

BERUFSAKADEMIE SACHSEN – Staatliche Studienakademie Riesa

Degree Program: Laboratory and Process Engineering

| Module code | Module name | Short description | Semester | ECTS |
|---|---|---|----------|------|
| Compulsory modules | | | | |
| Field of study: Laboratory and Process Engineering | | | | |
| 6LV-MATH1-T-10 | Mathematical Foundations | The module imparts the foundations of scientific and technical mathematics, such as linear algebra, equations and systems of equations, differential and integral calculus as well as methods of descriptive statistics, and enables students to apply this knowledge to the representation and solution of technical and scientific questions and problems. | 1 | 5 |
| 6LV-PHYS1-T-10 | Technical Physics 1 | The module covers the principles of mechanics, thermodynamics, optics, and atomic physics and thus forms the basis for all modules with metrological, analytical or process engineering content. Students acquire a basic understanding of the physical terms, principles and laws that are essential for further professional qualification and future work. | 1 | 5 |
| 6LV-CHEM1-T-10 | General and Inorganic Chemistry | Students expand and deepen their skills and knowledge of theoretical fundamentals of general, inorganic and, partly, physical chemistry. The contents of this module are an essential prerequisite for the understanding of other chemistry-relevant modules such as physical chemistry, biochemistry, and instrumental analysis. Parallel to the lecture, students deepen their knowledge in laboratory exercises and learn the safe and clean handling of chemicals and laboratory equipment as well as basic laboratory techniques with the aim of acquiring the practical skills necessary for the practical courses in all further modules related to laboratory analytics or process engineering. | 1 | 5 |
| 6LV-GBSS-T-10 | Foundations of Biology and Radiation Protection | This module serves as basic module 1 for imparting foundations in the fields of biology as well as radioactivity and radiation protection to the extent required for the degree program. Advanced modules of this degree program provide more in-depth knowledge in accordance with the selected field of study. | 1 | 4 |

| Module code | Module name | Short description | Semester | ECTS |
|----------------|---------------------------------|--|----------|------|
| 6LV-ENGL-T-12 | Technical English | In this module, students expand and deepen their English language skills with regard to business and technical English, so that they are able to express professional and business-related issues in both oral and written form. The practical phase of the 1st semester involves a presentation in English on a specialist topic which is based on the work in the respective practice company. The presentation is held in the theoretical phase of the 2nd semester. | 1 and 2 | 5 |
| 6LV-INFOR-T-12 | Informatics | This module imparts the fundamentals of computer science. Following a short consolidation of previous knowledge of computers, operating systems and office programs, the common spectrum of computer-based tools and media is presented. Furthermore, the module conveys the foundations of programming on the example of a programming language. Furthermore, students learn how to create and work with databases. | 1 and 2 | 5 |
| 6LV-MATH2-T-20 | Special Chapters of Mathematics | The first part of this module deals with differential equations, functions of two and more variables and series. In the second part, methods of conclusive statistics are described and used for the evaluation and interpretation of experimental results. | 2 | 5 |
| 6LV-PHYS2-T-20 | Technical Physics 2 | Students expand and deepen their knowledge of the fundamentals of electrical engineering and electronics and are enabled to calculate circuits in direct and alternating current technology. The selection of the electrical and electronic components to be dealt with depends on the further usability in the following module "Measurement and Control Engineering". In addition to the lectures and exercises, students attend laboratory exercises to deepen their knowledge of electrical engineering and electronics, thus learning the basics of a qualified handling of electrical and electronic components and the medium of electrical current. | 2 | 5 |
| 6LV-CHEM2-T-20 | Organic Chemistry | Students expand and deepen their knowledge and skills regarding the theoretical foundations of organic chemistry and the chemical fundamentals of biochemistry. The contents of this module are an essential prerequisite for the understanding of other chemistry-related modules such as physical chemistry, biochemistry, and instrumental analysis. Parallel to the lecture, students attend laboratory exercises to deepen their knowledge and learn the safe and clean handling of chemicals and laboratory equipment as well as basic laboratory techniques. Students acquire the practical skills necessary for the practical training in all further modules related to laboratory analysis or process engineering. | 2 | 5 |

| Module code | Module name | Short description | Semester | ECTS |
|----------------|---|---|----------|------|
| 6LV-GBUS-T-20 | Foundations of Biology and Environmental Protection | This module serves as basic module 2 for imparting foundations in the fields of general physiology as well as ecology and environmental protection to the extent required for the degree program. Advanced modules of this degree program provide more in-depth knowledge in accordance with the selected field of study. | 2 | 4 |
| 6LV-PCHEM-T-30 | Physical Chemistry and Spectroscopy | Based on the module on chemistry, the lecture imparts selected principles of physical chemistry, especially in the fields of thermodynamics and spectroscopic methods for structural elucidation. Students acquire essential knowledge for the subsequent modules on process engineering and instrumental analysis. | 3 | 5 |
| 6LV-MVTEC-T-30 | Mechanical Process Engineering and Fluid Mechanics | This module presents those fundamentals of process engineering in laboratory and process engineering which are related to mechanical processes. The necessary fluid mechanical basics are imparted. Due to its importance for laboratory and process engineering, the module places special emphasis on particle technology including particle measurement technology. Essential basic operations of mechanical process engineering, including the implementation of apparatus, are presented. Selected key aspects of the module are deepened in laboratory exercises. The principles of thermal process engineering are covered in the module "Thermal Process Engineering". | 3 | 5 |
| 6LV-PMM-T-30 | Project Management | Upon completion of the module, students are able to successfully plan and carry out projects and scientific research. The necessary tools, planning techniques and working methods are conveyed in this course. On this basis, participants are able to present the results of their work. | 3 | 4 |
| 6LV-MSRT-T-30 | Measurement and Control Engineering | The module imparts the foundations of measurement and control technology. Students deepen in practical laboratory exercises. The application examples and exercises used in the module are primarily related to aspects of laboratory and process engineering. | 3 | 4 |
| 6LV-INAN1-T-40 | Analytical Separation Methods | Students become acquainted with the interdisciplinary character of instrumental analysis in the form of the interaction of, among others, chemistry, physics, statistics, measurement and sensor technology, computer technology and process engineering. They acquire fundamental knowledge of the quality-oriented analytical process, sampling and the instrumental-analytical methods of chromatography and electrophoresis. Students understand these methods as a foundation for environmental, bioanalytical and radiation analytical investigations. In addition to the lecture, students attend laboratory exercises to deepen their knowledge of instrumental analysis and become familiar with basic instrumental analysis procedures. | 4 | 4 |

| Module code | Module name | Short description | Semester | ECTS |
|----------------|--------------------------------------|--|----------|------|
| 6LV-APPWS-T-40 | Foundations of Devices and Materials | This module deals with the technical principles of laboratory and process engineering equipment. The elements occurring in the devices are characterized, and the basics of technical drawing necessary for the representation of the device elements are taught. The importance of technical documentation for the efficient functional and production-oriented design of processes and documents is emphasized in this context. Furthermore, the module addresses the fundamentals of statics as well as strength and materials engineering to the extent required for this degree program. | 4 | 5 |
| 6LV-TVTEC-T-40 | Thermal Process Engineering | This module continues the discussion of the process engineering fundamentals of laboratory and process engineering. Focus is placed on the processes of heat transfer as well as the processes of mass transfer. Furthermore, the module introduces essential basic operations of thermal process engineering including their technical realization. Selected key areas of the module are consolidated in laboratory exercises. | 4 | 5 |
| 6LV-CVTEC-T-40 | Chemical Process Engineering | The module deals with the fundamentals of reaction engineering of process engineering processes, which play an important role in certain methods of bioreaction engineering or in gas purification processes. Starting with the presentation of basic reaction engineering terms, homogeneous reaction systems are addressed, and the ideal view is extended to real reactors. The module examines selected heterogeneous reaction systems and presents apparatus solutions. Furthermore, the problem of residence time investigations is discussed. The module includes exercises in which selected topics are consolidated through laboratory exercises. | 4 | 4 |
| 6LV-INAN2-T-50 | Elemental Analysis | Students become acquainted with the interdisciplinary character of instrumental analysis in the form of the interaction of, among others, chemistry, physics, statistics, measurement and sensor technology, computer technology and process engineering. They acquire fundamental knowledge of the quality-oriented analytical process, elemental analysis, and electroanalytical and radiometric procedures. Students understand these procedures as a foundation for environmental, bioanalytical and radiation analytical investigations. In addition to the lecture, students attend laboratory exercises to deepen their knowledge of instrumental analysis and become familiar with basic instrumental analysis procedures. | 5 | 4 |

| Module code | Module name | Short description | Semester | ECTS |
|--------------------------------------|-------------------------------|--|----------|------|
| 6LV-RECHT-T-50 | Law and Safety | Students learn to understand the legal issues and implications involved in the fields of biotechnology, environmental technology, and radiation technology. Main focus is put on the legal areas of the occupational safety sector and their correct application to technical-technological problems. Students acquire the ability to interpret, balance and assess legal requirements in a conclusive manner. Dealing with potential hazardous substances requires safe working, trained personnel, and knowledge of the relevant legal and safety regulations (laws, ordinances, guidelines). The second part of the module offers specialized knowledge according to the respective field of study. | 5 | 4 |
| 6LV-BWL-T-50 | Business Administration | Upon completion of the module, students are able to apply cost concepts of everyday business life in the planning and implementation of projects and in the preparation of offers and invoices. This includes the fundamentals of corporate legal forms (liability, rights of representation/authority to issue instructions), of German contract law as well as an understanding of organizational structures in the company. The module thus provides the basis for successful employee management (including communication skills). | 5 | 4 |
| 6LV-QUSM-T-60 | Quality and Safety Management | Students learn how to measure hazardous substances and how to forecast and evaluate hazardous situations/risks in different areas. Furthermore, the module addresses the conditions for the safe handling of hazardous substances (transport, storage, labelling, procurement, and delivery, etc.). Hazard potentials of plants and other hazards in the company can be medically and economically assessed and evaluated. Special qualification requirements in the field of laboratory and process engineering can be analyzed and implemented in personnel planning. | 6 | 4 |
| Compulsory modules | | | | |
| Field of study: Biotechnology | | | | |
| 6LV-GBT-T-30 | Foundations of Biotechnology | This basic module aims to impart knowledge of the function and use of biological systems and processes. The module content ranges from the molecular level to cell structure and function (prokaryotes and eukaryotes) to the interactions between cells, tissues, and organ systems as well as organisms. Based on the knowledge of inorganic and organic chemistry, the module deals with metabolic principles of the living cell. The theoretical knowledge of the subject area is consolidated through practical laboratory exercises and field trips. | 3 | 6 |

| Module code | Module name | Short description | Semester | ECTS |
|---------------|---------------------------|---|----------|------|
| 6LV-MOLB-T-40 | Molecular Biology | This interdisciplinary subject area deals with the foundations of enzyme biosynthesis and enzyme kinetics. Furthermore, various possibilities for the production and processing of enzymes are presented. Current biotechnological applications are presented and discussed for all subtopics. In the field of genetics, which deals with the principles of heredity, students acquire detailed knowledge of classical genetics as well as structures and processes in molecular genetics. The theoretical knowledge of the subject area, e.g. the isolation, transmission, and reproduction of genetic material, is consolidated through practical laboratory exercises and field trips. | 4 | 6 |
| 6LV-BVT-T-50 | Bioprocess Engineering | Bioprocess engineering uses biotechnological methods to create new products. The possibilities for the technological management of sensitive production systems with cell cultures and enzymes for the generation of high-quality metabolites and biopharmaceuticals are conveyed via online analytics, process automation and by dealing with engineering aspects of fermentation, product generation and purification as well as aseptics and sterile process technology. | 5 | 6 |
| 6LV-ZKAN-T-60 | Cell Culture and Analysis | The module imparts mainly laboratory-practical expertise in the cultivation of animal/human and plant cell populations outside of a biological organism (in vitro) under controlled conditions. Furthermore, molecular analytical methods for the characterization/ differentiation of cells and tissues are presented and applied. On the one hand, this module provides a general overview of modern methods and procedures for the isolation and analysis of proteins and nucleic acids as well as cell-based approaches to systems biology. On the other hand, selected specific chapters of bioanalytics are discussed in detail. These include in particular fluorescence-based methods, the procedures for protein determination, and the polymerase chain reaction (PCR). | 6 | 4 |

| Module code | Module name | Short description | Semester | ECTS |
|--|---|--|----------|------|
| 6LV-ANBIN-T-60 | Applied Bioinformatics | Students gain an insight into the detailed information available on biological species and develop a feeling for the diverse applications of bioinformatics. They become familiar with methods for the acquisition of biological data and analytical procedures and, by working independently on the web, acquire the ability to retrieve such information from corresponding databases and to carry out calculations on this basis. On the one hand, this module provides a general overview of modern methods and procedures for the isolation and analysis of proteins and nucleic acids, cell-based approaches to systems biology and natural science databases. On the other hand, selected chapters of bioanalytics are covered in detail against the background of computer science. This includes in particular the methods for protein and DNA sequencing. | 6 | 4 |
| Compulsory modules | | | | |
| Field of study: Chemical Technology | | | | |
| 6LV-CAS-T-30 | Chemistry of Selected Substance Classes | Students expand and deepen their knowledge and skills in the field of material diversity, especially in organic chemistry and the special chemical properties of modern materials. The contents of the module build on the first and second semester modules on chemistry. In addition to the lectures, students attend laboratory exercises to consolidate their knowledge and skills in the safe and clean handling of chemicals and laboratory equipment. | 3 | 6 |
| 6LV-CT1-T-40 | Chemical Technology 1 | The module commences with an overview of the chemical industry. Important chemical sites are introduced, and the problems of energy and raw material supply are discussed. Students are provided with an overview of the most important industrial production processes for inorganic substances. Selected examples of the production of primary chemicals as well as intermediate and special products are presented to illustrate the different requirements of the production processes, also in dependence on the production volume. Furthermore, the module imparts knowledge of process development and plant design. This includes the criteria for the selection of chemical processes, the different types of flow diagrams and the problem of upscaling. Students take part in field trips to gain a better understanding of the processes they have been introduced to. | 4 | 6 |

| Module code | Module name | Short description | Semester | ECTS |
|---|---|--|----------|------|
| 6LV-CT2-T-50 | Chemical Technology 2 | The module commences with an overview of the most important industrial production processes of organic substances. Selected examples of the production of basic chemicals as well as intermediate and special products are used to illustrate the different requirements of the production processes, also in dependence on the production volume. The part " Chemical Process Engineering II" expands and deepens the knowledge imparted in the basic module "Chemical Process Engineering" for chemical technologists. Students take part in field trips to gain a better understanding of the processes they have been introduced to. | 5 | 6 |
| 6LV-GCH-T-60 | Green Chemistry | The module introduces and discusses several concepts of green chemistry, which are used in attempts to make the production of chemical products more sustainable. Special emphasis is placed on the link to "white or industrial biotechnology", which is used to make the often multi-stage production of special products, in particular for the pharmaceutical industry, more efficient by using specifically coordinated chemical and biotechnological syntheses. The contents of the module build on previous courses in both chemistry and biology. | 6 | 4 |
| 6LV-PWA-T-60 | Process and Materials Analytics | The module focuses on familiarizing students with important methods for determining physical (material) properties and the special requirements for analytical or sensor-based methods of process control. Students expand and deepen their knowledge and skills in analytical investigation methods. The contents of the module are therefore based on the chemical and analytical modules of the 1st to the 4th semester. In addition to the lectures, students attend laboratory exercises to deepen their knowledge. They are able to independently and confidently operate and handle laboratory and analytical equipment. | 6 | 4 |
| Compulsory modules | | | | |
| Field of study: Radiation Technology | | | | |
| 6LV-GUSS-T-30 | Foundations of Environmental and Radiation Protection | Building on the modules " Foundations of Biology and Radiation Protection" and "Foundations of Biology and Environmental Protection", students gain more in-depth knowledge in the fields of geosciences as well as climate and water ecology. The module conveys geobiological fundamentals and interrelationships as well as further basics of radioactivity and interaction between ionizing radiation and matter. | 3 | 6 |

| Module code | Module name | Short description | Semester | ECTS |
|--|--|--|----------|------|
| 6LV-UAMS-T-40 | Environmental and Waste Management, Dispersal of Pollutants | The module deals with the principles of waste management and waste and recycling management. In addition, students gain knowledge about the dispersal of pollutants and fundamentals of radioecology. The importance of waste management concepts is discussed. The module also covers the requirements and contents of environmental impact assessments in the context of plant and operating permits. | 4 | 6 |
| 6LV-RAD-T-50 | Radiology | The module deals with the medical basics for clinical pictures which require diagnoses with conventional or digital radiology (e.g. CT, MRT) or radiotherapy. When examining the options for diagnosis and therapy using ionizing radiation, the module always considers the relationship between radiation exposure and the required radiation protection. | 5 | 6 |
| 6LV-STRS-T-60 | Radiation Protection | The module focuses on the determination of doses, contaminations, and activities as well as their external and internal calculation. For this purpose, participants are familiarized with the design and mode of operation of common radiation protection measuring devices and their application. In addition to the lecture, students attend laboratory exercises to consolidate their knowledge. | 6 | 4 |
| 6LV-SKST-T-60 | Special Chapters of Radiation Technology (Nuclear Technology, Dismantling, NORM) | The module deals with the complex field of nuclear technology, from theoretical foundations to the description of a research reactor/nuclear power plant and the dismantling of corresponding facilities. A connection is made to the NORM (naturally occurring radioactive material) complex, which lies in the existence of the radioactive conversion series, i.e. naturally occurring radioactivity. | 6 | 4 |
| Compulsory modules | | | | |
| Field of study: Environmental Engineering | | | | |
| 6LV-GUSS-T-30 | Foundations of Environmental and Radiation Protection | Building on the modules "Foundations of Biology and Radiation Protection" and "Foundations of Biology and Environmental Protection", students gain more in-depth knowledge in the fields of geosciences as well as climate and water ecology. The module conveys geobiological fundamentals and interrelationships as well as further basics of radioactivity and interaction between ionizing radiation and matter. | 3 | 6 |

| Module code | Module name | Short description | Semester | ECTS |
|---------------|---|--|----------|------|
| 6LV-UAMS-T-40 | Environmental and Waste Management, Dispersal of Pollutants | The module deals with the principles of waste management and waste and recycling management. In addition, students gain knowledge about the dispersal of pollutants and fundamentals of radioecology. The importance of waste management concepts is discussed the module also covers the requirements and contents of environmental impact assessments in the context of plant and operating permits. | 4 | 6 |
| 6LV-WAB-T-50 | Sewage and Waste Treatment | The module imparts the scientific foundations of the currently applied processes of sewage and sewage sludge treatment as well as waste treatment including their technical realization and new developments. Furthermore, students are introduced to recycling techniques. The importance of waste management concepts is emphasized. The priority of waste avoidance over waste disposal for an energy and resource efficient materials management is also emphasized. In the context of complex investigations and evaluations of wastewater and waste samples, the module shows how general analytical and metrological methods can be applied in practice and how the results can be presented in the form of analytical reports or partial expert reports. The complex investigations carried out in the laboratory exercises consolidate the analytical procedures and methods covered in the modules "Analytical separation methods" and "Elemental analysis". | 5 | 6 |
| 6LV-GAR-T-60 | Gas and Waste Gas Purification | This module deals with the scientific foundations of the currently applied processes for gas and waste gas purification, including the corresponding technical realizations and current developments. Investigations and evaluations of air samples are carried out, and the results are presented in the form of analysis reports or partial expert reports. The special features of gas and waste gas analysis are addressed. | 6 | 4 |
| 6LV-ALBB-T-60 | Contaminated Sites and Soil Treatment | This module deals with the foundations of the currently applied methods of soil remediation, including technical realizations and current developments. The corresponding recycling techniques are presented and the importance of the problem of contaminated sites is highlighted. With reference to the political and economic significance of the remediation of contaminated sites as well as a definition of the term "contaminated sites", the module discusses the principles of risk assessment in relation to contaminated sites, possible remediation strategies and procedures as well as the proper engineering planning of contaminated site remediation. Furthermore, the module includes complex investigations of soil samples and the presentation of the results in the form of analysis reports or partial expert reports. | 6 | 4 |

| Module code | Module name | Short description | Semester | ECTS |
|---|---------------------------------------|--|----------|------|
| Compulsory elective modules | | | | |
| Field of study: Laboratory and Process Engineering | | | | |
| 6LV-MONA1-T-50 | Instrumental Analysis (Semester 5) | In this module, one or more selected analytical systems (e.g. GC-MS, HPLC, CE, AAS, FT-IR, XRF) are intensively discussed both theoretically and in particular practically in the form of laboratory exercises. The module comprehensively covers the scientific and technical foundations of the selected analytical method as well as its main fields of application and limitations. Detailed knowledge of the structure and function of the selected analytical system is developed in accordance with the state of the art. As a result, students are qualified to set up and routinely operate the selected analysis system. | 5 | 3 |
| 6LV-FUE1-T-50 | Research and Development (Semester 5) | This module is an individually designed course that aims to strengthen project-oriented abilities and skills in scientific work. Focus is placed on the development of these abilities and skills for interdisciplinary work in application-oriented research. After being given an introduction, students work independently on a research task, which can be assigned by the Studienakademie as well as by a practice partner or another cooperating institution. Depending on the available research topics, participation in this module is restricted. On application, the head of the study program decides on the implementation, the allocation of topics and responsibilities. It is possible to complete the module in small groups (max. 2 students per topic). A current list of topics is available upon registration for the module. | 5 | 3 |
| 6LV-ALEN-T-50 | Renewable Energies | The module provides an overview of the types and possible applications of renewable energies. It includes a critical examination of the individual energy sources with regard to their development potential and economic viability, taking into account current funding programs. | 5 or 6 | 3 |
| 6LV-CAD-T-50 | CAD | This module introduces students to the use of a modern CAD system. The CAD system is presented as a modern communication technology that allows for efficient development, management and archiving of products. The applications covered in the exercises are selected in accordance with the requirements of laboratory and process engineering. | 5 or 6 | 3 |
| 6LV-MEMV-T-50 | Membrane Processes | The module imparts knowledge of modern and innovative separation processes on the basis of membranes. These separation processes are primarily used for particle or molecule sizes in the micro- and nanometer range and represent an alternative to the classical separation processes of mechanical and thermal process engineering. Membrane processes are used in the laboratory as well as in the industrial sector. | 5 or 6 | 3 |

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|---------------|--------------------------|--|----------|------|
| 6LV-BIOS-T-50 | Biosensors | Students acquire knowledge of crucial design features and properties of the most important classes of biosensors. Detailed knowledge of the advantages and disadvantages provides them with a complete picture of the real performance of biosensors in various application areas. | 5 or 6 | 3 |
| 6LV-LABV-T-50 | LabVIEW/Image Processing | The module imparts knowledge of the graphical programming language "LabVIEW" (Laboratory Virtual Instrumentation Engineering Workbench) and image processing using "Vision Assistant", both software products by National Instruments. This includes the design of sophisticated user interfaces from the field of "green engineering" such as bioreactors, heat pumps and fuel cells as well as the image processing of microscopic preparations and their associated computerized evaluation. Image processing refers to microscopy image analysis, whereby microscope images of microscopic specimens are processed on the PC by means of a microscope, camera, PC and the image processing software "Vision Assistant" in such a way that cells can be counted (Particle Analysis), specimens measured (Pattern Matching), specimens determined in color (Color Location), and evaluated and stored as results (Color Pattern Matching). | 5 or 6 | 3 |
| 6LV-HYGE-T-50 | Hydrogeology | The module provides an overview of hydrogeology as the science of underground water, its origin, storage conditions, laws of motion and dynamics, physical and chemical properties, interactions with rocks, relationships with atmospheric and surface waters and its economic importance. | 5 or 6 | 3 |
| 6LV-INÖK-T-50 | Industry and Ecology | The module addresses the scientific foundations of ecology as a central prerequisite for the development and implementation of suitable methods of environmental protection in urban industrial society. Students gain an understanding of the legal principles of ecology, which contribute to the evaluation, preservation, and, where necessary, the remediation and further development of the environmental parameters of a site. Focus is placed on the technical prerequisites for the analysis of ecosystem processes and the evaluation of undesirable developments on natural resources in order to use the acquired engineering skills and methodological competence to achieve efficient technical environmental protection in production processes. | 5 or 6 | 3 |

| Module code | Module name | Short description | Semester | ECTS |
|----------------|---|--|----------|------|
| 6LV-FERM-T-50 | Fermentation | The module provides an overview of the most important processes and techniques in the conversion of biological materials by microorganisms. In special laboratory exercises, students examine e.g. criteria for the selection of microorganisms, the design and characterization of bioreactors, analytical methods for monitoring and controlling fermentation and product synthesis on the lab scale model and on an industrial scale. | 5 or 6 | 3 |
| 6LV-TIEN-T-50 | Tissue Engineering and Biomaterials | Biomaterial usually refers to synthetic or non-living natural materials or materials that are used in medicine for therapeutic or diagnostic purposes and that come into direct contact with biological tissues of the body. Biomaterials play a special role in the scientific field of tissue engineering. Here they serve as a carrier scaffold for living cells and biomolecules. Tissue engineering is used to cultivate bioartificial tissues or organs (skin, blood vessels, bone and cartilage replacement, muscle, nerves, liver replacement systems, etc.) outside the human body and then implant them into patients. The module introduces different materials and their use as biomaterials. Furthermore, the basic terms and processes of tissue engineering, starting with the production of suitable carrier systems, cell isolation and the cultivation of finished cell/matrix constructs are covered. The module chapters are conveyed in a practice-oriented manner using selected examples and referring to current research results. | 5 or 6 | 3 |
| 6LV-PHARM-T-50 | Pharmacology and Active Substance Research | Pharmacology studies the biological effectiveness of active substances. The module focuses on the molecular causes of diseases, the identification of molecular and biochemical drug targets, the search for active substances and the production, functional testing, and formulation of active substances for therapy. | 5 or 6 | 3 |
| 6LV-UMME-T-50 | Environmental Meteorology | The module deals with the effects of anthropogenic physical and chemical interventions in the atmospheric environment and the resulting effects on organisms (humans, animals, plants). Furthermore, possibilities for reducing these phenomena are discussed. | 5 or 6 | 3 |
| 6LV-FKSV-T-50 | Qualification of Radiation Protection according to the Radiation Protection Ordinance | Based on the guideline for technical qualification according to the Radiation Protection Ordinance of 29 November 2018, the module leads to the acquisition of the required technical qualification. The course contents correspond to the module GH as defined in the guideline for technical qualification. | 5 or 6 | 3 |

| Module code | Module name | Short description | Semester | ECTS |
|--------------------------------------|---------------------------------------|--|----------|------|
| 6LV-MONA2-T-60 | Instrumental Analysis (Semester 5) | In this module, one or more selected analytical systems (e.g. GC-MS, HPLC, CE, AAS, FT-IR, RFA) are intensively discussed both theoretically and in particular practically in the form of laboratory exercises. The module comprehensively covers the scientific and technical foundations of the selected analytical method as well as its main fields of application and limitations. Detailed knowledge of the structure and function of the selected analytical system is developed in accordance with the state of the art. As a result, students are qualified to set up and routinely operate the selected analysis system. | 6 | 3 |
| 6LV-FUE2-T-60 | Research and Development (Semester 6) | This module is an individually designed course that aims to strengthen project-oriented abilities and skills in scientific work. Focus is placed on the development of these abilities and skills for interdisciplinary work in application-oriented research. After being given an introduction, students work independently on a research task, which can be assigned by the Studienakademie as well as by a practice partner or another cooperating institution. Depending on the available research topics, participation in this module is restricted. On application, the head of the study program decides on the implementation, the allocation of topics and responsibilities. It is possible to complete the module in small groups (max. 2 students per topic). A current list of topics is available upon registration for the module. | 6 | 3 |
| Practical modules | | | | |
| Field of study: Biotechnology | | | | |
| 6LV-PPBT1-T-10 | Practical Project Biotechnology 1 | In this module, students work under guidance on a task or problem related to a company-specific plant, analysis or work technology and present the corresponding results in written form. Thereby they are familiarized with basic work and safety techniques and company-specific tasks. Planning or partial project planning, testing, operation, optimization of operational plants or measuring, testing and analysis techniques as well as their maintenance, inspection, calibration, and servicing are practiced under guidance. | 1 | 6 |

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| 6LV-PPBT2-T-20 | Practical Project Biotechnology 2 | <p><i>The contents of this practical module correspond to those of the practical module Biotechnology 1, since the contents to be covered only differ every 2 semesters. However, the concrete task of the practical module must differ from the task dealt with in the practical module Biotechnology 1.</i></p> <p>In this module, students work under guidance on a task or problem related to a company-specific plant, analysis or work technology and present the corresponding results in written form. Thereby they are familiarized with basic work and safety techniques and company-specific tasks. Planning or partial project planning, testing, operation, optimization of operational plants or measuring, testing and analysis techniques as well as their maintenance, inspection, calibration, and servicing are practiced under guidance.</p> | 2 | 6 |
| 6LV-PPBT3-T-30 | Practical Project Biotechnology 3 | <p>In this module, students work on a task or problem related to a company-specific plant or work technology and present the corresponding results in written form. This involves the evaluation of analysis, measurement, and test results, taking into account legislative requirements. Students learn how to assess the adaptability of technical and technological documentation and process and/or measurement and analysis technology applications to the given operational situation. In addition, participants can perform partial project planning.</p> | 3 | 6 |
| 6LV-PPBT4-T-40 | Praxisprojekt Biotechnologie 4 | <p><i>The contents of this practical module correspond to those of the practical module Biotechnology 3, since the contents to be covered only differ every 2 semesters. However, the concrete task of the practical module-le must differ from the task dealt with in the practical module Biotechnology 3.</i></p> <p>In this module, students work on a task or problem related to a company-specific plant or work technology and present the corresponding results in written form. This involves the evaluation of analysis, measurement, and test results, taking into account legislative requirements. Students learn how to assess the adaptability of technical and technological documentation and process and/or measurement and analysis technology applications to the given operational situation. In addition, participants can perform partial project planning.</p> | 4 | 6 |
| 6LV-PPBT5-T-50 | Praxisprojekt Biotechnologie 5 | <p>In this module, students independently work on a complex task or partial project related to a company-specific work, measurement, analysis, or process technology and present the corresponding results in written form.</p> | 5 | 6 |

| Module code | Module name | Short description | Semester | ECTS |
|--|--|---|----------|------|
| Practical modules | | | | |
| Field of study: Chemical Technology | | | | |
| 6LV-PPCT1-T-10 | Practical Project Chemical Technology 1 | In this module, students work under guidance on a task or problem related to a company-specific plant, analysis or work technology and present the corresponding results in written form. Thereby they are familiarized with basic work and safety techniques and company-specific tasks. Planning or partial project planning, testing, operation, optimization of operational plants or measuring, testing and analysis techniques as well as their maintenance, inspection, calibration, and servicing are practiced under guidance. | 1 | 6 |
| 6LV-PPCT2-T-20 | Practical Project Chemical Technology 2 | <i>The contents of this practical module correspond to those of the practical module Chemical Technology 1, since the contents to be covered only differ every 2 semesters. However, the concrete task of the practical module must differ from the task dealt with in the practical module Chemical Technology 1.</i> In this module, students work under guidance on a task or problem related to a company-specific plant, analysis or work technology and present the corresponding results in written form. Thereby they are familiarized with basic work and safety techniques and company-specific tasks. Planning or partial project planning, testing, operation, optimization of operational plants or measuring, testing and analysis techniques as well as their maintenance, inspection, calibration, and servicing are practiced under guidance. | 2 | 6 |
| 6LV-PPCT3-T-30 | Practical Project Chemical Technology 3 | In this module, students work on a task or problem related to a company-specific plant or work technology and present the corresponding results in written form. This involves the evaluation of analysis, measurement, and test results, taking into account legislative requirements. Students learn how to assess the adaptability of technical and technological documentation and process and/or measurement and analysis technology applications to the given operational situation. In addition, participants can perform partial project planning. | 3 | 6 |

| Module code | Module name | Short description | Semester | ECTS |
|---|---|---|----------|------|
| 6LV-PPCT4-T-40 | Practical Project Chemical Technology 4 | <i>The contents of this practical module correspond to those of the practical module Chemical Technology 3, since the contents to be covered only differ every 2 semesters. However, the concrete task of the practical module-le must differ from the task dealt with in the practical module Chemical Technology 3.</i> In this module, students work on a task or problem related to a company-specific plant or work technology and present the corresponding results in written form. This involves the evaluation of analysis, measurement, and test results, taking into account legislative requirements. Students learn how to assess the adaptability of technical and technological documentation and process and/or measurement and analysis technology applications to the given operational situation. In addition, participants can perform partial project planning. | 4 | 6 |
| 6LV-PPCT5-T-50 | Practical Project Chemical Technology 5 | In this module, students independently work on a complex task or partial project related to a company-specific work, measurement, analysis, or process technology and present the corresponding results in written form. | 5 | 6 |
| Practical modules | | | | |
| Field of study: Radiation Technology | | | | |
| 6LV-PPST1-T-10 | Practical Project Radiation Technology 1 | In this module, students work under guidance on a task or problem related to a company-specific plant, analysis or work technology and present the corresponding results in written form. Thereby they are familiarized with basic work and safety techniques and company-specific tasks. Planning or partial project planning, testing, operation, optimization of operational plants or measuring, testing and analysis techniques as well as their maintenance, inspection, calibration, and servicing are practiced under guidance. | 1 | 6 |

| Module code | Module name | Short description | Semester | ECTS |
|----------------|---|--|----------|------|
| 6LV-PPST2-T-20 | Practical Project Radiation Technology 2 | <p><i>The contents of this practical module correspond to those of the practical module Radiation Technology 1, since the contents to be covered only differ every 2 semesters. However, the concrete task of the practical module must differ from the task dealt with in the practical module Radiation Technology 1.</i></p> <p>In this module, students work under guidance on a task or problem related to a company-specific plant, analysis or work technology and present the corresponding results in written form. Thereby they are familiarized with basic work and safety techniques and company-specific tasks. Planning or partial project planning, testing, operation, optimization of operational plants or measuring, testing and analysis techniques as well as their maintenance, inspection, calibration, and servicing are practiced under guidance.</p> | 2 | 6 |
| 6LV-PPST3-T-30 | Practical Project Radiation Technology 3 | <p>In this module, students work on a task or problem related to a company-specific plant or work technology and present the corresponding results in written form. This involves the evaluation of analysis, measurement, and test results, taking into account legislative requirements. Students learn how to assess the adaptability of technical and technological documentation and process and/or measurement and analysis technology applications to the given operational situation. In addition, participants can perform partial project planning.</p> | 3 | 6 |
| 6LV-PPST4-T-40 | Practical Project Radiation Technology 4 | <p><i>The contents of this practical module correspond to those of the practical module Radiation Technology 3, since the contents to be covered only differ every 2 semesters. However, the concrete task of the practical module-le must differ from the task dealt with in the practical module Radiation Technology 3.</i></p> <p>In this module, students work on a task or problem related to a company-specific plant or work technology and present the corresponding results in written form. This involves the evaluation of analysis, measurement, and test results, taking into account legislative requirements. Students learn how to assess the adaptability of technical and technological documentation and process and/or measurement and analysis technology applications to the given operational situation. In addition, participants can perform partial project planning.</p> | 4 | 6 |
| 6LV-PPST5-T-50 | Practical Project Radiation Technology 5 | <p>In this module, students independently work on a complex task or partial project related to a company-specific work, measurement, analysis, or process technology and present the corresponding results in written form.</p> | 5 | 6 |

| Module code | Module name | Short description | Semester | ECTS |
|--|---|---|----------|------|
| Practical modules | | | | |
| Field of study: Environmental Engineering | | | | |
| 6LV-PPUT1-T-10 | Practical Project Environmental Engineering 1 | In this module, students work under guidance on a task or problem related to a company-specific plant, analysis or work technology and present the corresponding results in written form. Thereby they are familiarized with basic work and safety techniques and company-specific tasks. Planning or partial project planning, testing, operation, optimization of operational plants or measuring, testing and analysis techniques as well as their maintenance, inspection, calibration, and servicing are practiced under guidance. | 1 | 6 |
| 6LV-PPUT2-T-20 | Practical Project Environmental Engineering 2 | <i>The contents of this practical module correspond to those of the practical module Environmental Engineering 1, since the contents to be covered only differ every 2 semesters. However, the concrete task of the practical module must differ from the task dealt with in the practical module Environmental Engineering 1.</i> In this module, students work under guidance on a task or problem related to a company-specific plant, analysis or work technology and present the corresponding results in written form. Thereby they are familiarized with basic work and safety techniques and company-specific tasks. Planning or partial project planning, testing, operation, optimization of operational plants or measuring, testing and analysis techniques as well as their maintenance, inspection, calibration, and servicing are practiced under guidance. | 2 | 6 |
| 6LV-PPUT3-T-30 | Practical Project Environmental Engineering 3 | In this module, students work on a task or problem related to a company-specific plant or work technology and present the corresponding results in written form. This involves the evaluation of analysis, measurement, and test results, taking into account legislative requirements. Students learn how to assess the adaptability of technical and technological documentation and process and/or measurement and analysis technology applications to the given operational situation. In addition, participants can perform partial project planning. | 3 | 6 |

| Module code | Module name | Short description | Semester | ECTS |
|-----------------------|---|--|----------|------|
| 6LV-PPUT4-T-40 | Practical Project Environmental Engineering 4 | <p><i>The contents of this practical module correspond to those of the practical module Environmental Engineering 3, since the contents to be covered only differ every 2 semesters. However, the concrete task of the practical module-le must differ from the task dealt with in the practical module Environmental Engineering 3.</i></p> <p>In this module, students work on a task or problem related to a company-specific plant or work technology and present the corresponding results in written form. This involves the evaluation of analysis, measurement, and test results, taking into account legislative requirements. Students learn how to assess the adaptability of technical and technological documentation and process and/or measurement and analysis technology applications to the given operational situation. In addition, participants can perform partial project planning.</p> | 4 | 6 |
| 6LV-PPUT5-T-50 | Practical Project Environmental Engineering 5 | In this module, students independently work on a complex task or partial project related to a company-specific work, measurement, analysis, or process technology and present the corresponding results in written form. | 5 | 6 |
| Bachelorarbeit | | | | |
| 6LV-BACH-T-60 | Bachelor Thesis | With their final thesis, students show that they are able to independently solve practice-related problem within a given period of time. In the process, they apply practical methods and scientific insights. The thesis is to be defended before an examination board if graded at least as "sufficient" (4.0). | 6 | 12 |