Technische Universität Dresden
Faculty of Chemistry and Food Chemistry

Study Regulations
for the Master's degree program in Biochemistry
from winter semester 2021/2022

Consolidated version of the official announcements of TU Dresden of March 21, 2019 and the First Amending Statute of the Study Regulations of March 23, 2021.

This is valid for all students enrolled in the Master's degree program Biochemistry **before** the winter semester 2023/24.

Technische Universität Dresden
Faculty of Chemistry and Food Chemistry

Study Regulations for the consecutive Master's degree program in Biochemistry

21 March 2019

The Technische Universität Dresden issues the following study regulations based upon Sec. 36 (1) of the Higher Education Freedom Act of Saxony as published on 15 January 2013 (SächsGVBl, p. 3).

Contents

§ 1
Scope

These study regulations are based upon the Higher Education Autonomy Act in Saxony and the examination regulations, and regulate the objectives, content, structure and organisation of the degree program for the consecutive Master's degree program in Biochemistry at TU Dresden.

§ 2
Objectives of the degree program

(1) Students will acquire the required breadth of specialist knowledge including key interdisciplinary skills as well as the associated practical competencies and abilities. They will be to identify the specialist relationships within biochemistry and deepen their knowledge, skills and abilities within their selected areas of the field. They will be able to undertake independent research and conduct experiments to acquire knowledge, critically scrutinise, present and discuss the results and findings of others. Students will be able to identify scientific problems as well as design and conduct experiments. They will be able to apply their knowledge, understanding and skills to finding solutions to problems in both new and unusual situations as well as be able to work as part of a team. They will be able to identify the importance of precise scientific documentation and the presentation of results and undertake to use good scientific practices. They will possess knowledge of legislation and regulations that apply to the field. They will be able to professionally assess the hazards associated with handling the materials commonly used in biochemistry, will have an awareness of the ethical issues that arise from the use of modern methods used in biochemistry, and be able to critically look at topics that are currently discussed within society. Students will have the ability to act responsibly and conscientiously.

(2) Graduates will acquire the specialist skills, methodical, personal and social competencies, as well as the practical skills and expertise, to enter a career in the field or qualify for a doctoral program. They will have the ability to tackle a wide range of problems within the field of biochemistry as well as continuously develop their professional skills.

§ 3
Admission requirements

To be admitted to the degree program, candidates must have completed a first vocational university degree recognised in Germany or obtained a qualification from a state or state-approved vocational academy in chemistry, biology, molecular biotechnology or similar field. Furthermore, this degree program requires English language proficiency at the advanced B2 level according to the Common European Framework of Reference for Languages. If the applicant does not have a certificate of general or subject-specific higher education entrance qualification with a basic or advanced course completed in English (or comparable levels), a higher education entrance qualification completed entirely in English or a certificate of a higher education degree completed entirely in English, then English ability must be demonstrated with an internationally recognised test (preferably IELTS: 6.5, TOEFL iBT: 79, UNIcert II).

§ 4
Commencement and duration of studies

(1) The degree program may be started in the winter semester.

(2) The normal period of study is four semesters and includes contact hours with teaching staff, self-study and the Master's examination.

§ 5
Teaching and learning formats

(1) The program content has a modular structure. Each modules delivers, consolidates and deepens learning content through lectures, seminars, practical sessions, practical work, tutorials, language courses and self-study.

(2) The teaching and learning formats according to Paragraph 1 are defined as follows:

1. Lectures introduce students to the particular area covered by a module, present the central topics and structures of the field and their relationships and provide an overview of the current state of research.
2. Seminars allow students to apply the material learned in example scenarios as well as to develop their methodical, analytical and communication skills. Students are guided in making use of specialist literature and other materials to independently learn about a chosen topic, present their results, discuss the topic with the group and/or present the topic in written form.
3. Practical sessions enable students to put into practice the material acquired in lectures.
4. Practical work is intended to allow students to put into practice what they have learned and gain additional practical skills, link theory with practice, and encompass special topics drawing on interdisciplinary problems.
5. Tutorials are intended to provide support to students. During tutorials, students reflect on the problems, approaches and results of their independent study with a tutor and receive personal feedback.
6. Language courses provide training and develop students' knowledge and skills in a foreign language. Students develop communicative and intercultural competencies within an academic and professional context as well as for everyday situations.
7. Self-study is intended for students to independently reinforce and deepen their knowledge of course content.

§ 6
Structure and organisation of the degree program

(1) The degree program has a modular structure. The courses offered are spread over three semesters. The fourth semester is reserved for completing the Master's dissertation and holding the colloquium. The third semester is organised in such that it is ideal for a temporary stay at another university (mobility window).

(2) The degree program consists of six core modules and electives for a total of 35 credit points. These electives allow the student to focus on particular areas of their choosing - technical biochemistry, chemistry of biological systems and general education modules. Modules worth between 10 and 25 credit points are to be chosen for technical biochemistry and the chemistry of biological systems, and for general modules a maximum of 10 credits points. The selection is binding. It is possible to change the selected modules; this requires the student to submit a written application to the Examinations Office stating the module they wish to drop and the new module they wish to join.

(3) Qualification objectives, content, teaching and learning formats used, requirements, applicability, frequency, amount of work and duration of individual modules are indicated in the module descriptions (Annex 1).

(4) Courses take place in English or German according to the module description.

(5) The optimum distribution of modules across individual semesters such as to allow the degree program to be completed within the standard period of study, along with the type and scope of lectures contained therein and the number and standard progression of the required study and examination activities, can be found in the included study plan (Annex 2).

(6) The range of electives as well as the study plan may be changed by the Faculty Board at the request of the Academic Affairs Committee. The available range of electives is to be announced at the start of the semester via the normal faculty channels. The changed study plan applies to students who are informed of these changes at the start of the semester via normal faculty channels. Exceptions to Sentence 3 are decided by the Examination Board upon application by the student.

(7) Where participation in courses for a selectable core or elective module, or in a non- selectable elective is limited to a certain number of students according to the module description, then participants will be selected at random from those registered. In this case, students must register for the module to take part. The method and deadline for registration will be announced to students accordingly via normal faculty channels.

§ 7
Content of the degree program

(1) The Biochemistry Master's degree program is research-oriented.

(2) The content of the degree program is oriented around the recommendations of the Society for Biochemistry and Molecular Biology (GBM) and the Gesellschaft Deutsche Chemiker (GDCh) and the Verband der Chemischen Industrie. Key topics include protein and enzyme biochemistry and the chemistry of metabolic processes. A further key topic is cellular processes in prokaryotes and eukaryotes with a strong biological focus. Practical activities in these fields are a key component. The degree program also looks at environmental needs and regulations as well as guidelines of good scientific practice.

§ 8
Credit points

(1) ECTS credit points document the average workload on students and their individual progress through their studies. One credit point equates to a workload of 30 hours. In general, 60 credit points are awarded per academic year, i.e. 30 points per semester. The total workload for the degree program is 120 credit points and comprises teaching and learning formats of the type and scope indicated in the module description, study activities and examinations, as well as the Master's dissertation and colloquium.

(2) The number of credit points earned by completing a module are indicated in the module description. Credit points are earned upon successful completion of the module. Sec. 25 of the examination regulations remains unaffected.

§ 9
Student counselling services

(1) General student counselling services are provided via the Central Student Information and Counselling Service of TU Dresden. They offer advice on issues relating to study options, ways of enrolment and other general matters affecting students. Academic advice regarding studies is responsibility of the student counselling service in the Faculty of Chemistry and Food Chemistry. In

particular, academic advisers provide support to students with issues relating to the organisation of their studies.

(2) At the start of the third semester, any student who has not yet completed any part of their studies at all is required to attend an academic advice session.

§ 10
Changes to module descriptions

(1) A simplified procedure exists for making changes to module descriptions in order to optimise the organisation of studies where conditions have changed. Fields that are excluded from this procedure are “Module name”, “Objectives”, “Content”, “Teaching and learning formats”, “Requirements for awarding of credit points” as well as “Credit points and grades”.

(2) According to this simplified procedure, the Faculty Board enacts the change to the module description at the request of the Academic Affairs Committee. Changes are to be announced via the normal channels within the faculty.

Annex 1
Module descriptions

Module number	**Module name**	**Lecturer responsible**
Chem-Ma-BC01	Fundamentals of Biological Chemistry and Molecular Cell Biology	Prof. Tobias Gulder (tobias.gulder@tu-dresden.de)
		Other lecturers: Prof. Nils Kröger (nils.kroeger@tu-dresden.de)
Objectives	Students will be able to apply in-depth theoretical knowledge of the chemistry of enzyme catalysed reactions and the reaction mechanisms of selected enzymes in primary metabolic pathways to other enzyme reactions. Students will also gain in-depth knowledge of the structures, the molecular structure and the function of the sub- cellular compartments of eukaryotic cells. Students will understand the relevance of biochemical findings for society.	
Content	This module covers the chemistry of enzyme reactions and enzyme reaction mechanisms, e.g. glycolysis, citric acid cycle, fatty acid decomposition and synthesis, respiratory chain, etc. The properties and functions of biomembranes, cell nuclei, mitochondria, the endoplasmic reticulum, Golgi complex, and the cytoskeleton. It also looks at examples of the influence of biochemical findings on society.	
Teaching and learning formats	Lectures (4 hrs/wk) and self-study.	
Participation requirements	Foundational knowledge of biochemistry and cell biology at the Bachelor's level is required. The textbook “Principles of Biochemistry” by D. L. Nelson, M. M. Cox (Worth Publ. Inc.) is recommended as preparatory material for this module.	
Applicability	This module is a core module for the Biochemistry Master’s degree program. It is a prerequisite for the modules Enzymes in Processes and Research Lab Class.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one end-of-semester exam lasting 90 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the written exam.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-BC07	Enzyme Purification and Characterization	Prof. Tobias Gulder (tobias.gulder@tu-dresden.de)
Objectives	Students will gain deeper theoretical and practical knowledge of the physical, chemical and biochemical properties of proteins and enzymes and use this knowledge to derive protein purification methods. They will be aware of the possibilities and limitation of separating processes, be able to select appropriate methods, and assess errors. Students will also understand the theory and practice of biochemical methods for characterising enzymes and their functions *in vitro* and *in vivo* as well as the determination of kinetic enzyme data.	
Content	This module covers fundamental principles of protein purification based on the physical, chemical, biochemical and immunological properties of proteins while maintaining their enzymatic and biological function. The module also looks at selected issues of protein purification using a wide range of preparation and analytical methods. The module further examines spectroscopic methods for identifying co-factors, exploring reaction mechanisms as well as characterising and interpreting kinetic data from enzyme catalyzed reactions.	
Teaching and learning formats	Lectures (2 hrs/wk), seminars (1 hr/wk), practical work (6 hrs/wk) and self-study.	
Participation requirements	Foundational knowledge of biochemistry at the bachelor's level is required. The textbook “Principles of Biochemistry” by D. L. Nelson, M. M. Cox (Worth Publ. Inc.) is recommended as preparatory material for this module.	
Applicability	This module is a core module for the Biochemistry Master’s degree program. It is a prerequisite for the module Research Lab Class.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one end-of-semester exam lasting 90 minutes and a portfolio.	
Credit points and grades	10 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work and examination. The examination is double-weighted and the portfolio report single-weighted.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 300 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-BC03	Gene Expression and Manipulation	Prof. Nils Kröger (nils.kroeger@tu-dresden.de)
Objectives	Based on their knowledge of primary molecular genetic cell processes, students will be able to identify the regulation mechanisms for the expression of prokaryotic and eukaryotic genes and use genetic engineering methods to both analyse and manipulate them. Students will be familiar with the societal advantages and disadvantages related to gene manipulation.	
Content	This module covers the primary molecular genetic processes (replication, transcription, translation) in prokaryotic and eukaryotic organisms, the organisation and molecular structure of prokaryotic and eukaryotic genes, the principles governing gene express in prokaryotic and eukaryotic organisms, the basic principles and steps involved in recombination and cloning, structural and functional investigation of genes (such as sequencing, gene localisation, regulation of gene expression, polymerase chain reaction (PCR), restriction fragment length polymorphism) as well as techniques for manipulating eukaryotic genomes and their importance, and regulatory issues for molecular genetic work.	
Teaching and learning formats	Lectures (2 hrs/wk), seminars (1 hr/wk), practical work (6 hrs/wk) and self-study.	
Participation requirements	Foundational knowledge of biochemistry and molecular biology at the Bachelor's level is required. The textbook “Principles of Biochemistry” by D. L. Nelson, M. M. Cox (Worth Publ. Inc.) is recommended as preparatory material for this module.	
Applicability	This module is a core module for the Biochemistry Master’s degree program. It is a prerequisite for the module Research Lab Class.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a practical report and one end-of-semester exam lasting 90 minutes.	
Credit points and grades	10 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work and examination. The examination is double-weighted and the practical report single-weighted.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 300 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-BC04	Biochemistry of the Cell	Prof. Nils Kröger (nils.kroeger@tu-dresden.de)
Objectives	Students will be able to identify the biochemical mechanisms of fundamental intercellular and transcellular organisational and transport processes in eukaryotic cells and present the biological mechanisms for regulating these processes.	
Content	This module covers intracellular control of proteins, intracellular vesicle transport, intracellular organisation and transport via the cytoskeleton, the cell cycle, intracellular signal transduction as well as cell-cell and cell-matrix interactions.	
Teaching and learning forms	Lectures (4 hrs/wk) and self-study.	
Participation requirements	Foundational knowledge of biochemistry and cell biology at the Bachelor's level is required. The textbook “Principles of Biochemistry” by D. L. Nelson, M. M. Cox (Worth Publ. Inc.) is recommended as preparatory material for this module.	
Applicability	This module is a core module for the Biochemistry Master’s degree program. It is a prerequisite for the module Research Lab Class.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one end-of-semester exam lasting 90 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the written exam.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-BC05	Bioanalytics	Prof. Brunner (eike.brunner@chemie.tu-dresden.de)
		Other lecturers: Prof. Schlierf (michael.schlierf@tu-dresden.de)
Objectives	Students will learn about modern methods of bioanalytics. They will gain an overview of the breadth of modern bioanalytics and will be able to select appropriate methods for solving bioanalytical problems. They will gain practical experience in the application of bioanalytical methods. They will be able to assess the value and applicability of these methods in the context of bioanalytic questions and be able to appropriately plan and conduct analytical investigations.	
Content	This module covers the theory and practice of bioanalytical methods such as mass spectrometry, chromatography/electrophoresis, nuclear magnetic resonance spectrometry (NMR), vibrational spectrometry, microscopy, fluorescence spectroscopy, and scanning electron microscopy.	
Teaching and learning formats	Lectures (2 hrs/wk), seminars (2 hrs/wk), practical work (6 hrs/wk) and self-study.	
Participation requirements	Foundational knowledge of biochemistry and bioanalytics at the Bachelor's level is required. The textbook “Principles of Biochemistry” by D. L. Nelson, M. M. Cox (Worth Publ. Inc.) is recommended as preparatory material for this module.	
Applicability	This module is a core module for the Biochemistry Master’s degree program. It is a prerequisite for the module Research Lab Class.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one end-of-semester exam lasting 90 minutes and a practical experience report.	
Credit points and grades	10 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work and examination. The examination is double-weighted and the practical report single-weighted.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 300 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-BC06	Research Lab Class	Prof. Tobias Gulder (tobias.gulder@chemie.tu-dresden.de)
Objectives	Students will possess in-depth practical skills for planning new experiments and for working with complex research topics. They will therefore gain the ability to make judgements and act on issues that are of great consequence to society. They will also gain team working skills and experience in scientific and interdisciplinary communication and discussions regarding research findings within a research group.	
Content	The module covers closely related, relevant and new research topics in biochemistry according to the focus area of the individual student and a look at recent findings with these areas.	
Teaching and learning formats	Seminar (1 hr/wk), practical work (15 hrs/wk) and self-study.	
Participation requirements	Prerequisite modules are: Fundamentals of Biological Chemistry and Molecular Cell Biology, Enzyme Purification and Characterization, Gene Expression and Manipulation, Biochemistry of the Cell, and Bioanalytics.	
Applicability	This module is a core module for the Biochemistry Master's degree program.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a paper requiring 10 hours of work, an ungraded practical report and an individual oral examination lasting 30 minutes.	
Credit points and grades	15 credit points are awarded for this module. The module grade is calculated from the unweighted average of grades from the assessed work according to Sec. 10(1)(5) of the examination regulations.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 450 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-TB09	Concepts of Natural Product Biosynthesis	Prof. Tobias Gulder (tobias.gulder@tu-dresden.de)
Objectives	Students will learn about important classes of natural materials and biosynthetic pathways, particularly those of biomedically relevant compounds (e.g. polyketides, peptides) and be able to identify the individual biosynthetic elements in the structures of natural materials. Students will be able to make predictions about resultant product structures based on the organisation of biosynthetic pathways and also suggest possible biosynthetic pathways for given structures.	
Content	This module covers fundamental principles of enzyme catalysis as well as metabolic crossover points of primary and secondary metabolism. It includes mechanistic analyses of the biosynthetic pathways of medically important classes of natural products as well as methods for understanding biosynthetic pathways and initial basic principles for manipulating biosynthetic processes *in vivo* and *in vitro*.	
Teaching and learning formats	Lectures (4 hrs/wk) and self-study.	
Participation requirements	Foundational knowledge of biochemistry at the bachelor's level is required. The textbook “Principles of Biochemistry” by D. L. Nelson, M. M. Cox (Worth Publ. Inc.) is recommended as preparatory material for this module.	
Applicability	This module is one of eight electives in the Technical Biochemistry focus area in the Biochemistry Master's degree program, from which students must select modules with a total of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one end-of-semester exam lasting 90 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-TB10	Practical Concepts of Natural Product Biosynthesis	Prof. Tobias Gulder (tobias.gulder@tu-dresden.de)
Objectives	Students will learn about important classes of natural materials and biosynthetic pathways, particularly those of biomedically relevant compounds (e.g. polyketides, peptides) and be able to identify the individual biosynthetic elements in the structures of natural materials. Students will be able to make predictions about resultant product structures based on the organisation of biosynthetic pathways and also suggest possible biosynthetic pathways for given structures. They will be able to identify how the biosynthetic pathways for natural materials can be modified to create new non-natural materials.	
Content	This module includes mechanistic analyses of the biosynthetic pathways of medically important classes of natural products as well as methods for understanding biosynthetic pathways and initial basic principles for manipulating biosynthetic processes *in vivo* and *in vitro*. Alongside current examples from literature on the biosynthesis of natural materials, practical implementation of selected aspects are included, particularly the aspects of production and application of natural materials and biosynthetic enzymes or the recombinant production of natural material molecules.	
Teaching and learning formats	Practical work (6 hrs/wk) and self-study.	
Participation requirements	Foundational knowledge of biochemistry at the bachelor's level is required. The textbook “Principles of Biochemistry” by D. L. Nelson, M. M. Cox (Worth Publ. Inc.) is recommended as preparatory material for this module.	
Applicability	This module is one of eight electives in the Technical Biochemistry focus area in the Biochemistry Master's degree program, from which students must select modules with a total of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a portfolio.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs every semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-TB02	Enzymes in Processes	Prof. Weigand (jan.weigand@tu-dresden.de)
		Other lecturers: Prof. Henle (thomas.henle@tu-dresden.de); Prof. Ansorge-Schumacher (marion.ansorge@tu-dresden.de)
Objectives	Students will be familiar with enzyme technology reaction techniques and process control using examples of industrial application and current areas of research. Students will possess an in-depth overview of modern enzyme technology processes and the current state of research. Students will be able to independently work on a research topics of their choosing, both in theory and in practice, and document and present their findings.	
Content	This module focuses on enzymatic functionalisation, biocatalysis and immobilisation of enzymes. This module looks at the following topics: • Enzyme technology • Biocatalysis for the production of fine chemicals and medicines as well as for the production of foodstuffs and ingredients • Immobilisation of enzymes • Enzymatic functionalisation of milk proteins • Brewing technology • Enzymatic process technology • Industrial applications • Implementation in process technology • Enzymes in technical catalysis	
Teaching and learning forms	Lectures (2 hrs/wk), seminars (1 hr/wk), practical work (3 hrs/wk) and self-study. Participation in the practical element of this module is limited to 10 students according to Sec. 6(7) of the study regulations.	
Participation requirements	Alongside Bachelor's level knowledge in biochemistry, food chemistry and food and biotechnology, the skills gained from the module Fundamentals of Biological Chemistry and Molecular Cell Biology are required. Recommend preparatory literature: H. Bisswanger, Enzyme Kinetics - Principles and Methods, Wiley- VCFI, 2008, ISBN: 978-3-527-31957-2 R.J. Whitehurst, Enzymes in Food Technology, Wiley-VCFI, 2010, ISBN: 978-31-4051-8366-6	
Applicability	This module is one of eight electives in the Technical Biochemistry focus area in the Biochemistry Master's degree program, from which students must select modules with a total of 10 to 25 credit points.	

Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one end-of-semester exam lasting 90 minutes and an ungraded report requiring 10 hours of work.
Credit points and grades	5 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work according to Sec. 10(1)(5) of the examination regulations. In this case, the examination is single-weighted and the report is double-weighted.
Frequency of the module	This module runs once per year in the summer semester.
Workload	The total workload for this module is 150 hours.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
Chem-Ma-TB03	Bioinformatics	Prof. Schroeder (michael.schroeder@tu-dresden.de)
Objectives	Students will possess knowledge of the basic principles of bioinformatics, particularly in the area of sequence comparison and current topics in bioinformatics. Students will have knowledge of algorithms for comparing sequences using dynamic programming, substitution matrices as well as multiple sequence alignments.	
Content	This module covers sequence comparison, substitution matrices, local and global alignment, assessment schemes and progressive alignment.	
Teaching and learning forms	Lectures (2 hrs/wk), practical sessions (2 hrs/wk) and self-study.	
Participation requirements	Basic skills in computer programming in a language such as Python are required for this module. Books such as “Learning Python” by M. Lutz (O’Reilly) are suitable preparatory materials for this module.	
Applicability	This module is one of eight electives in the Technical Biochemistry focus area in the Biochemistry Master's degree program, from which students must select modules with a total of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a test lasting 45 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-TB04	Protein Biochemistry and Proteomics	Prof. S. Alberti (Simon.Alberti@tu-dresden.de)
Objectives	Students will understand the principles of protein folding and protein-protein interactions in the context of protein complex formation and supramolecular structures. They will have substantial theoretical knowledge of protein biochemistry and protein biotechnology as well as a good understanding of instrumental protein analytics underpinned by practical experience in experimentation.	
Content	The module covers the fundamentals of protein biochemistry and provides an overview of diseases that are a result of errors in protein folding and proteins that do not function correctly. Also covered are methods for analysing proteins such as protein mass spectrometry, the characterisation of protein-protein interactions and the use of protein databases. The module also includes the fundamentals of protein biotechnology as well as the production of recombinant proteins and their analysis (affinity cleaning, protein binding assays, immunoprecipitation, protein electrophoresis and immunoblotting).	
Teaching and learning formats	Lectures (3 hrs/wk), practical work (5 hrs/wk) and self-study.	
Participation requirements	Bachelor's level knowledge of molecular biology, biochemistry and cell biology is required. Recommend preparatory literature: • Alberts, Johnson, Lewis, Morgan, Raff, Roberts, Walter. Molecular Biology of the Cell, Garland Science Press, • Berg, Tymoczko, Gatto, Stryer. Biochemistry, Palgrave Macmillan. • Introduction to Proteomics (D.C. Leibier, Humana Press).	
Applicability	This module is one of eight electives in the Technical Biochemistry focus area in the Biochemistry Master's degree program, from which students must select modules with a total of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a practical report and one end-of-semester exam lasting 120 minutes.	
Credit points and grades	10 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work and examination. The practical report is single-weighted andthe written examination is double-weighted.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 300 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-TB05	Genome Engineering, Genomes and Evolution	Prof. A. F. Stewart (Francis.Stewart@tu-dresden.de)
Objectives	Students will possess knowledge of the eukaryotic and prokaryotic genomes of organisms and genomes particularly important to genome engineering and understand the cell life cycle. They will be able to apply the tools and techniques of genome engineering. Students will be able to understand the nature of the genotype, its architecture, its characteristics and mutability on a new integrative level. They will be able to draw conclusions about the architecture of the genome, the content as well as the mechanisms of mutation through evolution. They will understand how the integrity of the genome is maintained based on the molecular mechanisms ofDNA replication and repair as well as recombination. They will be able to see that these processes both stabilise and modify the genome. They will be able to understand the structure of both prokaryotic nucleoids and eukaryotic chromatins. Students will also gain foundational knowledge of genetic engineering. Students will have a comprehensive understanding of the genome and genome engineering. This will complement their knowledge of tissue engineering, bioinformatics and cellular machines. Students will possess an overview of the different techniques used in the various areas of genomics (e.g. DNA recombination in bacteria, site-specific and other types of recombination, recombineering, restriction enzymes, southern blotting method and gel electrophoresis.	
Content	This module looks at the prokaryotic and eukaryotic genomes in relation to the evolution of life as well as the tools and techniques of genome engineering in theory and in practice.	
Teaching and learning formats	Lectures (3 hrs/wk), practical work (5 hrs/wk) and self-study.	
Participation requirements	Bachelor's level knowledge of the composition of DNA, the double helix structure of DNA, nucleic acid metabolism as well as knowledge of cell biology. Recommend preparatory literature: • Berg, Tymoczko, Gatto, Stryer Biochemistry (9th edition) Palgrave Macmillan. • Lewin B„ Genes VIII, Pearson 2004, ISBN 0-13-123924-4 • Alberts, Johnson, Lewis, Morgan, Raff, Roberts, Walter (6th edition) Molecular Biology of the Cell Garland Science Press ISBN 4978-0-8153-4524-4	
Applicability	This module is one of eight electives in the Technical Biochemistry focus area in the Biochemistry Master's degree program, from which students must select modules with a total of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a practical report and one end-of-semester exam lasting 120 minutes.	

Credit points and grades	10 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work and examination. The examination is triple-weighted and the practical report single-weighted.
Frequency of the module	This module runs once per year in the winter semester.
Workload	The total workload for this module is 300 hours.
Module duration	The module lasts for one semester.

Module number	Module name	Lecturer responsible
Chem-Ma-TB06	Drug Discovery	Prof. Yixin Zhang (yixin.zangl @tu-dresden.de)
Objectives	Students will know about the various options for discovering active substances, including screening methods, the targets of active substances and their development. They will understand the advantages and disadvantages of different active substances. Students will have a good understanding of the key concepts in medicinal chemistry and pharmacology such as pharmacokinetics.	
Content	This module looks at the fundamental chemistry and the processes of discovering active substances starting with the validation of biological models and target proteins to the various methods of substance screening and other related discovery concepts, through to pre-clinical and clinical trials. This module looks at the following topics: • Overview of active substance classification based upon their molecular structure or effect, or based upon the illness they are intended to treat • Some important examples from the history of active substance discovery • Current concepts and developments in cell-based therapy • Signal pathways in relation to cancer and autoimmune diseases • Various methods for improving pharmacokinetics.	
Teaching and learning formats	Lectures (2 hrs/wk), tutorials (2 hrs/wk) and self-study.	
Participation requirements	Foundational knowledge of biochemistry at the bachelor's level is required. The textbook “Principles of Biochemistry” by D. L. Nelson, M. M. Cox (Worth Publ. Inc.) is recommended as preparatory material for this module.	
Applicability	This module is one of eight electives in the Technical Biochemistry focus area in the Biochemistry Master's degree program, from which students must select modules with a total of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one end-of-semester exam lasting 90 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the written exam.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-TB07	Medical Biochemistry	Dr. Matura (anke.matura@chemie.tu-dresden.de)
		Other lecturers: Prof. Jens Pietzsch (j.pietzsch@hzdr.de)
Objectives	Students will learn the basic principles of medicinal biochemistry and the importance of the subject as a foundation for clinical diagnosis. They will learn the fundamental principles of biochemistry and regulation relationships in the genesis, diagnosis and treatment of diseases and gain knowledge of the principles of biotransformation, the effects of therapeutic agents and enzyme diagnostics. They will know about biochemical changes in selected intracellular and extracellular regulation mechanisms and understand the relationships between these changes and the genesis, manifestation and progression of certain diseases with a high degree of relevance in healthcare policy. Students will also learn about modern analytical and diagnostic methods used in clinical and research settings, particularly about methods of molecular imaging.	
Content	This module looks at the specialist field of clinical biochemistry. Alongside learning the defined concepts of medicinal biochemistry and pathobiochemistry, the module covers areas of application, methods and model organisms, biochemical changes in humans as well as new findings in biochemistry and biomedicine concerning the genesis, manifestation and progression of certain diseases that are highly relevant in healthcare policy.	
Teaching and learning formats	Lectures (4 hrs/wk) and self-study. Lectures are held in German.	
Participation requirements	Knowledge of biochemistry at the Bachelor's level is required. Recommended preparatory literature: "Löffler/Petrides - Biochemie und Pathobiochemie" (ed. Heinrich, Müller, Graeve) Springer.	
Applicability	This module is one of eight electives in the Technical Biochemistry focus area in the Biochemistry Master's degree program, from which students must select modules with a total of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one individual oral examination lasting 50 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-BS01	Microbiology of Anaerobic Systems	Prof. Michael Rother (michael.rother@tu-dresden.de)
Objectives	Students will understand the role of anaerobic microorganisms in global material cycles and have an understanding of their adaptation to this form of existence. Students will be able to describe the activities of anaerobic microorganisms based upon their structural and physiological properties. They will be able to critically assess the possibilities and limitations of anaerobic microbiology.	
Content	This modules covers the classification of anaerobic microorganisms with the context of geological history and phylogenetics as well as the description of various systems of energy conservation. It includes an overview of the metabolic diversity found in anaerobic microorganisms, their metabolic performance and their influence on the global materials cycle. The module further looks at the unique structural and physiological properties, isolation, characterization and description of anaerobic microorganisms.	
Teaching and learning formats	Lectures (3 hrs/wk) and self-study. The language of teaching for lectures can be either German or English and will be determined by the lecturer at the start of the semester and announced via normal faculty channels.	
Participation requirements	Knowledge of microbial physiology at the Bachelor's level is required. Recommended preparatory literature includes: "Brock Mikrobiologie" by Madigan, M.T. and Martinko, J. M H. (ed.) (Pearson Studium).	
Applicability	This module is one of six electives in the Chemistry of Biological Systems focus area of the Biochemistry Master's degree program from which students must select modules of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one end-of-semester exam lasting 90 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the written exam.	
Frequency of the module	This module runs once per year starting in the summer semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	This module lasts for two semesters.	

Module number	Module name	Lecturer responsible
Chem-Ma-BS02	Physiology of Anaerobic Microorganisms	Prof. Michael Rother (michael.rother@tu-dresden.de)
Objectives	Students will be able to apply methods for the cultivation and physiological characterisation of anaerobic microorganisms. They will know about the equipment necessary to do this. Students will gain an understanding of the molecular and biochemical processes that take place within anaerobic microorganisms and learn about the biotic and abiotic processes in threshold aerobic/anaerobic microbial environments.	
Content	This module looks at the methodical principles of working with anaerobic microorganisms, the isolation of anaerobic microorganisms from environmental samples as well as taxonomically relevant physiological and microscopic analyses. The module also looks at the physiological properties that allow microorganisms to change from aerobic to anaerobic metabolism in facultative microorganisms.	
Teaching and learning forms	Seminar (1 hr/wk), practical work (4 hrs/wk) and self-study. The language of teaching for the seminar and practical work can be either German or English and will be determined by the lecturer at the start of the semester and announced via normal faculty channels.	
Participation requirements	Knowledge of microbial physiology at the Bachelor's level is required. Recommended preparatory literature includes: "Brock Mikrobiologie" by Madigan, M.T. and Martinko, J. M H. (ed.) (Pearson Studium).	
Applicability	This module is one of six electives in the Chemistry of Biological Systems focus area of the Biochemistry Master's degree program from which students must select modules of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one individual oral examination lasting 20 minutes and an ungraded practical report.	
Credit points and grades	5 credit points are awarded for this module. The module grade is calculated from the unweighted average of grades from the assessed work according to Sec. 10(1)(5) of the examination regulations.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-BS03	Cellular Signaling	Prof. Yixin Zhang (yixin.zhangl @tu-dresden.de)
Objectives	Students will have knowledge of the chemical principles of cellular signalling as an important foundation of modern cell biology and understand the entire interdisciplinary context.	
Content	This module looks at different topics in cell signalling as a communication process that guides basic cell activities and coordinates all cell actions. This module looks at the following topics: • The concept of cellular signal transduction • Overview of different posttranslational modifications • Relationships between enzyme catalysed posttranslational modifications and the resulting change in the structure and function of the protein • Proteolysis by different proteases, phosphorylations and dephosphorylations by different kinases and phosphatases • Important examples of cell-cell signalling in relation to disease, particularly cancer and autoimmune diseases • Mechanisms of cell signalling • Kinetic and thermodynamic aspects of posttranslational modifications.	
Teaching and learning formats	Lectures (2 hrs/wk), seminars (2 hrs/wk) and self-study.	
Participation requirements	Foundational knowledge of biochemistry and molecular biology of the cell at the Bachelor's level is required. Recommended preparatory literature includes: Biochemistry. 5th edition, Berg JM, Tymoczko JL, Stryer L. New York: W Fl Freeman; 2002 und Molecular Biology of the Cell. 4th edition. Alberts B, Johnson A, Lewis J, et al. New York: Garland Science; 2002.	
Applicability	This module is one of six electives in the Chemistry of Biological Systems focus area of the Biochemistry Master's degree program from which students must select modules of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one end-of-semester exam lasting 90 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the examination.	
Frequency of the module	This module runs once per year in the summer semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-BS04	Cellular Machines	Prof. Stefan Diez (stefan.diez@tu-dresden.de)
Objectives	Students will be able to bring together the knowledge they have acquired in molecular cell biology, biochemistry, proteomics, biophysics and bionanotechnology and understand the concepts of functional biomolecular units as machines for use in complex technological or medicinal processes as nanoscale functional components. Students will have interdisciplinary research and development skills that will qualify them to work in both science and research and development in biotech companies.	
Content	This module looks at the structure and function of lipid membranes together with membrane proteins, energytransformation, interaction and folding of protein structures, DNA and associated proteins, signal transduction and protein degradation, classification and function of viruses, filament systems of the cytoskeleton, motor proteins in the cytoskeleton, intracellular transport, cellular movement and biomolecular sensor systems.	
Teaching and learning formats	Lectures (4 hrs/wk), seminars (4 hrs/wk) and self-study.	
Participation requirements	Bachelor's level knowledge of molecular biology, biochemistry, physics and knowledge of the chemical importance of single molecule aspects. Recommended preparatory literature includes: Molecular Biology of the Cell. 6th edition. Alberts B, Johnson A, Lewis J, et al. New York: Garland Science; 2014 and Mechanics of Motor Proteins and the Cytoskeleto. Jonathon Floward: Sinauer; 2005.	
Applicability	This module is one of six electives in the Chemistry of Biological Systems focus area of the Biochemistry Master's degree program from which students must select modules of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a paper requiring 15 hours of work and an individual oral examination lasting 20 minutes.	
Credit points and grades	10 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work and examination. The oral examination is 7x weighted and the practical report triple-weighted.	
Frequency of the module	This module runs once per year starting in the summer semester.	
Workload	The total workload for this module is 300 hours.	
Module duration	This module lasts for two semesters.	

Module number	Module name	Lecturer responsible
Chem-Ma-BS05	Metabolism of Natural Products and Natural Product Biosynthesis	Prof. Jutta Ludwig-Müller (Jutta.ludwig-mueller@tu-dresden.de)
		Other lecturers:
		Prof. Tobias Gulder (tobias.gulder@tu-dresden.de)
Objectives	Students will gain an insight into the central topic areas, fields of work and fields of applications of the molecular biology of natural materials in plants, be familiar with key specialist terms and describe the interdisciplinary context. Students will know about the most important biosynthetic pathways for secondary metabolites in microorganisms and the possibilities for manipulating these. They will also gain a understanding of the effects that natural materials have on other organisms. They will have strengthened their communication competencies through discussion rounds in working groups.	
Content	This module covers the functions of natural plant materials and their effect on other living organisms. It looks at the occurrence, biosynthesis and analysis of selected plant and microbial natural products, the possibilities for their biotech production and their function in plants during development and in interaction with other organisms. The module further looks at the effect of natural plant materials on humans in relation to interactions with cellular components, metabolism and toxicity, the effect on physiological processes, nutritional physiological and medicinal aspects as well as bioinformatic methods for the prediction of microbial natural products.	
Teaching and learning formats	Lectures (4 hrs/wk) and self-study.	
Participation requirements	Knowledge of plant physiology and biochemistry at bachelor level is required. A foundational textbook on phytology or plant physiology is recommended, e.g.: Lüttge, Kluge: Botanik, Wiley.	
Applicability	This module is one of six electives in the Chemistry of Biological Systems focus area of the Biochemistry Master's degree program from which students must select modules of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with one end-of-semester exam lasting 90 minutes.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved in the written exam.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-BS06	Biological Materials	Prof. Nils Kröger (nils.kroeger@tu-dresden.de)
Objectives	Students will be able to identify the structures and properties of biominerals and bioadhesives, particularly regarding the relationship between scale-independent structure and function. Students will also be familiar with the fundamental biochemical and physical mechanisms of the biosynthesis of these biological materials.	
Content	This module looks at the physical properties, biochemical composition, biogenesis and biological function of biominerals and bioadhesives. The module also covers fundamental physical and chemical theories on crystallisation and adhesion, methods of (bio)chemical and (bio)physical analysis of the composition and properties of biominerals and bioadhesives as well as the mechanisms of their biogenesis.	
Teaching and learning formats	Lectures (2 hrs/wk), seminars (2 hrs/wk), practical work (6 hrs/wk) and self-study. Participation in the practical element of this module is limited to 6 students according to Sec. 6(7) of the study regulations.	
Participation requirements	Bachelor's level knowledge in the areas of organic and inorganic chemistry, biochemistry and cell biology is required. Recommended preparatory literature includes: "Biomineralization" by Stephan Mann and "Bioadhesion and Biomimetics" by Bianco-Peled and Davidovich-Pinhas.	
Applicability	This module is one of six electives in the Chemistry of Biological Systems focus area of the Biochemistry Master's degree program from which students must select modules of 10 to 25 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with an ungraded practical report and an individual oral examination lasting 30 minutes.	
Credit points and grades	10 credit points are awarded for this module. The module grade is calculated from the weighted average of grades from the assessed work according to Sec. 10(1)(5) of the examination regulations. The oral examination is double-weighted and the practical report single-weighted.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 300 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-AM01	General Studies	Dean of Studies (studiendekan_bc@chemie.tu-dresden.de)
Objectives	Students will further improve their English language skills using topics relevant to society and taking a critical look at these fields. They will use their linguistic, social and personal skills and competencies to focus in particular on intercultural discourse and making responsible judgements and taking responsible actions in society.	
Content	This module deals, in English, with interdisciplinary issues chosen by the student that relate to living in a pluralistic society The development and application of scientific findings and methods in international and in intercultural fields of work are also considered.	
Teaching and learning formats	This module includes lectures or seminars totalling 4 hrs/wk as well as self-study. The required number of courses are to be selected from the General Studies catalogue of the Biochemistry Master's degree course. This catalogue will be announced along with coursework and examination requirements at the start of the semester through the normal faculty channels.	
Participation requirements	None.	
Applicability	This module is one of three electives in the General Education Modules focus area of the Biochemistry Master's degree program, from which students must select modules worth a maximum of 10 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with an ungraded piece of coursework or examination as stated in the “General Studies” catalogue.	
Credit points and grades	5 credit points are awarded for this module. The module will only be graded as “passed” or “not passed”.	
Frequency of the module	This module runs every semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Module number	Module name	Lecturer responsible
Chem-Ma-AM02	Profile Course: Advanced Professional English	Antonella Wermke (antonella.wermke@tu-dresden.de)
Objectives	Students will possess advanced communication and intercultural competencies in the English language at level C1/C2 of the Common European Framework of References for languages. Students will be able to flexibly and competently use these skills while studying abroad and in their careers.	
Content	The content of this module is based upon the choice of the students and looks at different aspects of spoken communication in the workplace, international negotiations, professional writing as well as project development and management.	
Teaching and learning formats	Language courses (4 hrs/wk) and self-study. The required courses are chosen from the "Profile Courses" catalogue for languages at TU Dresden; these will be announced along with coursework/examination requirements for each module at the start of the semester through the normal faculty channels.	
Participation requirements	General language skills and proficiency in English at level B2 of the Common European Framework of Reference for languages.	
Applicability	This module is one of three electives in the General Education Modules focus area of the Biochemistry Master's degree program, from which students must select modules worth a maximum of 10 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined as specified in the Profile Courses catalogue for languages at TU Dresden.	
Credit points and grades	5 credit points are awarded for this module. The module grade is calculated from the unweighted average of individual grades from the assessed work.	
Frequency of the module	This module runs every semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	This module lasts for two semesters.	

Module number	Module name	Lecturer responsible
Chem-Ma-AM03	Current Topics in Materials Science	Prof. G. Cuniberti (gianaurelio.cuniberti@tu-dresden.de)
Objectives	Students will learn about the various aspects of current research in materials science. They will gain relevant key competencies in the foundation of scientific presentation, patent law, technology transfer and leadership skills.	
Content	The module covers modern experimental and theoretical methods for discovering, characterizing, applying and marketing new materials with a focus on changing topic areas such as: • technology transfer: from the lab to the market • Intelligent materials for application in energy technology, in health care and information technology • Innovative materials for energy technologies: from ideas to market solutions • Nano in Macro: Integrating molecular components into functional macroscopic systems • Presentation, publication and securing funding: Talks, dissertations/publications/patents and research applications	
Teaching and learning formats	Lectures (1 hr/wk), practical sessions (1 hr/wk), practical work (1 hr/wk) and self-study.	
Participation requirements	None.	
Applicability	This module is one of three electives in the General Education Modules focus area of the Biochemistry Master's degree program, from which students must select modules worth a maximum of 10 credit points.	
Requirements for the award of credit points	Credit points are earned upon successful completion of the module. This module is examined with a report requiring 10 hours of work.	
Credit points and grades	5 credit points are awarded for this module. The module grade is the grade achieved for the report.	
Frequency of the module	This module runs once per year in the winter semester.	
Workload	The total workload for this module is 150 hours.	
Module duration	The module lasts for one semester.	

Annex 2
Study plan
with type and scope of courses given in hrs/week
as well as required work, the type, scope and format of which can be found in the module descriptions

Module no.	Module name	1st Semester	2nd Semester	3rd Semester (M)	4th Semester	CP
		L/E/S/P/LC	L/E/S/P/LC	L/S/P/T		
Core modules						
Chem-Ma- BC01	Fundamentals of Biological Chemistry and Molecular Cell Biology	4/0/0/0/0 1x Ex				5
Chem-Ma-BC07	Enzyme Purification and Characterization	2/0/1/6/0 2x Ex				10
Chem-Ma-BC03	Gene Expression and Manipulation	2/0/1/6/0 2x Ex				10
Chem-Ma-BC04	Biochemistry of the Cell		4/0/0/0/0 1x Ex			5
Chem-Ma-BC05	Bioanalytics		2/0/2/6/0 2x Ex			10
Chem-Ma-BC06	Research Lab Class			0/1/15/0 3x Ex		15
					Master's dissertation, Colloquium	29 1
Electives[1]						
Modules on Technical Biochemistry[2]						
Chem-Ma-TB09	Concepts of Natural Product Biosynthesis		4/0/0/0/0 1x Ex			5
Chem-Ma-TB10	Practical Concepts of Natural Product Biosynthesis		0/0/0/6/0 1x Ex			5
Chem-Ma-TB02	Enzymes in Processes		2/0/1/3/0 2x Ex			5
Chem-Ma-TB03	Bioinformatics		2/2/0/0/0 1x Ex			5

Module no.	Module name	1st Semester	2nd Semester	3rd Semester (M)	4th Semester	CP
		L/E/S/P/LC	L/E/S/P/LC	L/S/P/T		
Chem-Ma-TB04	Protein Biochemistry and Proteomics			3/0/5/0 2x Ex		10
Chem-Ma-TB05	Genome Engineering, Genomes and Evolution			3/0/5/0 2x Ex		10
Chem-Ma-TB06	Drug Discovery			2/0/0/2 1x Ex		5
Chem-Ma-TB07	Medical Biochemistry			4/0/0/0 1x Ex		5
Modules on Chemistry of Biological Systems[2]						
Chem-Ma-BS01	Microbiology of Anaerobic Systems		2/0/0/0/0	1/0/0/0 1x Ex		5
Chem-Ma-BS02	Physiology of Anaerobic Microorganisms		0/0/1/4/0 2x Ex			5
Chem-Ma-BS03	Cellular Signaling		2/0/2/0/0 1x Ex			5
Chem-Ma-BS04	Cellular Machines		2/0/2/0/0	2/2/0/0 2x Ex		10
Chem-Ma-BS05	Metabolism of Natural Products and Natural Product Biosynthesis			4/0/0/0 1x Ex		5
Chem-Ma-BS06	Biological Materials			2/2/6/0 2x Ex		10
Modules on General Studies[3]						
Chem-Ma-AM01	General Studies	4 hrs/wk[4] Ex*				5
Chem-Ma-AM02	Profile Course: Advanced Professional English	0/0/0/0/2 1x Ex	0/0/0/0/2 1x Ex			5
Chem-Ma-AM03	Current Topics in Materials Science	1/1/0/1/0 1x Ex				5
CP		**30**	**30**	**30**	**30**	**120**

1	Modules totalling 35 credit points must be chosen.
2	Modules totalling 10 to 25 credit points must be chosen.
3	Modules totalling a maximum of 10 credit points can be chosen.
4	This module includes lectures or seminars totalling 4 hrs/wk as chosen by the student.
*	depending on choice made by the student

M	Mobility window according to Sec. 6(1)(4)
CP	Credit points
L	Lecture
E	Practical session/exercises
S	Seminar
P	Practical work/placement
T	Tutorial
LC	Language course
Ex	Examination(s)