classroom discussions.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
The students must have an intermediate-level command of General English

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Seminars | Practical work | | |
| **CHP212423 O857** | **Human anatomy** | **English** | **MS** | **Winter** | **4** | **30** | **0** | **15** | **Prof. Nikolay Lazarov** | **ohan@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The human anatomy studies the structure of the human body on macroscopic and microscopic level. It must learn knowledge for the structure of cells, tissues, organs and systems. It is necessary the basic understanding of the embryological human development and the causes of some birth defects. The understanding of the structure of the human body must be connected with the function of respective cells, tissues, organs and systems.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Cognition about the human anatomy from the high school.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHP212423 O412** | **General and Inorganic Chemistry 2** | **English** | **MS** | **Summer** | **5** | **30** | **0** | **30** | **Assoc. Prof. Yoana Zaharieva** | **nhmm@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The course aims to introduce students to the most important properties of the elements and properties of their compounds, which are considered in relation to their position in the periodic table and on the basis of general principles, concepts and theories. Attention is paid to the processes and substances that have an important role in biological systems.
Practical exercises illustrate lectures, designed to create skills for its application in practice and to develop basic skills and handiness for laboratory work.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic knowledge and skills in General Chemistry

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Seminars | Practical work | | |
| **CHP212423 O822** | **Physics and Biophysics** | **English** | **MS** | **Summer** | **6** | **45** | **0** | **45** | **Assoc. Prof. P. Petkov, Assoc. Prof. Detelin Stefanov** | **detelin@biofac.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The Physics and Biophysics course is basic for “Pharmacy” specialty. It is required for mastering profile and special disciplines. The main goal of this course is providing basic knowledge and skills to students in physics and biophysics, which they can apply in their studies of chemical and other pharmaceutical disciplines, as well as in their professional career as pharmacists.
The Physics and Biophysics graduate course is divided into two parts – Physics and Biophysics. Its themes are aimed at providing qualitative description of physical and biophysical theories, explaining known facts and predicting new effects. The course makes use of mathematical knowledge acquired in high school. The first part of the course – Physics - introduces basic physical concepts and laws of mechanics, electricity and magnetism,

and oscillations and waves. The part on Biophysics includes sections such as biomechanics, heat and thermodynamics, wave processes in biology, bioelectromagnetism, radiation biophysics and molecular and cell biophysics. The two parts complement each other. The program's themes contain useful applications.
Laboratory exercises, accompanying the course, help students understand the physical and biophysical phenomena and teach them how to use measurement devices and apply physical and biophysical research methods. Laboratory exercises follow and complement the contents of the lectures, helping students to better adopt them.

**Requirements for enrollment: NO**
**If any, please describe the specific requirements:**

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Seminars | Practical work | | |
| **CHP212423 O856** | **Anatomical Pathology** | **English** | **MS** | **Summer** | **5** | **30** | **0** | **30** | **Assoc. Prof. Vesela Ivanova** | ohan@chem.uni-sofia.bg |

**Short description of the course (in the language of instruction):**
The Anatomical Pathology course studies the morphological changes in human disease processes at the organism, organ, tissue, cell and ultrastructural level. The first part of the Anatomical Pathology - general pathology - studies the main pathological processes that occur in different combinations of disease entities; the second part - clinical pathology – is devoted to the study of pathogenesis and pathomorphological manifestations in individual diseases. The study of the material bases of disease processes allows to determine their causes (etiology), mechanisms of their occurrence (pathogenesis) and dynamics of morphological changes (pathomorphosis), which makes it possible to apply knowledgeable treatment and prophylaxis. Morphological studies in experimental models of various disease processes are extremely valuable in establishing the impact of certain drugs on the course of the disease.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Knowledge of normal human anatomy and normal human physiology.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHP212423 O852** | **Microbiology and Virology** | **English** | **MS** | **Summer** | **9** | **60** | **0** | **60** | **Assoc. Prof. M. Iliev, Prof. St. Shishkov** | miliev1@biofac.uni-sofia.bg |

**Short description of the course (in the language of instruction):**

The offered course is designed for incoming students from the Master's degree in Pharmacy at the Faculty of Chemistry. The plan-program includes selected themes of general and special microbiology and virology. Topics in the "Microbiology" section cover the study of morphology, physiology and genetics of microorganisms, mechanisms of genetic transmission and microbial resistance factors. The course also includes basic knowledge of special microbiology on the role of microorganisms and macroorganisms for the onset and course of the infectious process, the main factors of pathogenicity and virulence, the devices of the microorganisms to neutralize the host's protective system. The most common microorganisms responsible for infectious diseases in humans are: bacteria, pathogenic fungi, ricketsiia, chlamydia, mycoplasma, and their basic biological characteristics are studied - morphological and cultural properties, antigenic structure, pathogenicity factors, resistance diagnosis and therapy. The acquisition of basic theoretical knowledge is accompanied by obtaining practical practical skills for working with bacteria. The Virology section provides basic knowledge of viruses as etiological agents. He acquainted with the strategy of replicating viruses according to their genomic structure. The virus-virus and host-virus interactions, the symptoms and the course of the pathogenesis of the viral diseases are discussed. The emphasis is on the clinic, the diagnosis, the therapy and the prevention of the taxonomic unit viruses that are relevant to medical practice. Basic knowledge of tumor-associated viruses is given. Students are acquainted with laboratory models, modern methods of virus isolation and virological and serological diagnostics of viral diseases. Basic theoretical and practical knowledge is provided on the types of antiviral preparations and vaccines and their application for control of viral infections.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic knowledge and skills in Biology and Anatomy**.**

| **Course code** | **Course title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Number of hours** | | | **Lecturer/s's name** | **Lecturer/s's E-mail** |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **Lectures** | **Seminars** | **Practical work** | | |
| **CHP212423 O222** | **History of Pharmacy** | **English** | **MS** | **Summer** | **3** | **30** | **0** | **0** | **Assoc. Prof Kalina Andrevska** | **fhka@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
History of pharmacy, even though it has its own continuous developmental periods throughout the past, today we view it as part of social pharmacy. History of pharmacy is the science that studies the development of pharmaceutical knowledge and practice of pharmacy in connection with the development of human society, medicine, chemistry, biology, philosophy and economics, and the cultural history of people throughout the ages. Thus, it is one of the major theoretical disciplines in the study of pharmacy, which clarifies the evolution in the development of drug knowledge in relation to the changing socio economic environment, professional roles and pharmacy issues.

**Requirements for enrollment: NO**
**If any, please describe the specific requirements:**

| | | | **Course** | | **EC** | **Number of hours** | | |
|---|---|---|---|---|---|---|---|---|

| Course code | Course title (in English) | Language of instruction | offered to BA/BS, MA/MS, PhD | Semester | | Lectures | Exercises/ Seminars | Practical work | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHP212423 O851** | **Human Physiology** | **English** | **MS** | **Winter** | **7** | **45** | **0** | **45** | **Assoc. Prof M. Chichova** | **mchichova@biofac.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The aim of the course is to provide fundamental contemporary knowledge of the physiological processes in the human body at cellular, organ, and system level. The regulation and coordination of these processes, homeostatic mechanisms and adaptation to the changing environment conditions are presented. An emphasis is placed on the molecular and cellular mechanisms of the studied processes. Practical exercises present classical and modern methods in physiological experiments, as well as examination of basic physiological parameters.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic knowledge and skills in Biology and Anatomy

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Seminars | Practical work | | |
| **CHP212423 O111** | **Analytical Chemistry 1** | **English** | **MS** | **Winter** | **7** | **30** | **0** | **60** | **Prof. Ivayla Pantcheva** | **ahip@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):** "Analytical chemistry 1" covers classical topics regarding chemical processes and methods applied in the qualitative and quantitative analyses. The fundamentals of equilibria in homogeneous systems as acid-base interactions and complex formation are presented as well as the factors affecting these processes. The acidimetric, alkalimetric and complexometric methods and their application in analytical practice and pharmaceutical analysis are described.
The lectures are accompanied by laboratory course where students practice basic laboratory manipulations and acquire main analytical skills. Fundamental principles of qualitative analysis of inorganic ions are discussed and experimental assays are performed. A knowledge on general / specific applications of titrimetric analysis (acid-base and complexometric systems) will be obtained.
The total grade consists of mid-term test, two practical casus and final (written/ oral) exam.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic knowledge and skills in General and Inorganic Chemistry

| Course code | Course | | Course | Semester | E C | Workload (hours) | | |
|---|---|---|---|---|---|---|---|---|

| | Title (in English) | Language of instruction | offered to BA/BS, MA/MS, PhD | (winter/ summer) | | Lectures | Exercises/ Seminars | Practical work | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHP212423 O211** | **Physical Chemistry and Colloid Chemistry 1** | **English** | **MS** | **Winter** | **4** | **30** | **0** | **30** | **Prof. V. Petrov**<br><br>**Prof. A. Ivanova** | **fhvkp@chem.uni-sofia.bg**<br><br>**aivanova@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The concepts and methods of Physical Chemistry and their application in Pharmacy and Medicine are presented in the course of Physical and Colloid Chemistry. The first general part includes basic approaches: molecular, kinetic and thermodynamic, to describe the properties of homogeneous and heterogeneous single-component and multi-component physicochemical systems. The Laboratory practicum introduces students to some important physicochemical measurements and calculation of molecular properties. Students should acquire fundamental knowledge in the field of Physical Chemistry and use them in subsequent courses for theoretical and experimental characterization of substances and materials with application in pharmacy.

**Requirements for enrollment: NO**

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Seminars | Practical work | | |
| **CHP212423 O311** | **Organic Chemistry 1** | **English** | **MS** | **Winter** | **7** | **45** | **0** | **45** | **Prof H. Aleksandrov** | **haa@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**

The aim of the ORGANIC CHEMISTRY course is to provide students with a basic understanding of the structure of organic molecules, the reactivity and the methods of synthesis of the most important classes of organic compounds.

The introductory part includes the necessary theoretical background training on the basic principles related to the structure, isomerism and nomenclature of organic compounds, chemical bonds and their electronic effects, as well as knowledge about structural analysis methods and to study the mechanism of the more important types of reactions. This will provide deeper understanding of their nature and possibilities for their application in the preparation of pharmaceutical compounds.

The systematic part of the course is based on the functional classification of organic compounds. The following groups of organic compounds are discussed in the lecture course Organic Chemistry Part I: hydrocarbons - alkanes, alkenes, alkynes, alkadienes, aromatic compounds, alkyl arenes, polycyclic arenes; alkyl halides; organometallic compounds; alcohols and phenols; and ethers.

Along with the main task – learning of most common principles of organic chemistry, the course also concerns the role of this branch of natural

sciences as a theoretical basis of biochemistry and pharmacy, as well as important branches of the chemical and pharmaceutical industry.
The practical classes (laboratory classes and seminars) aim to facilitate the understanding of the lecture material and at the same time to develop a habit in students for creative application for the acquired knowledge and skills for experimental work in the field of organic chemistry..

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:** Basic knowledge and skills in General and Inorganic Chemistry

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHP212423 O151** | **Information Technology and Statistics** | **English** | **MS** | **Winter** | **5** | **30** | **0** | **30** | **Prof. Stefan Tsakovski** | **STsakovski@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
Students will study the Internet structure and services and some MS Office applications (Word, Excel, Powerpoint) with respect to search and present scientific information. The statistical part of the course covers traditional descriptive and inference statistical approaches. Also basic knowledge of experimental design and classification of experimental data are given.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
The course is based on already obtained knowledge and skills of students during the "Mathematics" course. Each of the topics included in the course contains updating of the necessary mathematical tools and examples solving during the exercises.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| CHP212423 O112 | Analytical Chemistry 2 | English | MS | Summer | 6 | 30 | 0 | 60 | Prof. Ivayla Pantcheva | ahip@chem.uni-sofia.bg |

**Short description of the course (in the language of instruction):**
"Analytical chemistry 2" describes the principles of heterogeneous equilibria and redox systems, as well as their influencing by simultaneous equilibria processes. The application of redox titration (iodometry, permanganometry) in drug analysis is presented.
The principles of the basic electroanalytical techniques are discussed. The general aspects of molecule specific analysis (UV-VIS spectrometry, IR spectroscopy) are introduced accompanied by various examples. Application of separation and concentration analytical methods and fundamentals of

chromatographic separations are included. The basic bioanalytical methods are also presented.
The laboratory classes consist of practicum and demonstration presentations.
The grade is based on mid-term test, practical casus and final exam (written / oral).

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic knowledge and skills in Analytical Chemistry.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHP212423 O252** | **Physical Chemistry with Colloid Chemistry 2** | **English** | **MS** | **Summer** | **4** | **30** | **0** | **30** | **Prof. V. Petrov** | **fhng@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The ideas and methods of Physical Chemistry and their application in Pharmacy and Medicine are presented in the course of Physical and Colloid Chemistry.
The second part includes kinetics of chemical and biochemical reactions in closed and open systems, organization of chemical reactions in living systems, electrochemical processes, colloidal dispersion systems and their biological meaning.
Laboratory practicum introduces students to some important physicochemical measurements.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic knowledge and skills in General and Inorganic Chemistry and in Physical Chemistry with Colloid Chemistry

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHP212423 O322** | **Organic Chemistry 2** | **English** | **MS** | **Summer** | **6** | **45** | **0** | **45** | **Assoc.Prof. St. Stoyanov** | **SStoyanov@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The aim of the lecture course in ORGANIC CHEMISTRY is to provide students with an in-depth knowledge of the structure and reactivity of the most important classes of organic compounds, and the synthetic methods for their preparation.

The systematic approach is built upon the functional classification of the organic compounds. During the course in Organic chemistry part II the following groups of organic compounds are discussed: carbonyl compounds, carboxylic acids and their derivatives, amines and amino acids, heterocyclic compounds, organophosphorus compounds, natural compounds (carbohydrates, alkaloids, proteins, lipids and nucleic acids). Special emphasis is put on the mechanism of the main reactions which provides better understanding of their essence and possible application in pharmaceutical materials design.

Along with the main task - mastering the general principles of organic chemistry, the course touches on the role of organic chemistry as a theoretical basis of biochemistry, bioorganic chemistry and some important branches of the chemical and pharmaceutical industry.
Practical classes - in laboratory and seminar form, aim to support the perception and in-depth comprehension of the lecture material and to develop a habit for students to creatively apply knowledge and skills for experimental work in the field of organic chemistry.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Good knowledge of basic chemical disciplines - Inorganic chemistry, Physical chemistry and Organic chemistry part 1.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHP212423 O812** | **Pharmaceutical Botany** | **English** | **MS** | **Summer** | **6** | **45** | **0** | **45** | **Prof. D. Koleva,**<br><br>**Assoc. Prof A. Tosheva** | **dkoleva@biofac.uni-sofia.bg,**<br><br>**a_tosheva@biofac.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
This course covers basic and contemporary principles and methods related to the structural organization, taxonomy, systematic and biodiversity of plants. Medicinal plants of pharmaceutical interest are presented in systematic order focused to their structures, reproduction and classification as well as their importance as source to obtain herbal substances. Students will be acquainted with the modern aspects of the sustainable use of medicinal plants and their cultivation opportunities for pharmaceutical purposes. Successfully completing the course students are expected to achieve microscopy skills, theoretical and practical knowledge about plant cell specific cytological features, structure of the plant tissues in relation with their main functions, morpho-anatomical organization of the plant's vegetative and reproductive organs as well as classification and nomenclature needed to characterize the biodiversity of medicinal plants and to provide practical skills in botany and plant identification. The students should describe a plant using botanical terms, identify a plant using the key mechanics, name and publish a new species, recognize large and common families of plants and fungi of pharmaceutical interest.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
This course complements basic knowledge and skills of Botany (anatomy, morphology and plant systematics) acquired in Secondary school education level in the field of "Natural sciences, Mathematics and Informatics": Biology and health education, Chemistry and nature conservation.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Seminars | Practical work | | |
| **CHP212423 O** | **Pathophysiology** | **English** | **MS** | **Summer** | **5** | **30** | **0** | **30** | **Assoc. Prof. Palmena Angelova** | **ohan@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
Pathophysiology is a fundamental medical science that explains causes and mechanisms of diseases. It is interconnection between preclinical (anatomy, physiology, biochemistry) and clinical sciences.
General pathophysiology analyses common mechanism of diseases: microcirculation disturbances, metabolism, fluid and electrolyte disturbances, acid-base disturbances, tissue growth, hypoxia, inflammation, febris, immunological processes. They are not topic of other medical sciences. In the special part are discussed mechanism of diseases of the systems in connection to the clinical symptoms and treatment principles.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic knowledge of normal human anatomy and physiology.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHP212423 O351** | **Pharmacognosy 1** | **English** | **MS** | **Winter** | **10** | **60** | **0** | **90** | **Prof. Aneli Nedelcheva** | **ohan@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
This course covers basic and contemporary principles and methods related to the structural organization, taxonomy, systematic and biodiversity of plants. Medicinal plants of pharmaceutical interest are presented in systematic order focused to their structures, reproduction and classification as well as their importance as source to obtain herbal substances. Students will be acquainted with the modern aspects of the sustainable use of medicinal plants and their cultivation opportunities for pharmaceutical purposes. Successfully completing the course students are expected to achieve microscopy skills, theoretical and practical knowledge about plant cell specific cytological features, structure of the plant tissues in relation with their main functions, morpho-anatomical organization of the plant's vegetative and reproductive organs as well as classification and nomenclature needed to characterize the biodiversity of medicinal plants and to provide practical skills in botany and plant identification. The students should describe a plant using botanical terms, identify a plant using the key mechanics, name and publish a new species, recognize large and common families of plants and fungi of pharmaceutical interest.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
This course complements basic knowledge and skills of Botany (anatomy, morphology and plant systematics) acquired in Secondary school education level in the field of "Natural sciences, Mathematics and Informatics": Biology and health education, Chemistry and nature conservation.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHP212423 O521** | **Pharmaceutical Chemistry 1** | **English** | **MS** | **Winter** | **7** | **45** | **0** | **60** | **Assoc. Prof. Vladimir Gelev** | ohtvd@chem.uni-sofia.bg |

**Short description of the course (in the language of instruction):**
The Pharmaceutical chemistry course aims to give students knowledge about the state of the art in medicinal chemistry, its broad and long-term applications. Course topics are divided in pharmacological groups, using the Anatomical Therapeutic Chemical (ATM) classification system, used by WHO. This allows students to interconnect their knowledge in pharmaceutical chemistry with pharmaceutical analysis, pharmacology and pharmaceutics. Learning pharmaceutical chemistry trough pharmacological classification will help future pharmacists when searching for new drug molecules, guided by structure - pharmacological action relationships.
Medicines are presented with their international non-patent names (INN) and their synonyms where appropriate. Fundamental pharmacology is provided for each group, along with the chemical structure-activity relationship. The synthetic methods of production, biotransformation, chemical and physical properties, storage and stability are presented for a large number of medicines.
The course aims to familiarize students with the main pharmacology groups, to encourage in future pharmacy specialists a scientific approach in searching for new drug molecules, and to present a concept of drug design and synthesis.

**Requirements for enrollment: NO**
**If any, please describe the specific requirements:**

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHP212423 O881** | **Biochemistry** | **English** | **MS** | **Winter** | **7** | **45** | **30** | **30** | **Assoc. Prof. D. Teofanova** | teofanova@biofac.uni-sofia.bg |

**Short description of the course (in the language of instruction):**
The Biochemistry course aims to elucidate the specificities of human metabolism and the structural characteristics of biomolecules most important for the metabolic processes. The pathways of biosynthesis and degradation of biochemically relevant compounds are outlined and the bioenergetic

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| justification of metabolism and the ways in which energy is obtained, generated and transformed are shown. The basic principles of regulation and control that ensure the coordinated and cooperative action of multi-enzyme systems responsible for these processes are considered. The basis for understanding of various diseases at the molecular level and understanding what drug treatments and therapies are based on is provided. The biochemical mechanisms that underlie the genetic continuity that ensure the unity of all organisms are shown. The questions about what the molecular nature of the genetic material is, how it is transmitted with great accuracy to the next generation, and how the genetic information is expressed in an impressively large number of protein molecules in all living cells find their answers.The importance of the biochemical approach for the development of other fundamental (pharmacology, human physiology, genetics, clinical laboratory etc.) and applied (drug design) biosciences is demonstrated with appropriate examples. Laboratory exercises illustrate and expand the lectures and establish lab skills and habits, needed for the future professional realization of students. | | | | | | | | | | |
| **Requirements for enrollment: YES**<br>**If any, please describe the specific requirements:** Students should have basic knowledge and skills in organic chemistry, biology and physiology | | | | | | | | | | |
| **Course code** | **Course title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Number of hours** | | | **Lecturer/s's name** | **Lecturer/s's E-mail** |
| | | | | | | **Lectures** | **Seminars** | **Practical work** | | |
| **CHP212423 O884** | **Pharmacogenetics** | **English** | **MS** | **Winter** | **5** | **30** | **0** | **30** | **Assoc. Prof. Velizar Shivarov** | **ohan@chem.uni-sofia.bg** |
| **Short description of the course (in the language of instruction):**<br>University training in Pharmacogenetics aims at teaching the master students the mechanisms of action of drugs in the context of gene expression regulation.<br>The goal is to provide the pharmacy students a novel point of view on the entire spectrum of biomedicine including genetics, genomics, molecular biology, clinical pharmacology, pharmacy and toxicology. They are expected to acquire knowledge regarding all aspects of genetics and genomics in terms of the individualized response to exogenous chemical substance and regarding the way the personal genome is influencing the individual response to different medicines. Pharmacogenetics aims at the identification of the genes, which influence the response to different medicinal products. It is expected that this information would help treatment according to each patient's genome.<br>It is planned that the students will have 15 hours of lab training, during which DNA typing by means of a specific molecular method as well as analysis of the results through specific software will be performed. During the seminars practical problems will be solved and critical discussions on given topics will take place. The purpose of the latter is to train some basic presentation skills on a specific topic and defense of one's view on the topic. | | | | | | | | | | |
| **Requirements for enrollment: NO**<br>**If any, please describe the specific requirements:** | | | | | | | | | | |
| | | | **Course** | **Semester** | **EC** | **Number of hours** | | | | |

| Course code | Course title (in English) | Language of instruction | offered to BA/BS, MA/MS, PhD | (winter/ summer) | | Lectures | Seminars | Practical work | Lecturer/s's name | Lecturer/s's E-mail |
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| **CHP212423 O883** | **Hygiene and Ecology** | **English** | **MS** | **Winter** | **4** | **30** | **0** | **15** | **Prof. Ludmila Ivanova** | **ohan@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
"Hygiene and Ecology" is medical science, a basic preventive discipline that develops the theoretical foundations of interaction in the system "human - living environment", with a view to proper development, protection, and strengthening of human health and efficiency and ensuring active longevity .
PURPOSE OF THE COURSE
To provide theoretical knowledge in the field of hygiene for building capacity, skills, and attitudes necessary for the effective participation of future pharmacists in the field of prevention at the individual and population level.
MAIN TASKS OF THE PROGRAMM
• Introducing the principles and concept of hygiene and environmental health - anthropogenic pollution of the environment and their impact on human health;
• Getting acquainted with the processes of the life cycle, nutrition, work, education, etc., which integrate various factors of the external environment and have a significant impact on human health;
• Presenting the basic standards and measures in hygiene for optimizing the interaction "human - living environment"
• Developing a model of prevention policies and programs for the prevention of non-communicable diseases.
• Acquisition of knowledge and skills for communication and training in a healthy lifestyle.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic knowledge in chemistry, biochemistry, physics, biology, anatomy, and physiology.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
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| **CHP212423 O352** | **Pharmacognosy 2** | **English** | **MS** | **Summer** | **8** | **45** | **0** | **75** | **Prof. Aneli Nedelcheva** | **ohan@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
Pharmacognosy as a multidisciplinary science concerned the main groups of biologically active natural compounds and plant substances in which they are found. The information is structured on the basis of chemical classification of plant substances. Examination of the main groups of biologically active compounds includes chemical structure, classification and biogenesis, methods of isolation, identification and application. Data on the dynamics and factors influencing the accumulation of bioactive compounds in plant tissues and organs involved. The main herbal substances have been characterized on the basis of botanical origin, characteristics of plant species designation, requirements for obtaining, activity, application, information

about their standardization. The course includes some drugs of animal origin, as well as alternative sources of obtaining biologically active compounds of natural origin.
Practical exercises will provide knowledge about the nature, the main approaches and methods of herbal analysis. The goal is to learn the skills for detection of drugs (macroscopic and microscopic analysis), identification (qualitative reactions) of biologically active compounds and methods for their isolation and quantification in herbal substances.
Seminars will be focusing on the development of Pharmacognosy in Bulgaria, the current state, problems and perspectives on the system of Herbs and herb production in the country and learning about traditional and modern methods of producing biologically active compounds in Bulgarian industry.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Course in Pharmacognosy is designed for students in pharmacy who have basic knowledge and skills in botany, organic chemistry and analytical chemistry.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
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| **CHP212423 O522** | **Pharmaceutical Chemistry 2** | **English** | **MS** | **Summer** | **7** | **45** | **0** | **60** | **Assoc. Prof. Vladimir Gelev** | **ohtvd@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The Pharmaceutical chemistry course aims to give students knowledge about the state of the art in medicinal chemistry, its broad and long-term applications. Course topics are divided in pharmacological groups, using the Anatomical Therapeutic Chemical (ATM) classification system, used by WHO. This allows students to interconnect their knowledge in pharmaceutical chemistry with pharmaceutical analysis, pharmacology and pharmaceutics. Learning pharmaceutical chemistry trough pharmacological classification will help future pharmacists when searching for new drug molecules, guided by structure - pharmacological action relationships.
Medicines are presented with their international non-patent names (INN) and their synonyms where appropriate. Fundamental pharmacology is provided for each group, along with the chemical structure-activity relationship. The synthetic methods of production, biotransformation, chemical and physical properties, storage and stability are presented for a large number of medicines.
The course aims to familiarize students with the main pharmacology groups, to encourage in future pharmacy specialists a scientific approach in searching for new drug molecules, and to present a concept of drug design and synthesis.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements: Basic knowledge and skills in Pharmaceutical chemistry**

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, | Semester (winter/ summer) | ECTS | Number of hours | Lecturer/s's name | Lecturer/s's E-mail |
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| **CHP212423 O722** | **Pharmaceutical Technology 1** | **English** | **MS** | **Summer** | **10** | **60** | **0** | **90** | **Assoc. Prof. Zahari Vinarov**<br><br>**Assoc. Prof. Elena Vassileva**<br><br>**Prof. Nikolai D. Denkov** | zv@lcpe.uni-sofia.bg<br><br>evassileva@chem.uni-sofia.bg<br><br>nd@lcpe.uni-sofia.bg |

**Short description of the course (in the language of instruction):**

This course is designed to educate Pharmacy students in the subject of "Technology of drug dosage forms 1". The educational program consists of a series of lectures, which are complemented by practical exercises. In the end of the course, the students are subject to practical and theoretical exams.

The course aims to introduce the students to the following topics:

- Role of the Pharmacist in the processes of design, manufacture and quality control of drug products;
- Origin, properties and application of the main pharmaceutical excipients;
- Theoretical foundations and formulation technology of liquid preparations, aerosols, foams and herbal preparations;
- Approaches for solving technological problems for liquid preparations, aerosols, foams and herbal preparations;
- Quality assurance and control of liquid preparations, aerosols, foams and herbal preparations;

The educational program is developed on the basis of the following criteria:

- Recent trends in Pharmacy (on both national scale and worldwide);
- Practical application of the acquired knowledge and skills;
- Current legislation and regulatory requirements;
- Long-standing experience of the lecturers in the course;
- Relation to fundamental courses, studied in the previous years ("Physical chemistry with colloid chemistry", "Physics and biophysics" etc.);
- Relation to upcoming courses ("Biopharmacy and pharmacokinetics");

**Requirements for enrollment: YES**

**If any, please describe the specific requirements:**

Basic knowledge and skills in "Physical chemistry with colloid chemistry" and "Physics and biophysics".

| **Course code** | **Course title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Number of hours** | **Lecturer/s's name** | **Lecturer/s's E-mail** |
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| **CHP212423 O882** | **Pharmacology 1** | **English** | **MS** | **Summer** | **6** | **45** | **0** | **45** | **Assoc.Prof. Ivanka Atanasova** | **atanasovaiv@abv.bg** |

**Short description of the course (in the language of instruction):**

Pharmacology studies the interaction of a drug with a living organism at all hierarchical levels, i.e., from molecular and cellular level to the level of the whole organism. Modern, intensive developments, particularly of the molecular and cellular pharmacology, allow understanding the intimate mechanisms of action of drugs. Knowledge of pharmacology allows The “Master of Pharmacy” to understand the rational, safe and effective pharmacotherapy by physicians.

The aim of education of pharmacy students is to obtain advanced theoretical and practical training in pharmacology necessary for professional realization in different pharmaceutical specialties.

Presentation of drugs from various pharmacotherapeutic groups will use The Chemical ATC (Anatomical Therapeutic Chemical, ATC) classification of medicinal products. Drugs in major pharmacotherapeutic groups are studied using their international non-proprietary names (INN).

**Requirements for enrollment: NO**

**If any, please describe the specific requirements:**

| **Course code** | **Course title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Number of hours** | | | **Lecturer/s’s name** | **Lecturer/s’s E-mail** |
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| **CHP212423 O781** | **Pharmaceutical Technology 2** | **English** | **MS** | **Winter** | **10** | **60** | **0** | **90** | **Assoc. Prof. Christo Tzachev** | **christo_tzachev@hotmail.com** |

**Short description of the course (in the language of instruction):**

This course is designed to educate Pharmacy students in the subject of “Pharmaceutical Technology 2”. The educational program consists of a series of lectures, which are complemented by practical exercises. In the end of the course, the students are subject to practical and theoretical exams.

The course aims to introduce the students to the following topics:

- Theoretical foundations and formulation technology of semi-solid and solid dosage forms, suppositories and inserts;
- Approaches for solving technological problems for semi-solid and solid dosage forms, suppositories and inserts;
- Quality assurance and control of the drug products listed above;

The educational program is developed on the basis of the following criteria:

- Recent trends in Pharmacy (on both national scale and worldwide);
- Practical application of the acquired knowledge and skills;
- Current legislation and regulatory requirements;
- Long-standing experience of the lecturers in the course;

- Relation to fundamental courses, studied in the previous years („Technology of drug dosage forms 1”, “Physical chemistry with colloid chemistry”, “Physics and biophysics” etc.);
- Relation to upcoming courses (“Technology of drug dosage forms 3”, “Biopharmacy and pharmacokinetics”);

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic knowledge and skills in Pharmaceutical Technology

| **Course code** | **Course title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Number of hours** | | | **Lecturer/s’s name** | **Lecturer/s’s E-mail** |
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| **CHP212423 O885** | **Pharmacology 2** | **English** | **MS** | **Winter** | **7** | **45** | **0** | **60** | **Assoc.Prof. Ivanka Atanasova** | atanasovaiv@abv.bg |

**Short description of the course (in the language of instruction):**

Pharmacology studies the interaction of a drug with a living organism at all hierarchical levels, i.e., from molecular and cellular level to the level of the whole organism. Modern, intensive developments, particularly of the molecular and cellular pharmacology, allow understanding the intimate mechanisms of action of drugs. Knowledge of pharmacology allows The “Master of Pharmacy” to understand the rational, safe and effective pharmacotherapy by physicians.

The aim of education of pharmacy students is to obtain advanced theoretical and practical training in pharmacology necessary for professional realization in different pharmaceutical specialties.

Presentation of drugs from various pharmacotherapeutic groups will use The Chemical ATC (Anatomical Therapeutic Chemical, ATC) classification of medicinal products. Drugs in major pharmacotherapeutic groups are studied using their international non-proprietary names (INN).

**Requirements for enrollment: NO**
**If any, please describe the specific requirements:**

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
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| **CHP212423 O611** | **Pharmaceutical Analysis 1** | **English** | **MS** | **Winter** | **7** | **45** | **0** | **60** | **Prof. Tony Spassov**<br>**Prof. Sonia Ilieva**<br>**Assoc. Prof. Christo Chanev**<br>**Assoc. Prof. Valentina Lubomirova** | tspassov@chem.uni-sofia.bg<br>silieva@chem.uni-sofia.bg<br>ohhc@chem.uni-sofia.bg<br>vlah@chem.uni-sofia.bg |

**Short description of the course (in the language of instruction):**

This Pharmaceutical Analysis course examines students closely with methods used to evaluate the quality of synthetic and natural medicinal products. Instrumental, chemical, and physico-chemical analytical methods are considered, both principally and specifically applied to the different drug groups. Based on the knowledge of the chemical properties of drugs acquired in the course in Pharmaceutical Chemistry, students are given the necessary knowledge to choose a method of analysis, as well as theoretical and practical knowledge of how to get it, knowledge of modern analytical documentation - pharmacopoeias, standardization files, etc., as well as the validation of analytical methods.

The first part of the course deals with the methods of molecular spectroscopy - electron and vibration, NMR, chromatography, and mass spectrometry, atomic absorption spectrometry, emission spectral analysis with inductively coupled plasma, and inductively coupled plasma with mass spectrometry, thermal and diffraction methods .

Students gain knowledge of the nature, physical foundations of methods, with the most important instrumentation modules for individual methods, and their applicability for characterizing different classes of compounds. Practical laboratory work is related to the acquisition of real skills for capturing quality spectra, chromatograms and their interpretation. Reading spectra for structural analysis, conducting qualitative and quantitative chromatographic and spectral pharmacopoeial analysis of drugs.

**Requirements for enrollment: YES**

**If any, please describe the specific requirements:**

Basic knowledge and skills in Analytical Chemistry, Physics, Physical chemistry, Pharmaceutical Chemistry

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, | Semester (winter/ summer) | ECTS | Number of hours | Lecturer/s's name | Lecturer/s's E-mail |
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| | | | MA/MS, PhD | | | | | | | |
| **CHP212423 O121** | **Clinical Chemistry** | **English** | **MS** | **Winter** | **4** | **30** | **0** | **30** | **Assoc. Prof. Mariya Ivanova** | **m.ivanova@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The main objective of the course in clinical chemistry is to provide graduated pharmacists a competence, depth knowledge and skills in the following areas:
1. methodical - development, implementation, standardization, quality control and rationalization of modern clinical laboratory methods for studying the chemical composition of biological fluids and tissues of the human body in order to promote early diagnosis, prognosis , monitoring the dynamics of the disease process and the effects of treatment, effective prevention and assessment of the degree of recovery of health and working capacity;
2. laboratory and diagnostic - reference ranges and informative content of clinical - laboratory parameters with a view to the clinical interpretation of their changes under various conditions and diseases.
Special attention is paid to the management system of knowledge and skills related issues particularly relevant clinical laboratory: optimal organization, rationalization , mechanization and automation, standardization and unification, providing quality results and good knowledge of informativeness value.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
For the successfully learning of methodological principles in clinical chemistry students need to have knowledge of organic chemistry, analytical chemistry and biochemistry.

| **Course code** | **Course title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Number of hours** | | | **Lecturer/s's name** | **Lecturer/s's E-mail** |
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| **CHP212423 O582** | **Pharmaceutical Technology 3** | **English** | **MS** | **Summer** | **8** | **45** | **0** | **75** | **Assoc. Prof. Christo Tzachev**<br><br>**Assoc. Prof. Elena Vassileva,** | **christo_tzachev@hotmail.com**<br><br>**evassileva@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
This course is designed to educate Pharmacy students in the subject of "Pharmaceutical Technology 3". The educational program consists of a series of lectures, which are complemented by practical exercises. In the end of the course, the students are subject to practical and theoretical exams.

The course aims to introduce the students to the following topics:
- Theoretical foundations and formulation technology of parenteral preparations;
- Approaches for solving technological problems for parenteral preparations;

- Quality assurance and control of the drug products;
- Stability of drug products and the influence of different factors;
- Innovative drug delivery systems;

The educational program is developed on the basis of the following criteria:
- Recent trends in Pharmacy (on both national scale and worldwide);
- Practical application of the acquired knowledge and skills;
- Current legislation and regulatory requirements;
- Long-standing experience of the lecturers in the course;
- Relation to fundamental courses, studied in the previous years ("Technology of drug dosage forms 1", "Technology of drug dosage forms 2", "Physical chemistry with colloid chemistry", "Physics and biophysics" etc.);
- Relation to upcoming courses ("Biopharmacy and pharmacokinetics");

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Knowledge and skills at the level of Pharmaceutical Technology 2.

| **Course code** | **Course title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Number of hours** | | | **Lecturer/s's name** | **Lecturer/s's E-mail** |
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| **CHP212423 O512** | **Pharmaceutical Analysis 2** | **English** | **MS** | **Summer** | **8** | **45** | **0** | **75** | **Prof. Sonia Ilieva**<br><br>**Assoc. Prof. Tatyana Zikolova** | **silieva@chem.uni-sofia.bg**<br><br>**tzikolova@abv.bg** |

**Short description of the course (in the language of instruction):**
The main objective of Pharmaceutical Analysis 2 is to provide students with comprehensive knowledge about the methodology and specific approaches in characterizing large groups of drug substances of synthetic or natural origin. A plethora of state-of-the-art analytical techniques are studied and their capacity and specific features for performing quantitative and/or qualitative analysis of drug substances, impurities, metabolites and degradation products are discussed and meticulously assessed. The analytical methodologies taught are in line with the Pharmacopoeia requirements. The students gain knowledge enabling them to choose the most appropriate analytical method for characterizing a given analyte, as well as practical skills for its implementation. Furthermore, the course offers valuable information about the contemporary analytical documentation such as pharmacopoeias and standardization files as well as validation of the analytical methods employed.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
The students must have knowledge and skills in Inorganic, Organic and Analytical Chemistry, as well as Pharmaceutical Analysis 1, where the physical

principles and experimental techniques of the respective analytical methods had been taught.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
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| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHP212423 O212** | **Social Pharmacy and Pharmaceutical Law 1** | **English** | **MS** | **Summer** | **5** | **30** | **0** | **45** | **Prof. Emil Hristov** | **fheh@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The course "Social Pharmacy and Pharmaceutical Law" essentially takes place in the curriculum for the training of medical specialists in the professional field "pharmacy" and is determined by the nature of both the professional activity of the Master of pharmacy and social importance of the profession Master of pharmacy.
As one of the main specialized subjects in the education of students in "Pharmacy" based on scientific approaches and methods it provides the regulatory framework for the exercise of the regulated professions in the EU Member States and Bulgaria.
The Syllabus is developed based on the Curriculum and includes a total of 150 hours, spread over 60 hours of lectures and 90 hours tutorials and practical exercises.
Lecture program is divided into five thematic areas - Legal basis of pharmacy, Drug regulation, National Drug Policy, Pharmaceutical management and marketing and Economic aspects of pharmacy.
The Syllabus includes all the theoretical and scientific and practical aspects of medicinal products and pharmaceutical profession since the creation of the drug to reaching the patient and pharmacovigilance.
The aims of the curriculum are:
1. To acquaint the students with the basic definitions and terminology, methods and approaches and statutory requirements in the field of pharmacy and healthcare in the Republic of Bulgaria, the European Union and European Economic Area.
2. To acquaint the students with the key stakeholders in the pharmaceutical sector , manufacturers and importers of medicinal products, wholesalers, retailers ( pharmacies, drugstores , intermediaries , etc.), other legal entities and individuals operating in the pharmacy sector - companies for clinical trials, promotion, information, advertising and etc.
3. To acquaint the students with the National Drug Policy, Healthcare Policy respectively.
4. To gain a better understanding of the place and role of pharmacy and Master of pharmacy in social, economic and social life of the Community.
5. To gain a better understanding of the scientific and practical relationship between Pharmacy and State authorities and institutions.

**Requirements for enrollment: NO**
**If any, please describe the specific requirements:**

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
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| **CHP212423 O182** | **Toxicology** | **English** | **MS** | **Summer** | **6** | **45** | **0** | **45** | **Prof. Vasil Atanasov Dr. Sylvia Stoykova** | **ahva@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**

The course on toxicology aims to introduce the basic principles and concepts related to the toxic action of substances in the living organism. The overall part of the course examines the intake, resorption, distribution, biotransformation and elimination of xenobiotics and their metabolites from the body as well as some quantitative characteristics of the toxicokinetics. Particular attention is paid to the biotransformation of xenobiotics and the importance of these processes to drug metabolism, drug toxicity and safety in pharmacotherapy. Attention is drawn to the realization of the toxic effect (toxicodynamics). The different types of factors relevant to the toxicity of substances, in particular human medicines, are considered. In the special part of the course, attention is paid to the toxic effects on different organs and systems. The toxicological characteristics of the most common intoxications with drugs and poisons of industrial and household character are presented. The course practicum and seminars aim to examine and illustrate the more significant toxicological problems of drug toxicity.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Basic knowledge and skills in Pharmacology

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
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| **CHP212423 O892** | **Pharmacotherapy 1** | **English** | **MS** | **Summer** | **5** | **45** | **0** | **30** | **Assoc.Prof. Ivanka Atanasova** | **atanasovaiv@abv.bg** |

**Short description of the course (in the language of instruction):**

Pharmacotherapy means treatments by medicines. Over the past 15-20 years the modern pharmacy as a science and practice is increasingly transformed from a drug-oriented to a patient-oriented health care.
Teaching and learning in Pharmacotherapy are focused primarily on the treatment of major disease syndromes and disease states. Students will be introduced to disease characteristics in the context of appropriate therapy and applied opportunities to evaluate its safety and effectiveness. The knowledge of the "Master of Pharmacy" in pharmacotherapy permit, in close cooperation with doctors, rational, safe and effective pharmacotherapy. The aim of education is pharmacy students to acquire contemporary theoretical and practical training in drug therapy needed for their further

professional realization in different pharmaceutical specialties.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Knowledge and skills in Pharmacology

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester | ECTS | Number of hours: Lectures | Number of hours: Exercises/ Seminars | Number of hours: Practical work | Lecturer/s's name | Lecturer/s's E-mail |
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| **CHP212423 O621** | **Biopharmaceutics and Pharmacokinetics** | **English** | **MS** | **Winter** | **8** | **45** | **0** | **60** | **Assist.Prof Tzveta Saravska**<br><br>**Assoc. Prof. Christo Tzachev** | nhtth@chem.uni-sofia.bg<br><br>christo_tzachev@hotmail.com |

**Short description of the course (in the language of instruction):**
The main goal of the course is to provide the students with basic knowledge about the principles of biopharmaceutics and pharmacokinetics of dosage forms to allow them to evaluate and solve problems concerning the development, preparation, manufacture and control of drug products. The acquired knowledge about the complex drug/body interaction and the factors that affect the pharmacokinetic processes will help the students to design an optimal drug therapeutic dosing schedule and to monitor the drug therapy.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Knowledge and skills in pharmaceutics, physical chemistry, biochemistry, pharmacology and toxicology. Basic knowledge in mathematics is also required.

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
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| **CHP212423 O891** | **Pharmacotherapy 2** | **English** | **MS** | **Winter** | **6** | **45** | **0** | **30** | **Assoc.Prof. Ivanka Atanasova** | atanasovaiv@abv.bg |

**Short description of the course (in the language of instruction):**
Pharmacotherapy means treatments by medicines. Over the past 15-20 years the modern pharmacy as a science and practice is increasingly

transformed from a drug-oriented to a patient-oriented health care.
Teaching and learning in Pharmacotherapy are focused primarily on the treatment of major disease syndromes and disease states. Students will be introduced to disease characteristics in the context of appropriate therapy and applied opportunities to evaluate its safety and effectiveness. The knowledge of the "Master of Pharmacy" in pharmacotherapy permit, in close cooperation with doctors, rational, safe and effective pharmacotherapy.
The aim of education is pharmacy students to acquire contemporary theoretical and practical training in drug therapy needed for their further professional realization in different pharmaceutical specialties.

**Requirements for enrollment: YES**
**If any, please describe the specific requirements:**
Knowledge and skills in Pharmacology

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Seminars | Practical work | | |
| **CHP212423 O281** | **Social Pharmacy and Pharmaceutical Law 2** | **English** | **MS** | **Winter** | **6** | **30** | **0** | **45** | **Prof. Emil Hristov** | **fheh@chem.uni-sofia.bg** |

**Short description of the course (in the language of instruction):**
The course "Social Pharmacy and Pharmaceutical Law" essentially takes place in the curriculum for the training of medical specialists in the professional field "pharmacy" and is determined by the nature of both the professional activity of the Master of pharmacy and social importance of the profession Master of pharmacy.
As one of the main specialized subjects in the education of students in "Pharmacy" based on scientific approaches and methods it provides the regulatory framework for the exercise of the regulated professions in the EU Member States and Bulgaria.
The Syllabus is developed based Curriculum and includes a total of 150 hours, spread over 60 hours of lectures and 90 hours tutorials and practical exercises.
Lecture program is divided into five thematic areas - Legal basis of pharmacy, Drug regulation, National Drug Policy, Pharmaceutical management and marketing and Economic aspects of pharmacy.
The Syllabus includes all the theoretical and scientific and practical aspects of medicinal products and pharmaceutical profession since the creation of the drug to reaching the patient and pharmacovigilance.
The aims of the curriculum are:
1. To acquaint the students with the basic definitions and terminology, methods and approaches and statutory requirements in the field of pharmacy and healthcare in the Republic of Bulgaria, the European Union and European Economic Area.
2. To acquaint the students with the key stakeholders in the pharmaceutical sector , manufacturers and importers of medicinal products, wholesalers, retailers ( pharmacies, drugstores , intermediaries , etc.), other legal entities and individuals operating in the pharmacy sector - companies for clinical trials, promotion, information, advertising and etc.
3. To acquaint the students with the National Drug Policy, Healthcare Policy respectively.
4. To gain a better understanding of the place and role of pharmacy and Master of pharmacy in social, economic and social life of the Community.

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| 5. To gain a better understanding of the scientific and practical relationship between Pharmacy and State authorities and institutions.<br>Proposed program and structure of the course "Social Pharmacy and Pharmaceutical Law" meets the minimum State requirements for obtaining the degree of Master of Pharmacy and comply with the new guidelines for the development of the pharmaceutical profession and practice in Bulgaria and the Community. |
| **Requirements for enrollment: NO**<br>**If any, please describe the specific requirements:** |

| Course code | Course title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester | ECTS | Number of hours | | | Lecturer/s's name | Lecturer/s's E-mail |
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| **CHP212423 O291** | **Pharmacoeconomics** | **English** | **MS** | **winter** | **6** | **30** | **0** | **30** | **Prof. Emil Hristov**<br><br>**Assoc. Prof. Sava Ognyanov** | **fheh@chem.uni-sofia.bg**<br><br>**fhso@chem.uni-sofia.bg** |

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| **Short description of the course (in the language of instruction):**<br>The course "Pharmacoeconomics" essentially takes place in the curriculum for the training of medical specialists in the professional field "Pharmacy". In the center of public discussion for many years ago is the issue of continuous pressure to increase public spending on drug therapy, amid continuing calls for fiscal tightening and public health care costs.<br>As one of the main specialized subjects in the preparation of students in "pharmacy" based on scientific approaches and methods pharmacoeconomics tries to answer the question : How to find a reasonable balance between the cost of drug therapy and achieve a maximal therapeutic effect.<br>The syllabus is developed based curriculum and includes a total of 60 hours spread over 30 hours of lectures and 30 hours seminars and practical exercises.<br>The training program includes all the theoretical and scientific and practical aspects of pharmacoeconomics, health economics and health technology.<br>Preliminary objectives of the curriculum are:<br>1. To acquaint students with basic definitions ant terminology, methods and approaches of pharmacoeconomics.<br>2. To introduce students to health economics and health technology assessment.<br>3. To prepare students for a proper understanding of the place and role of pharmacoeconomics in the National Drug Policy and Health Policy respectively.<br>4. To prepare students for a proper understanding of the scientific and practical relationships between pharmacoeconomics and government bodies and institutions, healthcare providers and the pharmaceutical industry.<br>Proposed program and structure of the course "Pharmacoeconomics" meets the minimum State requirements for training in the specialty Master of pharmacy and is in line with the new trends in pharmacoeconomics and health technology worldwide. |
| **Requirements for enrollment: NO**<br>**If any, please describe the specific requirements:** |

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
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| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHP212423 O271** | **Pharmaceutical Care** | **English** | **MS** | **Winter** | **6** | **30** | **0** | **30** | **Assoc. Prof. Kalina Andreevska** | **fhka@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** Pharmaceutical care represents a new service to patients in pharmacies based on the cost-effectiveness approach, which includes a mandatory element of counseling the patient. The mission of practicing pharmacists today is to help patients achieve the best use of prescribed medication. Proper training of pharmacists allows them to always know what information to provide to the patient. They should develop the necessary knowledge and skills for effective communication, including the ability to listen effectively, to provide the appropriate feedback, to be persuasive, and to get the patient to trust them. Therefore, the first section focuses on communication skills in pharmaceutical practice, including interpersonal relationships model, the importance of perception, barriers that hinder communication, and nonverbal communication, includes practical life skills that facilitate communication between the pharmacist and the patient (or its relatives), and emphasis attention to strategies for improving compliance of patients with their treatment. The next section of the curriculum focuses on the essence of the concept of "pharmaceutical care" and milestones that should be met in order to develop better treatment plan for the individual patient and its effective monitoring.

**Requirements for enrollment: NO**

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| **CHP212413 E122** | **Bioinorganic chemistry** | **English** | **MS** | **Summer/ Winter** | **4** | **30** | **0** | **30** | **Prof. A. Ahmedova** | **ahaa@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The modern bioinorganic (biocoordination) chemistry deals with the biological processes involving metalloenzymes and metalloproteins, focusing on the main structural and functional characteristics related to the presence of metal ion(s) in their active site. This involves deeper understanding of the properties of metal ions to form coordination compounds and the corresponding characteristics of their structure and reactivity that are directly connected with the biological activity. Another crucial subject of the bioinorganic chemistry is the application of metal complexes in medicine for diagnostics and therapy of wide range of diseases. The unique properties of the metal complexes and the knowledge about the structure-reactivity-biological activity relationship hold out the opportunity for intelligent design of metallopharmaceuticals with target properties and activity. That is why the subjects in the present teaching course will evolve from the fundamental coordination chemistry knowledge to the direct pharmaceutical applications of metal complexes as therapeutic or diagnostic agents including quickly developing field of radiopharmaceuticals. The students will have the opportunity to synthesize by themselves the first metal-based chemotherapeutics, the cisplatin, during the practical work of this course.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| CHP212413 E182 | Coordination compounds in medicine | English | MS | Summer/ Winter | 4 | 30 | 0 | 30 | Prof. A. Ahmedova | ahaa@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** Application of coordination compounds of various metal ions in the contemporary medicine is gaining increasing popularity. Chemotherapy of cancer with platinum complexes is one of the most frequently used methods. Its known shortcomings, however, call for intensive search of more selective and more efficient cytostatics, which is the reason for the rich diversity of novel metal-based antitumour agents as well as the development of new approaches for cancer treatment. The course focuses on the state-of-the-art applications of coordination compounds in therapy and diagnostics along with the prospects to their elaboration. The usage of radiopharmaceuticals for diagnostics and therapy of various diseases is another modern subject that will be presented in this teaching course. The diversity of structures and properties of the metal complexes and the possibility for their fine tuning according to the target application is the key reason for the broad spectrum of their pharmaceutical application which will be demonstrated with appropriate examples from the nowadays medicinal practice. The knowledge on the properties and the biological role of the essential and toxic metal ions allows for the positive influence on neurodegenerative and cardio-vascular diseases as well as for detoxication through chelatotherapy. The students will have the opportunity to synthesize by themselves the first metal-based chemotherapeutics, the cisplatin, during the practical work of this course.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | | ECTS | Workload (hour) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
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| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| CHP212417 E211 | Molecular Modelling of Pharmacophores | English | MS | Winter/Summer | 4 | 30 | 0 | 30 | Prof. Anela Ivanova | aivanova@chem.uni-sofia.bg |

**Short description of the course (done in the language of instruction):** The course is designed for all students who want to obtain an overview over methods and techniques applied in computer-assisted pharmacophores design.

Molecular modelling (MM) has seen in the last years a rapid development which reaches far beyond its original goal to easily assess conformation and dynamics of larger molecules essentially provided by molecular mechanics and computer graphics. It has become a powerful tool ranging now from

graphical drug design (*de novo* design) to application of neural networks and artificial intelligence.
The aim of this course is to present the appropriate tools and basic models for molecular modelling of pharmacophores.

**Requirements for enrollment: NO**

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | | **ECTS** | **Workload (hour)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
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| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHP212423 F211** | **Colloids and Dispersions in Medicine and Pharmacy** | **English** | **MS** | **Winter** | **5** | **45** | **0** | **30** | **Prof. Konstantin Balashev** | **fhkb@chem.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The course gives a concise description of the physical-chemical principles determining interrelated colloidal and interfacial phenomena. These phenomena are generic; their occurrence in colloidal systems as blood, cell plasma, food products, waste water, etc. can be traced back to the same laws of nature. Because the colloidal dispersions in the life systems are predominantly gels of biopolymers and self-assembled amphiphilic structures rather than aqueous solutions, hence the course emphasis is placed on studying of these reversible (lyophilic) colloids. The synthesis, properties and applications of nanocolloids from semi-conductor, metal and polymer nanoparticles are also considered. The course is appropriate for the upper-level undergraduate and graduate students in chemistry, materials science, biotechnology, molecular biology, biomedical sciences, medicine and pharmacy.

**Requirements for enrollment: NO**

| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | **Semester (winter/ summer)** | **ECTS** | **Workload (hours)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
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| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHP212423 E721** | **Cosmetic products as disperse systems** | **English** | **MS** | **Winter** | **4** | **30** | **0** | **30** | **Prof. Krastanka Marinova** | **km@lcpe.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The aim of the course is to provide the students with specific knowledge on cosmetic products as disperse systems. All cosmetic formulations are complex multi-component disperse systems, the properties of which may be described within the general framework of physical chemistry of disperse systems. Apart from defining the properties and stability of cosmetic products, the state of the dispersion often fosters or aids a specific activity mechanism of the product. Therefore, the course introduces both the general principles of action, depending on the disperse state of the products, and many specific examples and applications. The various forms (emulsions, foams, suspensions, gels, etc.) are described, including those that enter decorative cosmetics for skin, hair and nails. The current terminology is introduced, which is in line with the active legislation, inclusive of various physical-chemical methods for characterization of the rheology, structure and composition of the products. During the practical exercises, the students prepare, observe and characterize actual products, using standard recipes

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| and preparation methods following the present regulations. |
| **Requirements for enrollment: NO** |

**Programme MASTER PROGRAM DISPERSE SYSTEMS IN CHEMICAL TECHNOLOGIES**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | | ECTS | Workload (hour) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
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| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHD212422 O712** | **Rheology of disperse systems** | **English** | **MS** | **Summer** | **5** | **30** | **15** | **15** | **Prof. Slavka Tcholakova** | sc@lcpe.uni-sofia.bg |
| **Short description of the course (done in the language of instruction):** The aim of the course is to acquaint students with the main types of rheological behavior, its manifestation in dispersed systems and the experimental methods. Formal rheology: deformations, stresses; elastic, viscous and plastic behavior of bodies; elasticity, viscosity and yield stress. Composite rheological models of Maxwell, Kelvin and Bingham; thixotropic behavior. Basic concepts of hydrodynamic interactions between particles in disperse systems. Surface rheology and its role for stabilization of films and the coalescence of drops/bubbles. Rheology of suspensions, emulsions and foams. Experimental methods for characterizing rheological properties. | | | | | | | | | | |
| **Course code** | **Course Title** (in English) | **Language of instruction** | **Course offered to BA/BS, MA/MS, PhD** | | **ECTS** | **Workload (hour)** | | | **Lecturer/s's name** | **Lecturer/s's e-mail/s** |
| | | | | | | **Lectures** | **Exercises/ Seminars** | **Practical work** | | |
| **CHD212422 O710** | **Formation and stability of disperse systems** | **English** | **MS** | **Winter** | **9** | **45** | **0** | **45** | **Prof. Slavka Tcholakova** | sc@lcpe.uni-sofia.bg |
| **Short description of the course (done in the language of instruction):** The main objectives of this course are (1) to introduce students to the main methods for obtaining various types of disperse systems, (2) to explain the main processes responsible for the stabilization and destabilization of these systems, and (3) to clarify the main factors that can be used to control the methods for obtaining and stabilizing the systems. The material is illustrated with examples from the numerous applications of disperse systems in modern technology and everyday life. Students acquire both theoretical knowledge and practical skills related to the preparation of foams, emulsions and suspensions, and to the methods for studying their properties. | | | | | | | | | | |
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| **Requirements for enrollment: NO** | | | | | | | | | | |

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | | ECTS | Workload (hour) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHD212422 O711** | **Emulsifiers, foam stabilizers and wetting agents** | **English** | **MS** | **Winter** | **7** | **45** | **0** | **15** | **Prof. Slavka Tcholakova** | **sc@lcpe.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The major aim of this course is to present the main properties of surfactants from the view point of their applications in different industries as emulsifiers, foam stabilizers, wetting agents and others. The course presents and discusses the thermodynamics and kinetics of adsorption of surfactants; the effects on the surface tension and electrical potential of fluid interfaces, and on the wetting of hard surfaces; of crystallization, micelle formation and solubilization in surfactant solutions. The engineering aspect of the course is related to the understanding of physicochemical theory in this field, which allows computer modeling of the properties of various systems and the processes that take place in them, interpretation of experimental data and quantitative predictions. The aim of the exercises is for the students to acquire basic experimental methods in this field and the methods for quantitative interpretation of the obtained results.

**Requirements for enrollment: NO**

| Course code | Course Title (in English) | Language of instruction | Course offered to BA/BS, MA/MS, PhD | Semester (winter/ summer) | ECTS | Workload (hours) | | | Lecturer/s's name | Lecturer/s's e-mail/s |
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| | | | | | | Lectures | Exercises/ Seminars | Practical work | | |
| **CHD212422 P711** | **Research practice** | **English** | **MS** | **Winter** | **5** | **0** | **0** | **150** | **All teachers from the Master programme** | **sc@lcpe.uni-sofia.bg** |

**Short description of the course (done in the language of instruction):** The research practice is organized as regular (if necessary, individual) classes, during which students should acquire the necessary skills to solve a given scientific problem using various experimental methods and/or theoretical approaches. Initially, each student is trained to find information about the specific scientific problem in specialized scientific literature sources and databases, to extract the necessary data and summarize them. After that, the students are trained to operate with the different experimental methods and/or theoretical approaches for solving the set research task. Effectiveness and control over the implementation of the tasks are the responsibility of the academic supervisor of the research practice.

**Requirements for enrollment: NO**