

Unofficial reading version

Regulations of the Faculty of Biochemistry, Chemistry, and Pharmacy at Goethe University Frankfurt am Main for the Master's degree program in Biochemistry with the degree "Master of Science (M. Sc.)" of February 18, 2024.

Approved by the Executive Board on April 9, 2024.

Amendments of March 17, 2025

Based on §§ 25 and 50 (1) no. 1 of the Hessian Higher Education Act (Hessisches Hochschulgesetz, HessHG) in the version of December 14, 2021, promulgated as Article 1 of the Act on the Revision and Amendment of Higher Education Regulations and the Adaptation of Further Legal Provisions of December 14, 2021 (Law and Ordinance Gazette (GVBl. p. 931), last amended by Article 7 of the Act of June 29, 2023 (GVBl. pp. 456, 472), the Faculty Council of the Faculty of Biochemistry, Chemistry, and Pharmacy at Goethe University Frankfurt am Main, adopted the following regulations for the Master's degree program in Biochemistry after hearing the Faculty Council on February 18, 2024. These regulations were approved by the Executive Board of Goethe University on April 9, 2024 in accordance with § 43 (5) of the Hessian Higher Education Act. They are hereby published.

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Abbreviations:

CEM	credit equivalent module
GVBl.	Law and Ordinance Gazette for the State of Hesse
HessHG	Hessian Higher Education Act of December 14, 2021, promulgated as Article 1 of the Act on the Revision and Amendment of Higher Education Regulations and on the Adaptation of Further Legal Provisions of December 14, 2021 (GVBl. p. 931), last amended by Art. 7 of the Act of June 29, 2023 (GVBl. pp. 456, 472)
HlmmaVO	Hessian Matriculation Ordinance of February 24, 2010 (GVBl. I, p. 94), last amended on October 24, 2018 (GVBl. p. 651)
FR	Framework Regulations for Tiered and Modularized Degree Programs at Goethe University Frankfurt am Main of April 30, 2014 as amended on July 15, 2020
BC	Biochemistry
BPC	Biophysical Chemistry

Section I: General information

§ 1 Scope of the regulations (FR: § 1)

These regulations contain the provisions specific to the Master's degree program in Biochemistry. They apply in conjunction with the Framework Regulations for Tiered and Modularized Degree Programs at Goethe University Frankfurt am Main (hereinafter referred to as Goethe University) dated April 30, 2014, in the version dated July 15, 2020, UniReport Statutes and Regulations dated December 22, 2020 in the respective valid version, hereinafter referred to as Framework Regulations (FR).

§ 2 Purpose of the Master's examination (FR: § 2)

(1) The Master's degree program concludes with a further professional qualification. The Master's examination serves to determine whether students have achieved the objective of the Master's degree program. The examinations are cumulative, i.e., the sum of the module examinations in the Master's degree program in Biochemistry, including the Master's thesis, together form the Master's examination.

(2) The cumulative Master's examination is intended to determine whether the students have acquired thorough specialist knowledge in the areas being examined and have an overview of the content of the area being examined, as well as whether they have the ability to apply scientific methods and knowledge independently and whether they are prepared for the transition to professional practice.

§ 3 Academic degree (FR: § 3)

After the candidate has successfully completed the course and passed the examination, the Faculty of Biochemistry, Chemistry and Pharmacy awards the candidate the academic degree of Master of Science, abbreviated as M.Sc.

§ 4 Standard period of study; part-time studies (FR: § 4)

(1) The standard period of study for the Master's degree program in Biochemistry is four semesters. The Master's degree program may be completed in a shorter period of time.

(2) If in order to achieve equivalence of a degree for admission to the Master's degree program in accordance with § 8 (4) more than 7 credit points – hereinafter referred to as CPs – are required, the period of study will be extended by one semester.

(3) In accordance with state law, the course of study may be carried out as part-time studies in full or in part. Details are governed by the latest version of the HlmmaVO. Students carrying out the degree program on a part-time basis are not entitled to the provision of special arrangements for teaching or courses.

(4) The Master's degree program in Biochemistry is a consecutive Master's degree program. For consecutive degree programs (Bachelor's + Master's degree), the total standard period of full-time study is five years (ten semesters).

(5) As part of the Master's degree program in Biochemistry, 120 CPs must be achieved in accordance with § 13.

(6) The Faculty of Biochemistry, Chemistry and Pharmacy provides a range of courses on the basis of these regulations and ensures that suitable examination dates are set so that the degree program can be completed within the standard period of study.

§ 5 Study abroad (FR: § 5)

(1) Candidates are advised to study at a university abroad during the course of the Master's degree program or to plan a relevant stay abroad for at least one semester. Goethe University's connections to universities abroad can

be used for this purpose. Information on these connections can be obtained from the Student Advisory Service and the Global Affairs Study and Teaching Department.

(2) Candidates are advised to study or stay abroad in the third semester. The modules *Research Internship I and II* are especially suitable for completing at a foreign university and can be recognized as part of the curriculum at Goethe University.

Section II: Objectives of the degree program; start of studies and admission requirements

§ 6 Objectives of the degree program (FR: § 6)

(1) The Master's degree program in Biochemistry at Goethe University is rooted in Frankfurt's rich tradition of biomolecular research and teaching. The degree program aims to equip graduates with the technical and methodological skills needed to work independently in a research environment. To this end, the teaching of fundamental academic skills is linked to general professional qualifications for this subject area. In terms of content, the degree program covers a range of topics, from cellular biochemistry to biophysical chemistry. It enables students to acquire broad training and to set their own focuses by means of different electives that can be designed based on their personal interests. For high-level research-based training, the degree program is integrally linked to the local research setting, which involves the home Faculty of Biochemistry, Chemistry and Pharmacy, the Faculties of Physics and Biological Sciences, as well as non-university institutions such as the Max Planck Institute (MPI) of Biophysics and the Paul Ehrlich Institute. The degree program takes into account the specific focuses of structural biology and membrane protein research in Frankfurt. In addition to the focus on biochemistry itself, this degree program aims to equip graduates with the general ability to make scientifically well-founded decisions through rational case analysis. It is also crucial to consider basic ethical and social conditions or recognize related consequences. In addition, the rapid progress in national and life sciences means that knowledge acquired in a course of study is subject to change over time. Therefore, the course aims to provide students with skills they can use post-graduation to quickly familiarize themselves with new developments, work their way into new areas, and contribute to advancements in their discipline in science and technology.

(2) The Master's degree program builds consecutively on the six-semester Bachelor's degree program in Biochemistry or a related field and is primarily research oriented.

(3) Successful completion of the course of studies enables graduates to pursue careers in research or in leadership positions, such as in academia, with governmental authorities, or in industry, or to begin a doctoral degree program. The acquired skills will also benefit graduates who wish to enter the labor market immediately upon completing their degree. Typical employment areas include various sectors within the chemical/pharmaceutical industry, such as research, development, production, quality management, and fields not specifically focusing on biochemistry, such as administration, consultancy, publishing, environmental protection, marketing, or the patent system.

§ 7 Start of studies (FR: § 7)

The program can only be started in the winter semester.

§ 8 Requirements for admission to the Master's degree program (FR: § 9)

(1) Applications for admission to the Master's degree program in Biochemistry must be submitted to the Examination Board or to an office specified by the President of Goethe University. The Examination Board regulates the details of the application procedure and decides on the admission of applicants. § 8 (6) sentence 2

remains unaffected by this. If admission restrictions are in place for the Master's degree program, the provisions of the university selection regulations in their currently valid version must be observed. The regulations for the aptitude test will then not apply.

(2) General admission requirements for the Master's degree program are

- a) Proof of a Bachelor's degree in Biochemistry or in the same subject area with a standard period of study of at least six semesters or
- b) Proof of a degree that is at least equivalent to a Bachelor's degree from a German university or a German university of applied sciences in the same or a related subject area with a standard period of study of at least six semesters or at least 180 credit points (CPs) or
- c) Proof of a foreign degree in the same or a related subject area with a standard period of study of at least six semesters or at least 180 CPs that is at least equivalent.

The Examination Board decides on the same or related subjects. § 8 (1) sentences 2 and 3 FR apply accordingly.

(3) The previous studies must have a subject area profile that can serve as a basis for admission to the Master's degree program in Biochemistry. The candidate must have acquired profound subject-specific and methodological knowledge in the sub-disciplines of Biochemistry and Biophysical Chemistry. Proof of a minimum share of subject-specific content totaling 30 credit points (CPs) from area (A) Biochemistry and (B) Biophysical Chemistry/Physical Chemistry/Biophysics must be submitted, whereby proof of at least 10 CPs in area (A) and at least 5 CPs in area (B) must be submitted.

The CPs from area (A) Biochemistry should come from the areas of molecular biology, microbiology, protein structure and function, metabolism, cell biology, cellular biochemistry. The CPs in area (B) Biophysical Chemistry should come from the areas of thermodynamics, enzyme kinetics, electrochemistry, theoretical chemistry, spectroscopy. Furthermore, an experimental thesis must have been part of the Bachelor's degree and at least 200 hours of practical laboratory training/activities must also be proven.

(4) In the cases of § 8 (2) b) and c), admission may be granted on the condition that additional coursework and module examinations are completed up to the equivalence with the Bachelor's degree program in Biochemistry at Goethe University up to 30 CPs. The conditions may relate in whole or in part to content that is not part of the Bachelor's degree program, but are rather its admission requirements, such as foreign language skills. The additional credits are not part of the Master's degree program. In the event that conditions are imposed, the study program may be extended accordingly. The Examination Board determines in the admission letter the deadline by which the student must provide proof that the requirements have been met. § 8 (7) sentence 2 remains unaffected. If the conditions are not duly fulfilled, the decision associated with them must be revoked.

(5) The requirement of proof of language proficiency for foreign applicants in accordance with the "Regulations of Goethe University Frankfurt am Main on the German Language Test for Admission of Foreign Study Applicants (DSH)" does not apply. Students who wish to enhance their German skills may attend the courses offered by Goethe University.

(6) A further admission requirement is proof of English language proficiency at level B2 of the Council of Europe's Common European Framework of Reference for Languages (CEFR) of September 2000. Proof of language skills can be provided as follows:

- Five years of English instruction at a school until graduation (last report card grade must be at least "satisfactory" ("befriedigend"), or
- A Level II UNICert® certificate, or
- A TOEFL test (internet-based score of at least 80), or
- An IELTS test (score of at least 5.0), or
- Other qualification considered equivalent by the Examination Board, for example, a qualified university degree from a degree program completed exclusively in English.

(7) If the degree certificate for the Bachelor's degree has not yet been issued when the candidate applies for a place in the Master's degree program, the application may instead be supported by proof of enrollment and a certificate. This certificate must be based on completed examinations amounting to at least 80% of the CPs required for the Bachelor's degree, contain a provisional average grade calculated on the basis of these examinations in accordance

with the relevant regulations, and have been issued by the office responsible for issuing the degree certificates at the university at which the applicant is currently enrolled. The admission procedure is based on the provisional average grade unless proof of the final grade is submitted before the end of the procedure. Admission on the basis of the certificate described above is subject to the proviso that the Bachelor's degree certificate is promptly submitted, no later than the end of the first semester. If this proof is not provided by the deadline, the student's admission is revoked and their enrollment must also be revoked.

(8) The Examination Board shall decide whether the admission requirements have been met and, if applicable, grant provisional admission in accordance with § 8 (7). It may also appoint an admission committee to perform this task. § 8 (1) sentence 4 remains unaffected.

(9) If the admission requirements are met, the applicant will be admitted by the President of Goethe University. Otherwise, the Examination Board or Admission Committee will issue a written rejection notice including legal remedies. Any conditions in accordance with § 8 (2) sentence 4 can be imposed, usually in a separate letter from the Examination Board or Admission Committee.

(10) The requirements for admission to the Master's examination are regulated in § 22. When being admitted to the Master's examination, the student must in particular submit a declaration stating whether they have already finally failed an intermediate examination (*Zwischenprüfung*), a preliminary *Diplom* examination, a Bachelor's examination, a Master's examination, a *Diplom* examination, a church university examination, a *Magister* examination or a state final examination in the respective subject or in a comparable degree program (degree program with a predominantly similar subject focus) at a university or whether they are currently undergoing an examination procedure in the respective subject or in such a degree program at a university in Germany or abroad that has not yet been completed.

Section III: Program structure and organization

§ 9 Program structure; modularization (FR: § 11)

(1) The Master's degree program in Biochemistry has a modular structure. A module is a teaching and learning unit that is self-contained in terms of content and time. It comprises a set of courses with related content, including practical phases, project work, and independent study periods, and aims to help students fulfill a predefined learning objective. Modules usually extend over one to two semesters.

(2) The Master's degree program in Biochemistry has an introductory area (I1), three core areas (C1, C2, C3), applied research (A1, A2, A3), a compulsory elective area (E), and the Master's thesis (A4).

(3) Modules can be: Compulsory modules, which are obligatory, including the Master's thesis, or compulsory elective modules, which must be selected from a given catalog of modules, which in the core area must be selected according to set rules (cf. § 9 (5 to 10)).

(4) The modules *Advanced Methods in Biochemistry and Biophysics*, *Advanced Methods in Membrane Biochemistry*, and *Developing a Research Project* and *Research Internships I and II* are project- and/or practice-oriented. They promote reflection about a certain subject area expertise related to a particular object. Details are governed by § 11.

(5) From the core areas C1 to C3, the candidate must pass at least six modules. At least two modules must be successfully completed in each core area and core area C3 must include at least one practical course module.

(6) In the compulsory elective area, the candidate must complete compulsory elective modules or partial compulsory elective modules up to 15 CPs. Up to 10 CPs earned in the compulsory elective area may come from the free compulsory elective module area. Annex 3 contains the list of possible compulsory elective modules. The

free compulsory elective area includes modules E2.1 and E2.2 and all modules from Goethe University's course catalog.

(7) In addition to the compulsory elective modules listed in Annex 3, modules or courses from other teaching units or faculties of Goethe University may be approved and completed. To obtain approval, the candidate must submit a module description in the Examination Office before the relevant course begins. In accordance with the relevant regulations of the faculty offering the course in the respective valid version, it contains the coursework and participation requirements as well as the credit points awarded for the modules. In order for courses to be recognized, students are advised to clarify with the instructors at the beginning of the course the conditions under which proof of the coursework or examination can be issued.

(8) Modules that candidates have already completed during their Bachelor's degree program do not have to be repeated in the Master's degree program.

(9) The following program structure for the Master's degree program in Biochemistry is based on the assignment of the modules to the study phases, the compulsory nature of the modules, and the calculation of the workload in accordance with § 13 in CPs:

	Compulsory (PF)/Compulsory elective (WP)	Credit points (CPs)	Remarks
Introductory area			
[I1] Degree program overview	PF	3	
Core area 1: Cellular & Organismic Biochemistry			
[C1.1] Advanced Cell Biology	WP	4–7	See § 9 (5)
[C1.2] Cellular and Molecular Neurobiology	WP	5–8	
[C1.3] Cellular Biochemistry	WP	4	
[C1.4] Infection and Pathobiology	WP	6–8	
Core area 2: Molecular Biochemistry			
[C2.1] Advanced Methods in Biochemistry	WP	3–7	See § 9 (5)
[C2.2] Membrane Biology	WP	4–5	
[C2.3] Advanced Molecular Biology & Microbiology	WP	3–5	
[C2.4] Biological Synthesis	WP	7	
Core area 3: Biochemical Methods			
[C3.1] Methods for Structural Biology and Biophysics	WP	3–7	See § 9 (5)
[C3.2] Advanced Methods in Biochemistry and Biophysics	WP	5	
[C3.3] Advanced Methods in Membrane Biochemistry	WP	3–9	
[C3.4] Structural Bioinformatics	WP	3	
Applied Research			
[A1] Group Research Proposal	PF	6	
[A2] Developing a Research Project	PF	8	
[A3] Research Internships I & II	PF	20	

[A4] Master's thesis	PF	30	See § 38
Compulsory elective area		Up to 15	See § 9 (6 and 7)
Focus Biochemistry			
[E1.1] Advanced Biophysical Methods	WP	5	
[E1.2] Solid-state NMR Spectroscopy	WP	7–10	
[E1.3] Liquid NMR Spectroscopy	WP	6–9	
[E1.4] EPR Spectroscopy	WP	7–10	
[E1.5] Single Molecule Spectroscopy and High-resolution Microscopy	WP	6	
[E1.6] Biophysics	WP	3–15	
[E1.7] X-ray Structure Analysis	WP	5–9	
[E1.8] Modeling and Simulation of Biomolecules	WP	6	
[E1.9] Structure and Function of Biomacromolecules	WP	7	
[E1.11] Modern Statistical Data Analysis for Practitioners	WP	5	
Focus Chemistry			
[E1.12] Advanced Organic Chemistry	WP	5	
[E1.13] Chemical Synthesis of Natural Products	WP	7	
[E1.14] Chemistry of Heterocycles	WP	5	
[E1.15] Highlights of Organic Chemistry and Chemical Biology	WP	4	
[E1.16] Laser Chemistry	WP	5	
Focus Biology			
[E1.17] Molecular Biosciences	WP	6	
[E1.18] Toxicology and Ecology	WP	6	
[E1.19] Advanced Chemical Biology	WP	5	
[E1.20] Advanced Chemical Biology – Practical Course	WP	6	
Focus Pharmacology			
[E1.21] Pharmacology	WP	6	
[E1.22] Computational Drug Design	WP	5	
[E1.23] Drug Development	WP	5–6	
Free compulsory elective area		Up to 10	
[E2.1] Key qualifications	WP	3–10	
[E2.2] Economics	WP	5–15	
Modules from Goethe University's course catalog	WP	10	
Total		120	

(10) The ability of students to freely choose compulsory elective modules may be restricted by resolution of the Faculty Council if capacity is insufficient, provided that the subject-related structure and orientation of the degree program remain unchanged. The Dean's Office must notify students of the restriction without delay. § 16 (2) shall apply. By resolution of the Faculty Council, additional compulsory elective modules can also be admitted if their scope and requirements correspond to the compulsory elective modules regulated in these regulations. § 12 (3) and § 16 (2) apply accordingly.

(11) The courses in the modules are divided into compulsory and compulsory elective courses with respect to their binding nature. Compulsory courses are clearly defined in the module description according to the content and format of the course. Compulsory elective courses are courses that students have to select within a module from a specific subject area or on a specific topic.

(12) Courses are taught in English. Provisions for any courses offered in German are regulated in the module handbook.

(13) If courses in a module build on each other, students are bound to the sequence specified in the module description.

(14) Within the Master's degree program in Biochemistry, students have the opportunity to undergo an examination or performance assessment in modules other than those prescribed in these regulations (additional modules), subject to the availability of places. The results of the examination are not taken into account when calculating the overall grade for the Master's examination.

§ 10 Use of modules (FR: § 12)

The provisions of § 12 of the Framework Regulations apply.

In particular, modules in the Master's degree program in Biochemistry from the course offerings of other degree programs ("import modules," i.e., external modules) are subject to the examination regulations (registration and withdrawal deadlines) of the exporting faculty (regulations of the original degree program). The study regulations of the Master's degree program in Biochemistry apply for deadlines for retaking examination, the number of possible retakes, and for retaking examinations to improve grades. This information is stated in Annex 2. Changes are made to the module handbook by the Examination Board in a timely manner (see § 12) and can be found on the website for the degree program (see § 16 (2)) at <https://www.uni-frankfurt.de/76805906/>.

§ 11 Practical module (FR: § 13)

(1) The Master's degree program in Biochemistry provides for an internal practical module in the Applied Research study phase in the form of module *A3 Research Internships I and II*.

(2) Students are expected to find an internship themselves. The internship coordinator (module coordinator) advises students in their search for a suitable internship and during the entire internship.

§ 12 Module descriptions/Module handbook (FR: § 14)

(1) Annex 3 contains a module description for each compulsory and compulsory elective module in accordance with § 14 FR. The module descriptions are part of these regulations.

(2) The module descriptions are supplemented by a regularly updated module handbook. This handbook contains additional information in accordance with § 14 (2) FR and Annex 6 FR and serves in particular to inform students.

(3) Changes to the module handbook that do not concern the content of the module descriptions in accordance with Annex 5 FR are possible by resolution of the Faculty Council in good time before the start of the course period of a semester and must be announced on the website for the degree program by this time. They must not lead to significant changes to the curriculum. The University Computing Center and the Examination Office responsible for the degree program must be consulted on the changes in good time before a resolution is passed by the Faculty Council. The consultation covers administrative content only.

(4) Changes to the import modules may be carried out by the faculty offering them without the need to amend these regulations. They will be included in the module handbook by the Examination Board in a timely manner and will be announced on the degree program website.

§ 13 Scope of studies and modules; credit points (CPs) (FR: § 15)

(1) Credit points (CPs) are allocated to each module in the module description on the basis of the European Credit Transfer System (ECTS), taking into account the resolutions and recommendations of the Standing Conference of the Ministers of Education and Cultural Affairs (KMK), and the German Rectors' Conference (HRK). The CPs enable the transfer of credits earned to other degree programs at Goethe University or another university and vice versa.

(2) CPs are a quantitative measure of the workload required for students of average ability to successfully complete the corresponding module, including in-class instruction, participation in extramural practical courses or excursions, preparation and review of course material, and preparation and development of their own contributions and examinations. One CP corresponds to a workload of 30 hours. The regular workload is set at a maximum of 1800 working hours per academic year. Thirty CPs correspond to the average workload of one semester.

(3) At least 300 CPs are required for the Master's degree in Biochemistry – taking into account the previous studies up to the first professionally qualifying degree.

(4) CPs are only awarded for a fully and successfully completed module.

(5) A credit point account is set up at the Examination Office for each student in the degree program.

(6) The scope of work (workload) is reviewed as part of the evaluation in accordance with § 14 (1) and (2) HessHG and for the reaccreditation of the degree program and adjusted to the workload determined by the evaluation.

§ 14 Teaching and learning formats; admission to modules (FR: § 16)

(1) The courses in the Master's degree program in Biochemistry are held in the following formats:

- a) Lecture: Cohesive presentation and communication of basic and specialized knowledge as well as methodological skills through lectures, if required in conjunction with demonstrations or experiments. Instructors develop and teach course content with the involvement of students;
- b) Exercise: Working through and deepening teaching material, as well as training in subject methodology and teaching of special skills by working on and discussing model tasks;
- c) Seminar: Development of scientific findings or processing of current problems using scientific methods through contributions, usually prepared by students, learning and practicing presentation and discussion skills or further developing these skills;
- d) Practical course: Guided execution of practical tasks in the experimental and instrumental field and/or computer simulations; training in the application of scientific investigation and solution methods; teaching of technical skills and insights into functional processes;
- e) Project: Development of concepts and realization of solutions for complex, practical tasks; teaching of social skills through largely independent preparation of the task with simultaneous content-related and methodological supervision;
- f) Independent study: Independent work with current research publications.

(2) If, in accordance with the module description, admission to the courses of a module is dependent on the successful completion of other modules or attendance at subject advising, or if the module description makes

participation in an individual course dependent on proof of participation or coursework for another course, the eligibility to participate will be verified by those in charge of the course.

(3) The module description may stipulate that binding registration may be required for participation in the module or in certain courses of the module. The website for the degree program will announce in good time whether and how binding registration is required.

(4) If it is anticipated that the number of students interested in a course will exceed the capacity of the course, those in charge of the course may institute a sign-up procedure. The sign-up requirements and the sign-up deadline are announced in the annotated course catalog or by other means. If the number of students who have signed up exceeds the capacity of the course or if the course is overcrowded and students cannot be referred to alternative courses, the Dean's Office will check whether an additional course can be set up at the request of those in charge of the course. If this is not possible for capacity reasons, it is permissible to accept only a limited number of students who are willing and entitled to participate in order to ensure that the course is carried out properly; in this case, the guidelines for the minimum group sizes of the course types in accordance with the implementation decree of the Hessian Ministry of Science and Art on the Hesse Capacity Ordinance (Kapazitätsverordnung Hessen) in the respectively valid version must be observed. In this case, those in charge of the course must carry out an appropriate, transparent selection procedure in accordance with the guidelines of the Dean's Office that does not take into account the chronological order of registrations. When drawing up the selection criteria, it must be ensured that priority is given to those students for whom the course is compulsory and who have a particular interest in being admitted to the course; the interests of students in special circumstances within the meaning of § 27 (1) FR must be taken into account. The relevant proof must be submitted by the students. A special interest in admission to the course is also given in particular if the student was already entitled to the place in the previous semester according to the course plan and was unable to obtain a place despite having signed up for the course. In the case of compulsory courses, students who are registered but not admitted to the course must be issued a certificate upon request.

§ 15 Participation record and coursework (FR: § 17)

(1) In addition to passing the module examination, the successful completion of the module may, insofar as this is regulated in the respective module description, be made dependent on the provision of proof of participation and/or coursework as proof of proper study or as a prerequisite for admission to a module examination. § 11 (15) FR remains unaffected by this.

(2) The participation record refers to regular and/or active participation. Regular and/or active participation within the meaning of (3) and (4) can only be specified if they are absolutely necessary to ensure the acquisition of knowledge and skills associated with the module. For lectures, neither regular nor active participation may be required. This applies even if coursework within the meaning of § 15 (6) and (7) is required for a lecture.

(3) Participation in a course is deemed to have been regular if the student was present at all individual classes scheduled by those in charge of the course during the course of a semester. Participation must still be confirmed as regular even if the student has missed 20% of the course. The same applies to block courses with fewer than five meetings. If the permitted period of absence is exceeded for reasons for which the student is not responsible, e.g., illness, maternity leave, necessary care of a child living in the same household or care of a close relative (e.g., children, parents, grandparents, spouse, partner in a non-marital relationship) or participation as an appointed or elected representative in academic or student self-government, the lecturer shall decide in consultation with the module coordinator whether and to what extent equivalent coursework is necessary and appropriate. The regulations on disadvantage compensation in § 25 must be observed.

(4) The module descriptions may stipulate that the student has not only participated in the course regularly in the sense of § 15 (3), but has also participated actively in the course. However, it may also require only active participation. Depending on how it has been determined by those in charge of the course, active participation

includes the completion of smaller pieces of work, such as protocols, short oral presentations, and group work. These tasks are neither graded nor evaluated with a pass/fail grade.

(5) Coursework can only be required in modules that do not conclude with a cumulative module examination. The coursework has been successfully completed if it has been assessed as "passed" by the lecturer in accordance with the module description or positively by means of a grade in accordance with § 39 (3). In the case of group work, individual work must be clearly distinguishable and assessable. The grades of the coursework are not included in the module grade. If required by the module description, regular participation in the course as defined in § 15 (3) is required in addition to the coursework.

(6) Coursework can be in particular

- Written exams
- Expert discussions
- Protocols
- Completion of experiments/practical laboratory work
- Presentation/lecture
- Portfolio

The lecturer decides on the form and deadline by which the coursework is to be completed in accordance with the module description and announces this to the students at the beginning of the course. The assignment criteria may not be changed during the semester to the detriment of the students. The lecturer may allow students to revise a written assignment that has received a grade of "fail" and may set a deadline for submitting the corrected assignment.

(7) Written work completed without supervision must be undertaken by the student in accordance with the rules of good academic practice. When submitting the paper, the student must confirm in writing that they have written it independently and that all sources and aids used by them have been listed in the paper. Furthermore, it must be declared that the paper has not yet been used – not even in part – in another degree program or the same degree program in a different module as coursework or an examination. § 27 (1) applies accordingly. In order to be able to verify compliance with the rules of good academic practice, lecturers are entitled to require students to submit an electronic copy of written work that has not been completed under supervision. The Examination Board shall make further specifications in this regard.

(8) Passed coursework cannot be repeated. Failed coursework can be repeated an unlimited number of times.

(9) Participation record and coursework for individual courses can only be counted once in the same degree program. This regulation does not apply to double degree programs.

§ 16 Course plan; information (FR: § 18)

(1) The course plan attached as Annex 1 provides students with information on how to organize their studies in a targeted manner. It takes into account content-related references between modules and organizational conditions of the courses on offer.

(2) The Faculty shall set up a website for the Master's degree program in Biochemistry, where general information and regulations on the degree program can be found in their current form. The module handbook and the course plan and, if modules are imported and/or exported, the list of the current import and export offers of the degree program, are also published there.

(3) For the Master's degree program in Biochemistry, the Faculty shall compile an annotated course catalog with a description of the content and organization of the courses offered on the basis of the module descriptions and

the course plan. This is to be updated for each semester and should appear in the last week of lectures of the previous semester.

§ 17 Subject advising; student orientation (FR: § 19)

(1) Students have the opportunity to attend subject advising for the Master's degree program in Biochemistry at the Faculty of Biochemistry, Chemistry and Pharmacy throughout the course of their studies. Subject advising is provided by individuals appointed by the Dean of Studies. As part of subject advising, students receive support in particular with regard to study design, learning and study techniques, and the course selection. The subject advising services should be used in particular:

- At the beginning of the first semester;
- If the student has failed an examination and has not passed the required coursework;
- In the event of difficulties in individual courses;
- When changing degree programs or universities.

(2) In addition to subject advising, the Student Advisory Service of Goethe University is available to students. As a general student advisory service, it provides information on study options, content, structure, and requirements of a degree program and advises students on personal difficulties related to studying.

(3) Before the start of the lecture period of each semester in which students can begin their studies, a student orientation event takes place to which the first-year students are invited by notice or otherwise. The orientation event provides information about the structure and overall organization of the degree program and semester-specific features. Students are given the opportunity to clarify questions relating to the organization of their studies in particular.

§ 18 Academic Director and module coordinator (FR: § 20)

(1) The Dean of Studies of the Faculty of Biochemistry, Chemistry, and Pharmacy is responsible for the academic direction of the Master's degree program in Biochemistry, unless the Faculty Council delegates this task to a member of the group of professors authorized to examine in the Master's degree program for a period of two years at his or her suggestion. The Academic Director is an advisory member of the Study Commission and has the following tasks in particular:

- Coordination of the teaching and examination offerings of the degree program in cooperation with the module coordinators, if required also from other faculties;
- Creation and updating of lists of examiners;
- Evaluation of the degree program and implementation of any quality assurance measures developed as a result in cooperation with the Study Commission (cf. § 7 Evaluation Statutes for Teaching and Studies);
- If applicable, appointment of the module coordinators (§ 18 (2) remains unaffected).

(2) For each module, the Academic Director of the degree program appoints a module coordinator from among the instructors of the module. For interfaculty modules, the module coordinator is appointed in cooperation with the Dean of Studies of the other faculty. The module coordinator must be a member of one of the following groups for compulsory modules and should be a member of one of the following groups for compulsory elective modules: either a university lecturer primarily employed by the university (professor, junior professor, qualifying professor) or an academic member of the teaching unit primarily employed by the university. Module coordinators are responsible for all content-related coordination concerning the module and the organizational tasks assigned to

them by these regulations, in particular for participating in the organization of the module examination. The module coordinator is represented by the Academic Director of the degree program.

Section IV: Organization of examinations

§ 19 Examination Board; Examination Office; examination administration system (FR: § 21)

(1) The Faculty Council shall form a joint Examination Board for the Bachelor's degree program in Biochemistry and the Master's degree program in Biochemistry.

(2) The Examination Board consists of seven members, including four members from the group of professors, one academic staff member, and one student each from the Bachelor's degree program in Biochemistry and the Master's degree program in Biochemistry.

(3) The members of the Examination Board, together with a deputy, are elected by the Faculty Council of the Faculty of Biochemistry, Chemistry, and Pharmacy on the recommendation of the respective groups. The term of office of the students is one year, that of the other members two years. Examination Board members may be reelected.

(4) In matters concerning a member of the Examination Board, their membership shall be suspended in relation to this matter and shall be exercised by the deputy. This does not apply to purely organizational matters.

(5) The Examination Board elects a chair from among the professors who belong to it. The deputy chair is elected from among the professors or their deputies who are members of the Examination Board. The Chair conducts the business of the Examination Board. The Chair convenes the meetings of the Examination Board and chairs all discussions and resolutions. As a rule, at least one meeting of the Examination Board should take place each semester. A meeting must be convened if at least two members of the Examination Board so request.

(6) Examination Board meetings are not open to the public. It is quorate if at least half of the members, including the chair or deputy chair, are present and the professors' votes make up the majority. Resolutions require the approval of the majority of those present. In the event of a tie, the Chair has the tie-breaking vote. The resolutions of the Examination Board must be recorded in minutes. In all other regards, the procedure is governed by the rules of procedure for the committees of Goethe University.

(7) The Examination Office staff may attend the meetings of the Examination Board in an advisory capacity. The module coordinators in the Master's degree program in Biochemistry participate in the Examination Board with an advisory vote. § 19 (9) applies accordingly.

(8) The Examination Board may delegate individual tasks to its Chair for sole implementation and decision-making. The members of the Examination Board and the examinee in question have the right to appeal decisions made solely by the Chair. The Chair of the Examination Board may delegate the performance of tasks to the Examination Office. This is the office of the Examination Board. It conducts day-to-day business in accordance with the instructions of the Examination Board and its Chair.

(9) The members of the Examination Board and their deputies are subject to official secrecy. If they are not in public service, they must be sworn to secrecy by the Chair; they confirm this obligation with their signature, which is kept on file.

(10) The members of the Examination Board have the right to attend the oral examinations as members of the audience.

(11) The Examination Board may issue instructions, set deadlines and make other decisions with legally binding effect in compliance with data protection regulations by posting them at the Examination Office or by other suitable measures in accordance with § 41 of the Hessian Administrative Procedure Act (Hessisches Verwaltungsverfahrensgesetz).

(12) Decisions made against the student by the Examination Board or the Chair of the Examination Board must be communicated to the student immediately in writing, stating the reasons and including legal remedies. The student must be given the opportunity to comment before the decision is made.

(13) § 21 (15) FR applies to electronic examination administration.

§ 20 Responsibilities of the Examination Board (FR: § 22)

(1) The Examination Board and the Examination Office responsible for the Master's degree program in Biochemistry are responsible for the organization and proper execution of examinations in the Master's degree program in Biochemistry. The Examination Board ensures that the provisions of these regulations are observed and decides on questions of interpretation of these regulations in the event of doubt. It decides on all examination matters that are not assigned to another body or committee or to the Chair of the Examination Board by the regulations or statutes.

(2) As a rule, the Examination Board is responsible for the following tasks in particular:

- Decision on the fulfillment of the requirements for admission to the Master's degree program, including the imposition of conditions for making up coursework and examinations from the Bachelor's degree program and the decision on provisional admission;
- Determination of the examination dates, examination periods, and registration and withdrawal deadlines for the examinations and their announcement;
- Appointment of the examiners, if applicable;
- Decisions on admission to examinations;
- The decision on recognition and credit in accordance with §§ 29 and 30 as well as the imposition of conditions on coursework and examinations to be made up for within the scope of recognitions;
- The principles for announcing the grades of examinations and the overall grade for the Master's degree;
- Decisions on the Master's thesis;
- Decisions on passing and failing;
- Decisions on disadvantage compensation and the extension of examination or preparation deadlines;
- Decisions on violations of examination regulations;
- Decisions on the invalidity of the Master's degree;
- Decisions on appeals and objections by students to decisions made in examination procedures, insofar as these are to be upheld; § 50 (2) remains unaffected.
- Regular reporting to the Study Commission on the development of examination and study periods, including the preparation periods for the Master's thesis, as well as on student demand for the various compulsory elective modules;

- Disclosure of the distribution of subject and overall grades;
- Suggestions for reforming these regulations.

(3) For the purpose of verifying compliance with good academic practice, the Examination Board is entitled to check academic work for cheating and attempted cheating using suitable electronic means. To this end, it may request that the examination papers be submitted to it in electronic form within a reasonable period of time. If the author does not comply with this request, the thesis may be graded as failed.

§ 21 Examiners and co-examiners (FR: § 23)

(1) Members of the group of professors and academic staff who have been commissioned to independently carry out teaching tasks, as well as lecturers and teaching staff for special tasks as well as persons experienced in professional practice and training who have been commissioned by the dean to conduct an examination are authorized to conduct university examinations (§ 22 (2) HessHG). "Privatdozenten", "außerplanmäßige" professors, honorary professors who teach in the examination subjects, as well as professors who have retired or are no longer employed may be appointed as examiners by the Examination Board with their consent. § 38 (6) remains unaffected.

(2) Examinations may only be graded by persons who themselves possess at least the qualification to be determined by the examination or an equivalent qualification.

(3) As a rule, the examination belonging to a module is carried out by the lecturers in the module without special appointment by the Examination Board. If a lecturer is unable to conduct examinations for compelling reasons, the Examination Board may appoint another examiner.

(4) Written examinations that cannot be retaken must be assessed by two examiners. § 38 (17) remains unaffected by this. Oral examinations must be conducted by several examiners or by one examiner in the presence of a co-examiner.

(5) Only persons who have completed at least a Master's degree or a comparable examination and are a member of Goethe University may be appointed as co-examiners for oral examinations. The Chair of the Examination Board appoints the co-examiner. The Chair may delegate the appointment to the examiner.

(6) Examiners and co-examiners are subject to official secrecy.

Section V: Examination requirements and procedures

§ 22 Initial registration and admission to Master's examinations (FR: § 24)

(1) The student must submit a completed registration form for admission to the Master's examination to the Examination Office for the Master's degree program in Biochemistry at the latest when registering for the first module examination in the Master's degree program in Biochemistry. If not already submitted with the application for admission to the degree program, the application for the examination must be accompanied in particular by the following documents:

- a) A declaration stating whether the student has already finally failed a Bachelor's examination, a Master's examination, a *Magister* examination, a *Diplom* examination, a church university examination, or a state final examination in the subject of Biochemistry or in a comparable degree program (degree program with a predominantly similar subject focus) at a university or whether

they are currently in an as yet still uncompleted examination procedure in the subject of Biochemistry or a comparable degree program at a university in Germany or abroad;

- b) A declaration stating whether and, if so, how often the student has already failed module examinations in the Master's degree program in Biochemistry or in the same modules of another degree program at a university in Germany or abroad;
- c) if applicable, proof of previous coursework or examinations that are to be included in the degree program.

(2) The Chair of the Examination Board decides on admission. In cases of doubt, the Examination Board decides on admission, if required after consulting a representative from the subject area. Admission will be refused if

- a) The documents are incomplete or
- b) The student has finally forfeited the right to admission to the examination for a module according to § 22e (1) b) or for the respective degree program or has finally failed one of the examinations mentioned in § 22e (1) a).

(3) The Examination Board shall decide on exceptions to § 22 (1) and (2) in special cases upon application by the student.

(4) The Chair of the Examination Board will inform the student in writing if admission is refused. This refusal must be accompanied by a justification and include legal remedies.

§ 23 Examination date and registration procedure (FR: § 25)

(1) Module examinations are taken during the time period of the corresponding module and related to the content of that module. Module examinations for compulsory modules and annually scheduled compulsory elective modules must generally be offered at least twice a year. Further details are regulated in § 43 (6).

(2) The oral examinations and written examinations at the end of the module should be carried out within examination periods to be determined by the Examination Board. The examination periods generally comprise the first two and last two weeks of the lecture-free period.

(3) The exact examination dates for the module examinations are determined by the Examination Board in consultation with the examiners. § 23 (4) remains unaffected by this. The Examination Office shall inform students of the time and place of the examinations and the names of the examiners involved in an examination plan as early as possible, but no later than four weeks before the examination dates, by means of a notice or other suitable measures. If it is necessary to deviate from this examination plan for compelling reasons, the date may only be rescheduled with the approval of the Chair of the Examination Board. Dates for the oral final module examinations or for examinations taken in conjunction with individual courses or as a part of courses (partial module examinations) are set by the examiner, if required after consultation with the students. Students can apply to the Examination Board for the setting of alternative dates for examinations if work is prohibited for religious reasons on the planned examination date. The request must be justified.

(4) The Examination Board sets registration periods (generally two weeks) that must be announced by posting them or other suitable measures no later than four weeks before the beginning of the registration periods.

(5) Students must register for each module examination in writing or, if determined by the Examination Office, electronically, within the registration period. For written examinations, registration occurs automatically when the student takes the examination. For import modules, the regulations of the exporting faculty apply. These regulations are stated in the module handbook.

(6) Students may only register for the module or partial module examination if they are enrolled at Goethe University. In order to take the relevant module examination, students must have been admitted to the Master's

examination and must not have finally failed the relevant module examination or partial module examination. Furthermore, they must have completed the coursework and proof of participation required for the module in accordance with the module description. If admission to a module examination or partial module examination depends on the completion of coursework (preliminary examinations) and this has not yet been completed in full, the Chair of the Examination Board may grant conditional admission to a module examination or partial module examination. The module is only passed when all coursework and module examinations and all partial module examinations have been passed. The Examination Board decides on exceptions. Students on leave of absence cannot take examinations or complete coursework. However, it is permissible to retake failed examinations during the leave of absence. Students are also entitled to complete coursework and examinations during a leave of absence if the leave of absence is due to maternity leave or parental leave or due to the care of relatives in need of care according to a medical certificate or due to membership of a squad formed at the federal level (A, B, C or D/C squad) of a top professional association in the German Olympic Sports Confederation or due to the fulfillment of a military service obligation in accordance with Art. 12 a of the Basic Law or because of participation as an appointed or elected representative in academic self-government.

(7) The student may withdraw the examination registration up to two workdays before the examination date or before the examination period without giving reasons. In the event of a later withdrawal, § 24 (1) shall apply.

§ 24 Failure to appear for and withdrawal from module examinations (FR: § 26)

(1) A module examination is deemed to have been given a grade of "fail" (5.0) in accordance with § 39 (3) if the student has missed a binding examination date without good cause or has discontinued participation before the end of the examination. The same applies if they have not completed a written module examination within the specified preparation period or have submitted a blank sheet of paper as a module examination in a supervised written test or have remained silent in an oral examination.

(2) The reason given for missing or discontinuing the examination must be reported in writing to the Chair of the Examination Board immediately after the reason becomes known and must be substantiated. Any incapacity to take an examination that occurs during the performance of an examination must be reported immediately to the examiner or the proctor. This does not affect the obligation to notify the Chair of the Examination Board immediately and to provide credible reasons. In the event of illness, a medical certificate and a certificate of incapacity for the examination issued by a general practitioner/specialist must be submitted immediately, in any case within three working days, stating the type of examination (written examination, oral examination, longer examinations, other forms of examination) for which the incapacity for the examination date exists from a medical point of view. The Chair of the Examination Board decides on the basis of the form attached in Annex 10 FR on the student's inability to take the examination. If there are reasonable doubts, a medical certificate from a public health officer must also be submitted.

(3) The illness of a child (who has not yet reached the age of 14) who is to be cared for by the student or the illness of a close relative (e.g., children, parents, grandparents, spouse or partner) shall be deemed equivalent to the student's own illness. Maternity leave is also considered an important reason.

(4) The Chair of the Examination Board shall decide on the recognition of the reason for missing or withdrawing from the examination. If the reason is recognized, a new date will be set immediately.

(5) In the event of recognized withdrawal or failure to attend, the examination results in parts of the module already taken will remain valid.

§ 25 Coursework and examinations in the event of illness and disability; extenuating circumstances (FR: § 27)

(1) In courses and examinations, consideration must be given to the nature and severity of a student's disability or chronic illness, or to stress caused by pregnancy or the upbringing of children or the care of close relatives in need of care.

(2) Proof of the nature and severity of the stress must be provided by the student to the Chair of the Examination Board in good time by submitting suitable documents, and in the case of illness a medical certificate must be submitted. In cases of doubt, a medical certificate from a public health officer may also be required.

(3) If the student can credibly demonstrate that they are unable to complete the examination or coursework in full or in part as planned due to a disability, a chronic illness, the care of a close relative in need of care, pregnancy or the upbringing of a child who has not yet reached the age of 14, this disadvantage must be compensated for by appropriate measures, such as an extension of the processing time or a different organization of the examination procedure. Students must be permitted to make use of the statutory maternity protection periods and parental leave periods if appropriate proof is provided.

(4) Decisions on disadvantage compensation in the performance of examinations shall be made by the Chair of the Examination Board, in the case of coursework by the Chair of the Examination Board in consultation with the person responsible for the course.

§ 26 Mandatory subject advising; time limits for taking examinations (FR: § 28)

(1) The student must attend a mandatory consultation at the Examination Office/subject advising if the course of study has been delayed by more than two semesters compared to the recommended schedule of modules. For students studying part-time, the deadline is extended accordingly. Part-time semesters are counted as half subject-related semesters.

After the mandatory consultation, the Examination Board will require the student concerned to complete the module examinations still outstanding with respect to the recommended schedule of modules at the time the requirement is imposed within a period to be determined by the Examination Board (at least two semesters); this also applies if the student does not participate in the consultation. Failure to comply with this requirement will result in the loss of the right to take examinations in the Master's degree program in Biochemistry. This must be pointed out when the conditions are imposed. If the person concerned provides credible evidence in good time in accordance with § 26 (2) that they were prevented from fulfilling the condition for good cause, the Examination Board shall extend the deadline for fulfilling the condition by at least one further semester.

The Master's examination must be taken by the end of the seventh subject-related semester. For part-time students, this time period is extended, whereby semesters in part-time studies are counted as half subject-related semesters. The Examination Board will request students who have not passed the Master's examination after completing their fourth semester to visit the subject advising office. If the deadline for completion in accordance with sentence 1 is exceeded without the conditions for extending the deadline being in place, this will result in the loss of the right of admission to an examination in the Master's degree program in Biochemistry.

(2) The deadline for

- fulfillment of the requirements
- achieving the required number of CPs
- successful completion of the Master's examination

under § 26 (1) shall be extended at the student's request if Goethe University is responsible for the delay or if the student was unable to meet the deadline due to serious extenuating circumstances. Extensions and interruptions of periods of study are not taken into account when adhering to deadlines if they are caused

1. By approved semesters of leave;
2. By study-related stays abroad of up to two semesters;
3. By participating as an appointed or elected representative in academic or student self-government;
4. By illness, disability or chronic illness or for any other reason for which the student is not responsible;
5. By maternity leave or parental leave;
6. By the necessary care of a child up to the age of 14 or the care of a close relative (children, parents, grandparents, spouse or partner) with assignment to a care level in accordance with § 15 (1) of the Eleventh Book of the German Social Code (SGB);
7. By belonging to an A, B, C or D/C squad of the top sports associations.

In the case of § 26 (2) number 5, at least the use of the deadlines in accordance with § 3 (2) and § 6 of the Maternity Protection Act (MuSchG) and the regulations on parental leave in §§ 15 and 16 of the Federal Parental Allowance and Parental Leave Act (BEEG) must be taken into account accordingly. Furthermore, proper studies abroad of up to two semesters are not taken into account. The application for extension of the deadline should be submitted at the time when the student realizes that an extension of the deadline is necessary. The application must always be submitted before the deadline expires. It is the student's responsibility to provide the proof; it must be submitted together with the application. A doctor's certificate must be presented in the event of illness. In cases of doubt, a medical certificate from a public health officer may be required. The Examination Board decides on the application for an extension of the deadline.

§ 27 Cheating and violation of regulations (FR: § 29)

(1) If the student attempts to influence the result of their examination or coursework by cheating or using unauthorized aids, the examination or coursework shall receive a grade of "fail" (5.0). In particular, an attempt to cheat is also deemed to have been made if the student brings unauthorized aids into the examination room or has submitted a false declaration in accordance with §§ 15 (7), 31 (8), 35 (4), 38 (16), or if they have submitted the same piece of work (or parts thereof) more than once as an examination or coursework.

(2) A student who actively participates in an attempt to cheat may be excluded from continuing the respective examination by the respective examiner or supervisor; in this case, the examination or coursework in question shall be assessed as "fail" (5.0).

(3) In the event of particularly serious cheating, especially repeated cheating or cheating accompanied by a written declaration by the student that the work was completed independently without the use of unauthorized aids, the Examination Board may decide to exclude the student from retaking the examination and completing further coursework, so that the right to take the examination in the Master's degree program in Biochemistry expires. The severity of the cheating is to be assessed on the basis of the energy expended by the student, such as organized cooperation or the use of technical aids, such as radios and cell phones, and the extent to which equal opportunities are compromised as a result of the cheating.

(4) A student who disrupts the proper conduct of the examination may be excluded from continuing the examination by the respective examiner or the supervisor, usually after a warning; in this case, the examination in question is deemed to have been assessed as "fail" (5.0). § 27 (3) sentence 1 shall apply accordingly.

(5) A student may be excluded from a course or courses for the duration of a semester in the event of repeated disruptions in a course or in several courses; as a result, the course or courses shall be deemed not to have been regularly and actively participated.

(6) If a student has wrongfully gained access to an examination through culpable conduct, the Examination Board may decide that the examination in question is deemed to have been failed ("fail" (5.0)).

(7) § 50 (1) shall apply to the decisions taken in accordance with § 27 (1) to (5).

(8) Decisions made against the student by the Examination Board must be communicated to the student immediately in writing, stating the reasons and including legal remedies.

(9) For course reports, written presentations, and the Master's thesis, the subject-specific citation rules for the preparation of academic work apply. In case of non-compliance, an attempt to cheat must be investigated.

(10) In order to be able to verify any suspicion of academic misconduct, the Examination Board may decide that written examination and/or coursework that is not to be completed under supervision must also be submitted in electronic form.

§ 28 Procedural flaws in the examination procedure (FR: § 30)

(1) If it transpires that the procedure of an oral or written examination was flawed in a way that influenced the examination results, the Examination Board shall, at the request of a student or ex officio, order a particular student to retake the examination. In the case of written examinations, procedural flaws must be reported to the proctor during the examination and in the case of oral examinations to the Chair of the Examination Board or the examiner immediately after the examination. If the student does not consider the corrective measures taken by the supervisor to be sufficient for a written examination, they must submit the complaint to the Chair of the Examination Board immediately after the examination.

(2) Six months after completion of the examination, ex officio orders pursuant to § 28 (1) may no longer be issued.

§ 29 Recognition of coursework and examinations (FR: § 31)

(1) Periods of study, coursework, and examinations completed at a higher education institution in Germany shall be recognized, provided there are no significant differences in terms of the skills acquired and the qualification objectives achieved. For this recognition, overall consideration and overall assessment of the content, scope, and requirements of the coursework and examinations is required, taking particular account of the qualification objectives achieved rather than a schematic comparison. If the Examination Board cannot prove a significant difference, the periods of study, coursework, and examinations must be recognized.

(2) § 29 (1) shall apply accordingly to the recognition of periods of study, coursework, and examinations in state-recognized distance learning courses, at other educational institutions, in particular at state or state-recognized vocational academies, for multimedia-based coursework and examinations, as well as for coursework and examinations completed by pupils on the basis of § 60 (5) HessHG.

(3) § 29 (1) shall also apply accordingly to the recognition of work completed at foreign universities. The equivalence agreements approved by the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder (KMK) and the German Rectors' Conference (HRK) as well as agreements within the framework of university partnership agreements must be observed for recognition. If equivalence agreements do not exist, the Examination Board decides. If there is any doubt about equivalence, the German Central Office for Foreign Education (ZAB) must be consulted.

(4) If a study abroad period is recommended, the student should meet with the Chair of the Examination Board or an authorized representative to discuss the eligibility for recognition of coursework and examinations before beginning the study abroad.

(5) Relevant practical work experience can be recognized as practical training. Further details are set down in the module description.

(6) Final theses (e.g., Master's theses, *Diplom* theses, state examination theses) which students have already successfully completed outside the Master's degree program in Biochemistry at Goethe University will not be recognized. Furthermore, multiple recognition of one and the same examination or piece of coursework in the same Master's degree program in Biochemistry is not possible.

(7) As a rule, coursework and examinations from a Bachelor's degree program cannot be recognized for the Master's degree program.

(8) If examinations are recognized, the grades – insofar as the grading systems are comparable – are to be adopted and included in the calculation of the overall grade. If the grading systems are not comparable, the note "passed" is included. As a rule, recognized achievements are marked in the final document with details of the university at which they were acquired.

(9) The applicant shall submit to the Examination Board all the documents required for recognition or crediting in accordance with § 29 (10), which show the assessment, CPs, and dates of all examinations the applicant has taken in another degree program or at other universities. The documents must also show which examinations and coursework were failed or repeated. The Examination Board may request the submission of further documents, such as the legally binding module descriptions of the modules to be recognized.

(10) Failed attempts in other degree programs or in degree programs at other universities will be recognized if the examination would have been recognized had it been passed.

(11) The recognition of examinations taken more than five years earlier may be refused in individual cases; the decision may be linked to the imposition of conditions. If the requirements of § 29 (1) to (3) in conjunction with (9) are met, there is a legal entitlement to recognition. § 29 (10) sentence 1 and § 29 (6) and (10) remain unaffected.

(12) Decisions with general validity on questions of recognition are made by the Examination Board; recognition in individual cases is made by its Chair, if required with the assistance of a subject examiner. Taking the recognition into account, the subject examiner will assign the applicant to a subject-related semester.

(13) If credits are recognized for coursework or examinations that are not assigned CPs, the corresponding equivalents must be calculated and noted accordingly in the student account.

(14) If recognitions are granted, they may be linked to conditions relating to subsequent coursework or examinations. The applicant must be notified in writing of any conditions and any deadlines for fulfilling the conditions. The notification must include legal remedies.

§ 30 Recognition of competencies acquired outside a university (FR: § 32)

For knowledge and skills that were acquired before the start of the degree program or during the degree program outside a university and that are equivalent in level and learning outcome to modules of the degree program, the CPs of the corresponding modules can be credited upon application. This applies in particular to the compulsory elective modules. Credit is awarded individually by the Examination Board on the recommendation of the module coordinator. Written proof (e.g., certificates of examination, certificates) of the scope, content and achievements is required. In total, no more than 50% of the CPs required in the degree program may be replaced by recognizing competencies acquired outside a university. The CPs are credited without a grade. This is indicated accordingly in the certificate.

Section VI: Conducting the module examinations

§ 31 Module examinations (FR: § 33)

(1) Students take module examinations during the course of the degree program. The module examinations conclude the respective module. They are examinations that can be retaken twice and are graded.

(2) Modules conclude with a single module examination, which can also be taken in conjunction with one of the courses in the module (course-related module examination).

Only in the modules *Developing a Research Project* and *Infection and Pathology* is the module examination cumulative.

(3) Through the module examination, the student should prove that they have mastered the fundamental principles of the content and methods of the module and can apply the knowledge and skills acquired. The subject matter of the module examinations is generally the content of the courses of the respective module as specified in the module descriptions. In the case of module examinations that are taken as part of a particular course, the overarching qualification objectives of the module are also examined.

(4) For cumulative module examination, the student must pass all partial module examinations in order to pass the module.

(5) The respective examination format for the module examination can be found in the module description. Written examinations take the form of:

- Written examinations;
- Protocols;
- Proposals.

Oral examinations take the form of:

- Individual examinations;
- Group examinations.

Additional examination formats include:

- Presentations;
- Group discussions;

(6) The format and duration of the module examinations are regulated in the module descriptions. If the module description provides for several types of examination, the type of examination for the respective examination date is determined by the examiner and communicated to the students at the beginning of the courses of the module, however, no later than when the examination date is announced.

(7) The examination is conducted in English or German. If the language of instruction is not German, written examinations are provided in English.

(8) Written work prepared without supervision (e.g., term papers) must be prepared by the student in accordance with the rules of good scientific practice. When submitting the paper, the student must confirm in writing that they have written it independently and that all sources and aids used by them have been listed in the paper. Furthermore, it must be declared that the paper has not yet been used – not even in part – in another degree program or the same degree program in a different module as coursework or an examination. § 15 (7) applies accordingly.

(9) Participants in module examinations must be able to identify themselves by presenting an official photo ID or the Goethe Card.

(10) The examiner decides whether aids may be used in a module examination and if so, which ones. The permitted aids must be announced in good time before the examination.

§ 32 Oral examinations (FR: § 34)

(1) Oral examinations are held by the examiner as an individual examination in the presence of a co-examiner. Group examinations with up to five students are possible.

(2) The duration of oral examinations is between a minimum of 15 minutes and a maximum of 60 minutes per student to be examined. The duration of the respective module examination can be found in the module description.

(3) The main subjects and results of the oral examination must be recorded by the co-examiner in an examination record. The examination record must be signed by the examiner and the co-examiner. Before the grade is determined, the co-examiner must be heard in private without the presence of the examinee or the public. The record must be forwarded to the Examination Office without delay.

(4) The result of the oral examination shall be announced to the student following the oral examination and, in the event of a failing grade or upon immediate request, a more detailed explanation shall be provided; the reasons given shall be noted in the record.

(5) Students in the same degree program are entitled to listen in on oral examinations. Oral examinations are open to the public for students who are due to take the same examination. The student to be examined may object to the admission of the public. The admission of the public does not extend to the consultation about the examination results or the notification of the examination results to the student being examined. It can also be limited for capacity reasons. The Chair of the Examination Board may request appropriate evidence to verify the prerequisites stated in § 32 (5) sentence 1.

§ 33 Written examinations (FR: § 35)

(1) Written examinations involve answering one or more tasks or questions. In a written examination, the student should demonstrate that they can solve tasks independently in a limited time and under supervision with limited aids and can recognize a problem on the basis of the necessary basic knowledge or by applying the usual methods of the subject and find ways to work out a solution.

(2) Multiple-choice questions, including "single-choice" questions, are permitted in written examinations if they enable the necessary transfer of knowledge to a sufficient extent. For these questions, the following requirements must be met:

1. The examination questions must allow for reliable examination results. The examination questions must be unambiguously comprehensible, clearly answerable, and suitable for clearly determining the level of knowledge and skills of the students to be tested. In particular, no solution other than the one specified as correct in the assessment may be acceptable. The Examination Board must use a suitable procedure to ensure this.
2. If the tasks prove to be unsuitable in this respect, they must be excluded from the assessment. If answers do not correspond to the given model solution, but are nevertheless justifiable, they will be counted as correct in the student's favor. It is not permitted to deduct points for incorrect answers.

(3) If multiple-choice/single-choice questions account for more than 25% of the total number of points to be obtained in the written examination, the following requirements must also be met:

1. The list of questions and answers must be drafted by at least two authorized examiners, one of whom must belong to the group of professors.
2. Students must be informed of the requirements for passing and the grading scheme for the written examination no later than when the assignment is set.

(4) A written examination consisting exclusively of tasks in accordance with § 33 (2) sentence 1 is passed if the student has answered at least 50% (pass limit) of the examination questions correctly or if the number of questions answered correctly by the student or, in the case of a points system, if the number of points achieved by the student is not more than 22% lower than the average examination performance of all students taking part in the same examination for the first time. If only part of a written examination consists of tasks in accordance with § 33 (2) sentence 1 and these tasks account for more than 25% of the total number of points to be obtained in the written examination, the pass rule in accordance with § 33 (4) sentence 1 shall only apply to this part of the examination.

(5) If the student arrives late for the examination, they cannot make up the time missed. Students may only leave the examination room with the permission of the proctor.

(6) The person supervising a written examination must prepare a brief report of each examination. All incidents that are relevant to the determination of the examination results, in particular incidents pursuant to §§ 24 and 27, must be entered in this report.

(7) The time allowed for candidates to complete written examinations should be geared to the scope of the module to be examined or in the case of partial module examinations, to the scope of the part of the module to be examined. The time limit for written examinations is a minimum of 30 and a maximum of 240 minutes. The precise duration is specified in the respective module descriptions.

(8) The written examinations are generally assessed by one examiner. They must be assessed by a second examiner if they are not passed on the student's final attempt to pass the examination. The grading must be justified in writing. If the grades differ, the grade of the written examination or other written supervised work is calculated from the average of the two grades. The grading procedure for examinations should not exceed four weeks.

(9) Multimedia-based examinations ("e-examinations") are permitted, provided they are suitable for fulfilling the purpose of the examination. They may only be performed using data processing systems administered by the University or approved for this purpose by the responsible examination office in agreement with the University Computing Center. The unique identifiability of the electronic data must be ensured. It must be possible to clearly and permanently link the data to the examinee. The examination must be conducted in the presence of a qualified record-keeper. An examination record must be kept of the examination process, in which at least the names of the record-keeper and the examinees, the start and end of the examination and any special incidents must be recorded. § 49 applies to the inspection of the multimedia-based examination and the examination results. The examination question, including a model solution if available, the grading scheme, the individual examination results, and the report must be archived in accordance with the statutory provisions.

§ 34 Proposals

(1) Through intensive literature study, the student identifies relevant research topics and formulates questions that lead to the development of a research project. The proposal should be no longer than 3,000 words.

(2) The module description defines whether the proposal can be allowed as group work. To this end, it must be ensured that the contribution of each individual to be assessed as coursework can be identified based on objective criteria.

(3) The student proposes a topic together with the examiner.

(4) The proposal should comprise preparation time of at least two weeks and no more than four weeks (fulltime, i.e., 2 to 5 CPs workload). The submission deadline and the particular time period for preparing the proposal are determined and documented by the examiner.

(5) Proposals are to be submitted to the examiner by the specified submission deadline in a single copy with a declaration in accordance with § 31 (8) (declaration of independent work). If the proposal is sent by regular mail, the postmark serves as the definitive submission date. The submission of the written proposal must be recorded by the examiner.

(6) The assessment by the examiner should be completed within six weeks of submission. The assessment must be justified. In all other regards, § 33 (7) applies accordingly.

§ 35 Protocols (FR: § 36)

(1) With a protocol, students should demonstrate that they are able to independently document the practical treatment of a problem from a subject area using scientific methods.

(2) The protocol should introduce the topic of the practical work, explain the problem and the chosen solution approach, describe the practical work carried out to solve the problem, present and discuss the results obtained, and provide an outlook. The practical work carried out must be adequately and reproducibly documented. The protocol should be between 3 and 30 pages long, with a font size of 10.

(3) Protocols should be prepared no later than three weeks after completion of the practical work and should be submitted in writing or electronic form. The examiner shall provide information on the exact deadlines and format at the beginning of the course.

(4) Protocols are to be submitted to the examiner within the specified preparation period in a single copy with a declaration in accordance with § 15 (7) or § 31 (8). If the protocol is sent by regular mail, the postmark serves as the definitive submission date. The submission of the protocol must be recorded by the examiner.

(5) The reports are generally assessed by one examiner. The assessment of the protocol should be completed within three weeks of submission. It must be assessed by a second examiner if it is not passed on the student's final attempt to achieve a passing grade on the protocol. The grading must be justified in writing. If the grades differ, the grade of the protocol is calculated from the average of the two grades. The grading procedure for reports should not exceed four weeks.

§ 36 Presentations

A presentation involves the methodical and targeted preparation of information with the goal of conveying specific content to a selected audience. In this context, a presentation not only conveys knowledge, but also demonstrates the presenter's skills in addressing and engaging with the topic. A good presentation is distinguished by its clear structure, effective information delivery, and the presenter's ability to convey the content vividly and convincingly. The opportunity for interaction, such as through questions from the audience, is also an integral component of the presentation (15 to 60 minutes). The assessment is conducted by the examiner immediately after the presentation and takes into account the content, presentation skills, and the presenter's ability to respond appropriately to questions or comments.

§ 37 Group discussions

A group discussion as an examination format involves several examinees gathering to discuss a specific topic together. The format aims to examine the participants' individual expertise as well as their abilities in collaboration, argumentation, and critical thinking.

During the group discussion (30 to 60 minutes), the examinees are presented with relevant questions or scenarios that they must then explore in the group. The examiner and co-examiner assess not only the quality of the contributions but also the participants' abilities to collaborate constructively, present their arguments clearly, and engage with the contributions of their group members.

Group discussions not only enhance individual presentation and discussion skills, but also provide insights into the examinees' social skills. This format allows for the evaluation of various aspects of examinees' personal and professional qualifications.

§ 38 Master's thesis (FR: §§ 40, 41)

- (1) The Master's thesis is a compulsory part of the Master's degree program. It forms an independent module.
- (2) The Master's thesis aims to demonstrate that the student is able to work on a topic comprehensively and in depth within a specified period of time in accordance with the objectives set out in §§ 2 and 6. The topic must be such that it can be completed within the specified period.
- (3) The Master's thesis counts for 30 CPs; this corresponds to a preparation period of six months.
- (4) In order to apply for admission to the Master's thesis, the student must have submitted the research project in Module A2, *Developing a Research Project*. Admission to the Master's thesis also requires proof of 60 CPs from the Master's degree program in Biochemistry.
- (5) The Master's thesis shall be supervised by an individual from the group of authorized examiners in accordance with § 21 (1). A separate appointment of the supervisor by the Examination Board is not required, unless the Master's thesis is completed at an institution outside Goethe University (external Master's thesis). The supervisor is charged with guiding the student in the preparation of the Master's thesis and with obtaining regular updates about the progress of the thesis. The supervisor must ensure that any equipment required for the Master's thesis is available. The supervisor is the first or second assessor of the Master's thesis.
- (6) With the approval of the Chair of the Examination Board, the Master's thesis may also be completed at an institution outside Goethe University, such as the Paul Ehrlich Institute or the Max-Planck Institute (MPI). In this case, the topic must be assigned in consultation with a member of the group of professors of the responsible subject.
- (7) The topic of the Master's thesis must be agreed upon with the supervisor and communicated to the Chair of the Examination Board when registering the Master's thesis. If the student is unable to find a supervisor, the Chair of the Examination Board will ensure that the student receives a topic for the Master's thesis and the necessary supervision in good time upon the student's request.
- (8) The Chair of the Examination Board decides on admission to the Master's thesis.
- (9) The topic is assigned by the Chair of the Examination Board. The date of assignment and the topic must be recorded at the Examination Office. The student may not work on the Master's thesis before the topic has been officially assigned.
- (10) The Master's thesis can also be permitted in the form of group work as long as the contribution of the individual student to be assessed can be clearly defined and assessed based on sections, page numbers, or other objective criteria and as long as the requirements in § 38 (2) are fulfilled.
- (11) The Master's thesis must be written in English. It may be written in German with the consent of the Chair of the Examination Board. In the event that the Master's thesis is written in a language other than English, a summary in English must be attached to the Master's thesis.
- (12) The assigned topic can only be returned once and only within the first third of the preparation period. The new topic must differ in content from the returned topic. If a new topic for the Master's thesis is issued as a result of withdrawal in accordance with § 38 (13) sentence 4, this topic may not be returned.

(13) If the submission deadline cannot be met for reasons for which the student is not responsible (e.g., illness of the student or of a child for whom the student is responsible), the Chair of the Examination Board shall extend the preparation period if the student requests this before the submission deadline. § 24 (2) shall apply accordingly. A maximum extension of 50% of the preparation period specified in § 38 (3) may be granted. If the absence lasts longer, the student may withdraw from the examination.

(14) The Master's thesis must be submitted to the Examination Office by the deadline. The time of receipt must be officially recorded. If the Master's thesis is sent by regular mail, the postmark serves as the definitive date of submission. If the Master's thesis is not submitted on time, it will receive a grade of "fail" (5.0).

(15) The Master's thesis must be submitted to the Examination Office in three written (bound) copies and electronically as a PDF file. If the Master's thesis is not submitted in the prescribed form by the submission deadline, it will receive a grade of "fail" (5.0).

(16) The Master's thesis must be written in accordance with the rules of good scientific practice. In particular, all passages, images and drawings taken verbatim or in essence from publications or other third-party texts must be identified as such. The Master's thesis must be accompanied by a statement by the student that they have written the thesis –in the case of a group thesis, the part of the thesis that they have marked accordingly – independently and without the use of sources and aids other than those specified. Furthermore, it must be declared that the Master's thesis has not been used, not even in part, for another examination or coursework.

(17) The Examination Board forwards the Master's thesis to the first reviewer for assessment in accordance with § 39 (3). At the same time, it appoints another examiner from the group of authorized examiners in accordance with § 21 for a second assessment and also forwards the thesis to this examiner for assessment. § 38 (5) sentence 5 remains unaffected. At least one of the examiners must be a professor who teaches in the degree program. The second reviewer may limit themselves to co-signing the first reviewer's report if they agree on the assessment. The examiners should make the assessment immediately; it should be available no later than eight weeks after submission of the thesis. If the two examiners assess the Master's thesis differently, the grade for the Master's thesis is determined in accordance with § 39 (5).

(18) The Master's thesis shall be assessed within a further two weeks by another authorized examiner in accordance with § 21 if the assessments of the two examiners differ by more than 2.0 or if one of the two examiners has assessed the Master's thesis as "fail" (5.0). In this case, the grade is calculated from the grades of the first examiner, the second examiner, and the third examiner in accordance with § 39 (5). § 38 (18) sentence 1 shall not apply if the requirements of § 24 or § 27 are met.

Section VII: Assessment of coursework and examinations; formation of the grades and the overall grade; failing the overall examination

§ 39 Assessment/grading of coursework and examinations; formation of the grades and the overall grade (FR: § 42)

(1) Coursework is assessed as "passed" or "failed" by the respective lecturer. Coursework in *Module A3* is graded in accordance with § 39 (3). However, the grades are not counted in the overall grade of the Master's examination.

(2) Examinations are graded and, by exception, the grades "passed" or "failed" are given in accordance with the module description. The grading or assessment of the examinations is carried out by the respective examiners. The student's individual performance must always be taken into account.

(3) The following grades are to be used for grading the individual examinations:

1	Very good	An outstanding performance;
2	Good	A result that is significantly above the average requirements;
3	Satisfactory	A result that meets average requirements;
4	Sufficient	A result that still meets the requirements despite its shortcomings;
5	Fail	A result that no longer meets the requirements due to significant deficits.

The grades can be raised or lowered by 0.3 to intermediate values in order to provide a more granular assessment of examination results; the grades 1.0; 1.3; 1.7; 2.0; 2.3; 2.7; 3.0; 3.3; 3.7; 4.0 and 5.0 are permissible.

(4) If the module examination consists of multiple partial examinations, the grade for the module is calculated from the arithmetic mean of the grades for the individual examinations (partial module examinations). Only the first decimal place after the decimal point is taken into account. All other digits are deleted without rounding.

(5) If the module examination is assessed differently by two or more examiners, the module grade is calculated from the arithmetic mean of the grades of the examiners' assessments. When calculating the module grade, only the first decimal place after the decimal point is taken into account. All other digits are deleted without rounding.

(6) The examiners may deviate from the calculated grade of a passed module examination if this better reflects the overall impression of the student's performance and the deviation has no influence on the passing grade (bonus regulation to improve the grade). In particular, the coursework completed during the semester in exercises or other courses is to be taken into account, up to a maximum of 25% of the overall assessment of the corresponding module examination. Further details can be found in the module handbook. The coursework leading to the awarding of bonus points must be announced publicly in an appropriate manner by the beginning of a semester at the latest. Earned bonus points expire at the end of the semester following the semester in which the bonus was awarded.

(7) For the Master's examination, an overall grade is formed in which the results of the completed modules from the core areas C1, C2, and C3 of at least 38 CPs, the modules A1, *Group Research Proposal* and A2, *Developing a Research Project*, and the Master's thesis are included.

(8) If more CPs are acquired in a compulsory elective area than are required, the modules that were completed first will be used to determine the overall grade. If several modules have been completed in the same semester, the modules with the better grades count.

(9) The overall grade of a passed Master's examination is calculated as follows, whereby only the first decimal place after the decimal point is taken into account; all other places are deleted without rounding:

1.0 up to and including 1.5	Very good
1.6 up to and including 2.5	Good
2.6 up to and including 3.5	Satisfactory
3.6 up to and including 4.0	Sufficient

More than 4.0 Fail

(10) If an English translation of the certificate of examination is issued, the grades for the individual examinations and the overall grade are shown according to the following grading scale:

1.0 up to and including 1.5	Very good
1.6 up to and including 2.5	Good
2.6 up to and including 3.5	Satisfactory
3.6 up to and including 4.0	Sufficient
More than 4.0	Fail

(11) In the case of an overall grade up to and including 1.3, the overall assessment is "with distinction." The English translation of "mit Auszeichnung bestanden" is "with distinction."

(12) An ECTS grading table in accordance with § 47 shall be included in the diploma supplement to ensure transparency of the overall grade.

§ 40 Passing and failing examinations; announcement of grades (FR: § 43)

(1) A module examination consisting of a single examination is passed if it has been assessed with the grade "sufficient" (4.0) or better. Otherwise, it has been failed.

(2) A module examination consisting of several partial module examinations (cumulative module examination) is only passed if all partial module examinations have been assessed with at least "sufficient" (4.0).

(3) The Master's examination is passed if all modules prescribed in these regulations have been successfully completed, i.e., the proof of participation required in the module description has been submitted and the course certificates and module examinations, including the Master's thesis, have been successfully completed, i.e., graded with at least "sufficient" (4.0).

(4) The results of all examinations must be announced immediately. The Examination Board decides whether grades are to be announced anonymously to the university public by means of a notice and/or the electronic examination administration system, whereby the legitimate interests of those affected must be protected. If a module examination has finally received a grade of "fail" (5.0) or if the Master's thesis has been assessed as less than "sufficient" (4.0), the student will receive a written notification from the Chair of the Examination Board with legal remedies, which may include information on whether the module examination or the Master's thesis can be repeated and, if so, within what period.

§ 41 Compiling the examination results (transcript of records) (FR: § 44)

Upon request, students will be issued with a certificate of passed examinations in the form of a transcript of records (an example can be found in Annex 7 FR) in German and English, which contains at least the module titles, the date of the individual examinations and the grades.

Section VIII: Changing compulsory elective modules; retaking examinations; loss of the right of admission to an examination and failing the final attempt at an examination

§ 42 Changing compulsory elective modules in the core area (FR: § 45)

If a compulsory elective module in a core area is failed or has been failed with no possibility to retake it, the student may change to a new compulsory elective module once.

§ 43 Retaking examinations; free attempt; retaking examinations to improve grades (FR: § 46)

- (1) Examinations that have been passed cannot be retaken.
- (2) All failed compulsory module examinations and partial compulsory module examinations must be retaken.
- (3) Failed module examinations and partial module examinations may be retaken no more than twice. The regulations of § 43 (9) remain unaffected.
- (4) A failed Master's thesis may be repeated once. A different topic is issued. The topic of the Master's thesis may only be returned as part of an examination retake if the student did not make use of this option when writing the first attempt at the Master's thesis. The student is not permitted to repeatedly return the topic.
- (5) Failed attempts at the same or a comparable module examination in another degree program at Goethe University or another German university shall be counted toward the permitted number of examination retakes. In special cases, particularly in the case of a change of degree program, the Examination Board may choose not to include a retake in the total number of retakes.
- (6) The first examination retake should be offered at the end of the relevant semester, but at the latest at the beginning of the following semester. The second retake should be offered on the next possible examination date after the failed examination retake. The Examination Board determines the exact dates for the retake and announces these in good time.
- (7) Students are advised to take the examination retake on the next possible date. § 23 (5) applies.
- (8) Examination retakes must always be taken in accordance with the regulations under which the first examination was taken.
- (9) A student may retake passed final module examinations or partial module examinations once to improve the grade, whereby the better grade is counted. In this case, the final module examinations and/or partial module examinations may be taken from no more than two modules. The Examination Board determines the conditions and the deadline within which the retake of the examinations to improve a grade is to be applied for and the retakes are to be carried out.

§ 44 Loss of the right of admission to an examination and final failure (FR: § 47)

- (1) The Master's examination is finally failed or the right to take the examination is finally forfeited if
 1. A module examination has not been passed after all attempts to retake the examination have been exhausted and there is no possibility of changing in accordance with § 42,
 2. A deadline for the provision of certain requirements in accordance with § 26 has been exceeded,
 3. There is a serious case of cheating or a serious violation of regulations in accordance with §27.

(2) A notification of the final failure of the Master's examination and the associated loss of the right to take the examination will be issued with legal remedies.

(3) If the student has finally failed the Master's examination in the degree program and thus finally forfeited the right to take the examination, they must be exmatriculated. Upon request, when presented with the certificate of exmatriculation the student will receive a certificate from the Examination Office which lists the passed and failed module examinations, their grades and the credit points earned and which indicates that the Master's examination has been finally failed or that the right to take the examination has been forfeited.

Section IX: Certificate of examination; diploma and diploma supplement

§ 45 Certificate of examination (FR: § 48)

A certificate of examination of successful completion of the Master's examination shall be issued in German, if possible within four weeks of receipt of the assessment of the last examination results, or upon application by the student with an English translation, in each case in accordance with the provisions of the templates in the Framework Regulations. The certificate of examination contains details of the modules with the module grades (those modules that are not included in the overall grade for the Master's examination are marked), the topic and grade of the Master's thesis, the total number of CPs and the overall grade. The certificate of examination also includes the results of examinations in additional modules as well as achieved courseworks. The certificate of examination must be signed by the Chair of the Examination Board and must bear the seal of Goethe University. The certificate of examination bears the date of the day on which the last examination or coursework was completed.

§ 46 Master's diploma (FR: § 49)

(1) At the same time as the Master's certificate of examination, the student shall receive a Master's diploma with the date of the certificate of examination. This certifies the conferral of the academic degree. The diploma must also be issued in English.

(2) The diploma shall be signed by the Dean of the Faculty of Biochemistry, Chemistry, and Pharmacy and the Chair of the Examination Board and shall bear the seal of Goethe University.

(3) The academic degree may only be used after the diploma has been awarded.

§ 47 Diploma supplement (FR: § 50)

(1) A diploma supplement in accordance with international standards shall be issued with the Master's diploma and the transcript; the text agreed between the German Rectors' Conference (HRK) and the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder (KMK) in the currently valid version shall be used. The diploma supplement is signed by the Chair of the Examination Board.

(2) The diploma supplement contains an ECTS grading table. The overall grades awarded in the respective degree program in a comparative cohort shall be recorded and their numerical and percentage distribution across the grade levels shall be determined in accordance with § 39 (9) and presented in a table as follows:

Overall grades	Total number within the reference group	Percentage of graduates within the reference group
up to 1.5 (very good)		

from 1.6 to 2.5 (good)		
from 2.6 to 3.5 (satisfactory)		
from 3.6 to 4.0 (sufficient)		

The reference group results from the number of graduates of the respective degree program over a period of three academic years. The calculation only takes place if the reference group consists of at least 50 graduates. If fewer than 50 students within the comparison cohort have completed the degree program, additional cohorts must be included in the calculation by decision of the Examination Board.

Section X: Invalidity of the Master's examination; examination files; appeals and objections

§ 48 Invalidity of examinations (FR: § 51)

(1) If the student has cheated on coursework or during an examination and this fact only becomes known after the transcript has been issued, the Examination Board may subsequently correct the grades for the coursework and examinations in which the student has cheated and declare the examination or coursework failed in whole or in part. The examiners must be heard beforehand. The student must be given the opportunity to comment before a decision is made.

(2) If the requirements for admission to an examination were not met and the student was permitted to take the examination without intentionally misrepresenting their qualifications, and this fact only becomes known after the transcript has been issued, this deficiency will be remedied if the student passes the examination. If the student has intentionally obtained unlawful admission to the examination, the Examination Board shall decide on the legal consequences in accordance with the Hessian State Administrative Procedure Act (HVwVfG) in the respectively valid version. § 48 (1) sentence 3 shall apply accordingly.

(3) The incorrect transcript shall be withdrawn and a new one issued if applicable. Together with the incorrect transcript, the diploma supplement and, if applicable, the corresponding transcript of records must also be withdrawn and, if necessary, reissued. The Master's certificate must also be confiscated with these documents if the examination has received a grade of "fail" due to cheating. A decision in accordance with § 48 (1) and (2) sentence 2 is excluded after a period of five years from the date of the examination certificate.

§ 49 Inspection of examination files; retention periods (FR: § 52)

(1) After the examination results have been announced, the student may inspect the written examinations, the reviews of the written examinations, and the examination minutes by request in a timely manner.

(2) The examination files shall be kept by the examination offices. The retention periods for examination documents are governed by § 21 of the Hessian Matriculation Ordinance (HImmaVO) in the respectively valid version.

§ 50 Appeals and objections (FR: § 53)

(1) Appeals may be lodged against decisions made by the Chair of the Examination Board. Appeals must be lodged with the Chair of the Examination Board within one month of notification of the decision. The

Examination Board decides on the appeal. If the Examination Board does not remedy the objection, the Chair of the Examination Board will issue a justified rejection notice, which must include legal remedies.

(2) The student in question may appeal in writing to the Chair of the Examination Board (Examination Office) against negative decisions of the Examination Board and against negative examiner assessments within one month of notification, provided that legal remedies were given, otherwise within one year of notification. If the Examination Board does not uphold the objection, if required after obtaining the opinion of the examiners involved, the President will issue the notice of objection. The notice of objection must state the grounds on which it is based and include legal remedies.

Section XI: Closing provisions

§ 51 Entry into force and transition provisions (FR: § 54)

(1) These regulations shall enter into force on the day following their publication in the UniReport/Statutes and Regulations of Goethe University Frankfurt am Main.

(2) These regulations apply to all students commencing their studies in the Master's degree program in Biochemistry as of the winter semester 2024/25.

(3) Students who began their studies in the Master's degree program in Biochemistry before these regulations came into force may take the Master's examination in accordance with the regulations dated May 20, 2019 by March 31, 2027 at the latest. After this date, they will be subject to these regulations. Coursework and examinations already completed will be credited in accordance with § 29.

Frankfurt, April 30, 2024

Prof. Dr. Clemens Glaubitz

Dean of the Faculty of Biochemistry, Chemistry, and Pharmacy

Annex 1: Sample course plan

Course plan for the Master's degree program in Biochemistry

Semester 1	I1 Study Course Overview (3 CPs) <ul style="list-style-type: none"> • Welcome Event • Lecture Series 	Core area 1: Cellular & Organismic Biochemistry (at least 2 modules) Core area 2: Molecular Biochemistry (at least 2 modules) Core area 3: Biochemical Methods (at least 2 modules, at least 1 practical course)	Compulsory elective area (up to 15 CPs)	31 CPs
Semester 2	A1 Group Research Proposal (6 CPs)			31 CPs
Semester 3	A2 Developing a Research Project (8 CPs)	A3 Research Internship I (10 CPs) <ul style="list-style-type: none"> • Optionally abroad (I+II) 	A3 Research Internship II (10 CPs) <ul style="list-style-type: none"> • Optionally abroad (I+II) 	28 CPs
Semester 4	A4 Master's thesis (30 CPs)			30 CPs
				120 CPs

Annex 2: List of import/export modules (Annex 4 FR)

Import modules

Original program	degree	Module (name, number)	Faculty (FB) [Number]	Summer semester (SS)/ Winter semester (WS)	CPs
M.Sc. Chemistry		[C2.4] Biological Synthesis	FB 14	WS	7
M.Sc. Chemistry		[E1.2] Solid State NMR Spectroscopy	FB 14	WS/SS	7–10
M.Sc. Chemistry		[E1.3] Liquid State NMR Spectroscopy	FB 14	WS/SS	6–9
M.Sc. Chemistry		[E1.4] EPR Spectroscopy	FB 14	WS/SS	7–10
M.Sc. Chemistry		[E1.5] Single Molecule Spectroscopy and High-resolution Microscopy	FB 14	SS	6
M.Sc. Chemistry		[E1.7] X-ray Structure Analysis	FB 14	WS	5–9
M.Sc. Biophysics		[E1.8] Modeling and Simulation of Biomolecules	FB 13	SS	6
M.Sc. Chemistry		[E1.9] Structure and Function of Biomacromolecules	FB 14	WS	7
M.Sc. Biophysics		[E1.10] Modern Statistical Data Analysis for Practitioners	FB 13	WS	5
M.Sc. Chemistry		[E1.11] Advanced Organic Chemistry	FB 14	SS	5
M.Sc. Chemistry		[E1.12] Chemical Synthesis of Natural Products	FB 14	SS	7
M.Sc. Chemistry		[E1.13] Chemistry of Heterocycles	FB 14	WS	5
M.Sc. Chemistry		[E1.14] Highlights of Organic Chemistry and Chemical Biology	FB 14	SS/WS	4
M.Sc. Chemistry		[E1.15] Laser Chemistry	FB 14	SS	5
M.Sc. Chemistry		[E1.18] Advanced Chemical Biology	FB 14	SS	5
M.Sc. Chemistry		[E1.19] Advanced Chemical Biology– Practical Course	FB 14	WS	6
M.Sc. Chemistry		[E1.20] Pharmacology	FB 14	SS	6
M.Sc. Biophysics		[E1.21] Computational Drug Design	FB 13	WS	5
M.Sc. Chemistry		[E2.1] Key qualifications	FB 14	WS/SS	6

Partial import modules

Original degree program	Module (name, number)	Faculty (FB) [Number]	Summer semester (SS)/ Winter semester (WS)	CPs
B. Sc. Biophysics	[E1.6] Biophysics	FB 13	SS/WS	3–15
M.Sc. Molecular Biosciences	[E1.16] Molecular Biosciences	FB 15	SS	6
M.Sc. Ecology and Evolution	[E1.17] Toxicology and Ecology	FB 15	WS/SS	6
M.Sc. Pharmaceutical Research	[E1.22] Drug Development	FB 14	WS/SS	5–6
B. Sc. Economics	[E2.2] Economics	FB 02	WS/SS	5–15

Annex 3: Module descriptions (Annex 5 FR)

[I1]	Study course overview	Compulsory module	3 CPs (total) = 90 h		3 SWS
			Contact hours 3 SWS / 45 h	Independent study 45 h	
Content:					
<p><u>Welcome Event:</u> In order to facilitate students' entry into the MSc Biochemistry programme, an introductory seminar is held at the beginning of the study programme. The aim of the seminar is to provide an overview and all relevant information about the study programme and module options. In addition, lecturers will give short presentations on their specific area of work and teaching while students will give a short presentation on the topic of their bachelor thesis. There will also be a social programme to encourage people to get to know each other.</p> <p><u>Introducing the research groups:</u> The lecturers of the study programme present an overview of their research, recent publications and teaching. Afterwards a representative paper provided by the lecturer will be presented by a group of students in the form of a short presentation and discussed in the plenary.</p>					
Learning outcomes and skills:					
<p>The Welcome Event provides a comprehensive understanding of the structure of this study programme. By providing clear guidance on the structure of the programme, it aims to equip students with the necessary skills to navigate and succeed in their studies. Students will be familiarised with the curriculum, learning objectives, academic requirements, module selection options, information resources, and online information platforms (QIS university portal, OLAT online learning platform). It aims to develop their skills in planning and organising their studies and in using resources effectively.</p> <p>The Introducing the research groups gives students an insight into the research interests of the lecturers involved in the study programme. It will also help them to decide on which topic and in which group they would like to do an internship and write a Master thesis. In addition, they will practise summarising and presenting a scientific paper.</p>					
Admissions requirements/conditions for participation in the module/courses:					
None					
Course requirements for credits:					
Participation record:			Seminar: Regular and active participation		
Coursework			Welcome Event: presentation on the topic of the student's bachelor thesis Introducing the research groups: paper presentation		
Forms of teaching / learning:			Seminar		
Module assessment:			Form/duration/content, if applicable:		
Final module assessment:			None		
Cumulative module assessment consisting of:					
Calculation of the module grades for cumulative module assessment:					

[C1.1]	Advanced Cell Biology	Compulsory elective module in core area C1	4– 7 CPs (total) = 120– 210 h		3–5 SWS
			Contact hours 3–5 SWS/ 45–75 h	Independent study 75– 135 h	
Course content:					
<p><u>Lecture</u>: Autophagy, mitochondrial cell biology, non-membranous organelles / phase transitions, endocytosis and membrane traffic, optogenetics in cell biology, signal transduction, systems and synthetic biology, other current developments in cell biology, modern methods in cell biology.</p> <p><u>Seminar (CEM)</u>: Current original literature on cell biological topics in the literature seminar is presented as a seminar talk (student groups of two or three), and discussed and evaluated in the plenum.</p> <p><u>Practical course (CEM)</u>: Basic cell-biological experiments using cultivated mammalian cells. Cell culture, sterile techniques, testing for contamination (PCR, fluorescence staining of mycoplasma), transfection of cells, light microscopy, (immuno)fluorescence microscopy, staining of specific cell types, organelles or cytoskeletal elements in fixed or unfixed cells, Ca²⁺ imaging, luciferase assay and RNAi.</p> <p><i>The lecture must be combined with either the seminar (CEM) or/and the practical course (CEM).</i></p>					
Learning outcomes and skills:					
After successfully completing the course, students will be able to understand the basics, methods, and complex relationships in cell biology and to critically evaluate current research literature. In addition, based on selected practical experiments on cultivated cells, they have learned basic methods and acquired skills so that they can apply them, for example as part of a Master's thesis, in their own research project, or later in their professional life.					
Prerequisites for the module or for individual courses in the module:					
Practical course: Passed final module examination on the lecture					
Course requirements for credits:					
Participation record:		<ul style="list-style-type: none"> - Seminar: Regular and active participation - Practical course: Regular participation 			
Coursework:		<ul style="list-style-type: none"> - Seminar: Presentation - Practical course: Fulfillment and protocols of the practical course experiments 			
Teaching and learning formats:		Lecture, seminar, practical course			
Module examination:		Form/duration/content, if applicable:			
Final module examination:		Written (90 minutes) or oral (45 minutes) final module examination on the lecture			
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[C1.2]	Cellular and Molecular Neurobiology	Compulsory elective module in core area C1	5– 8 CPs (total) = 150–240 h		4–6 SWS
			Contact hours 4–6 SWS/ 60–90 h	Independent study 90–150 h	
Course content:					
<p><u>Lecture:</u> History of neuroscience, structure of the human brain, cells of the nervous system, structure and function of nerve cells, compartments of neurons, neuronal cytoskeleton and transport in neurons, structural principles of simple nervous systems. Electrical properties of neurons, Nernst potential, cable theory, passive and active electrical properties of the neuronal membrane, spatial and temporal summation, action potential, electrophysiology. Voltage-gated ion channels, structures and function. Electrical and chemical synapses, synaptic plasticity, neurotransmitters, neuropeptides. Optogenetic methods. Presynaptic structures and mechanisms of neurotransmitter release. SNAREs, synaptic vesicles and their "cycle". Postsynaptic organization and mechanisms. Postsynaptic plasticity, mRNA transport in dendrites, local translation. Metabotropic and ionotropic (nAChR, P2XR, AMPAR, NMDAR) neurotransmitter receptors, chemoreceptors, structures and function. 2nd messengers and kinase cascades. Sensory receptor cells (mechano-, chemo-, photo-, noci-) and molecular receptors, processing of sensory signals in the brain. Olfactory system. Thermoreception. Neuronal developmental biology, morphogenesis, axogenesis and targeting, cell specificity of synapse formation. Higher brain functions, neuromodulatory systems, emotion, brain rhythms, epilepsy, sleep, learning, memory, reward system, hippocampus, LTP and LTD.</p> <p><u>Seminar (CEM):</u> In the literature seminar, current original literature from the cellular and molecular neurobiology field, published in the past year, and related to the topics of the lecture, is presented in a seminar talk (individual students or groups of two), and discussed and evaluated in the plenum. Also special methods in neurobiology are covered as part of these seminars.</p> <p><u>Practical course (CEM):</u> Basic cell- and neurobiology experiments using the model organism <i>Caenorhabditis elegans</i> (a soil nematode). Culture of <i>C. elegans</i>, visualization of specific cell types, organelles or cytoskeletal elements by fluorescent proteins, optogenetics, light-induced neurotransmitter release, secretion and endocytosis in <i>C. elegans</i>, pharmacological testing of synaptic transmission in wild-type and relevant mutants, sensory perception, thermotaxis, mechanoreception, chemotaxis, axon guidance.</p> <p>The lecture must be combined with either the seminar (CEM) or/and the practical course (CEM).</p>					
Learning outcomes and skills:					
<p>After completing the module, students are able to:</p> <ul style="list-style-type: none"> to reflect and distinguish the mechanisms of elementary nervous system functions, as well as (to some extent) higher brain functions in humans and mammals. Based on this knowledge, they can develop their own questions and work them out, aided by the research literature. to understand and critically evaluate current research literature on cellular and molecular neurobiology, to explain and critically discuss original work to a specialist audience in a lecture. <p>Carry out, evaluate, and discuss, simple practical experiments on the cellular and molecular neurobiology as well as on the behavioral neurobiology of <i>C. elegans</i>.</p>					
Prerequisites for the module or for individual courses in the module:					
Practical course: module assessment for the lecture.					
Course requirements for credits:					
Participation record:			<ul style="list-style-type: none"> - Seminar: Regular and active participation - Practical course: Regular participation 		
Coursework:			<ul style="list-style-type: none"> - Seminar: Presentations - Practical course: Fulfillment and protocols of the practical course experiments 		
Teaching and learning formats:			Lecture, seminar, practical course		
Module examination:			Form/duration/content, if applicable:		
Final module examination:			Written (90 minutes) or oral (45 minutes) final module examination on the lecture		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[C1.3]	Cellular Biochemistry	Compulsory elective module in core area C1	4 CPs (total) = 120 h		2 SWS
			Contact hours 2 SWS / 30 h	Independent study 90 h	
Course content:					
<p>This Master course in Biochemistry covers various key topics, including chaperone-mediated protein folding, the relationship between protein misfolding and diseases, principles of proteasomal protein degradation, ubiquitination, the ubiquitin proteasome pathway, ER-associated protein degradation (ERAD), protein translocation and secretion, insertion mechanisms for type I, II, and III membrane proteins, alternative pathways for membrane protein insertion, the structure and mechanisms of ABC transporters, signal transduction mechanisms, G-coupled receptors, receptor tyrosine kinases, and plasma membrane organization.</p> <p>In this context, chaperone-mediated protein folding refers to the process by which specialized proteins called chaperones assist in the correct folding of other proteins, ensuring their proper structure and function. This is a critical aspect of cellular protein homeostasis and functionality.</p> <p>The students will independently study selected research papers addressing these topics and discuss these in the following lecture (self study).</p>					
Learning outcomes and skills:					
Students will have a well-founded knowledge of elementary biochemical processes in the cell. This will enable them to understand and assess the latest developments in cellular biochemistry.					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:			None		
Coursework:			None		
Teaching and learning formats:			Lecture, independent study		
Module examination:			Form/duration/content, if applicable:		
Final module examination:			Oral (30 min.) or written (180 min.) exam for the lecture		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[C1.4]	Infection and Pathobiology	Compulsory elective module in core area C1	6– 8 CPs (total) = 180–240 h		4–6 SWS
			Contact hours 4–6 SWS 60–90 h	Independent study 120– 150 hours	
Course content:					
<p><u>Seminar - Immunology</u>: Cells and organs of the immune system; innate immunity; complement cascade, Toll-like receptors; structure and applications of antibodies; structure and function of MHC molecules and T cell receptors; antigen processing; cross presentation; development of B and T cells; positive and negative selection of B and T cells; dendritic cells; natural killer cells; allergy, autoimmune diseases; course of an immune response.</p> <p><u>Lecture – Molecular Virology (CEM)</u>: Methods of virology, cell entry, intracellular transport, particle formation, capsid structures and symmetries, replication strategies, antiviral strategies, RNA processing, reverse transcription, transposable elements, virulence, epidemiology, evolution, molecular biology of HIV, acute and latent infections, transformation, oncogenesis, viruses and immunology, viral vectors. The focus is on teaching molecular mechanisms and principles.</p> <p><u>Lecture - Tumor Biology (CEM)</u>: Biochemistry of oncogenic signaling pathways, epigenetic changes and sequence and structural changes in the human genome and their tumorigenic potential, senescence in tumor cells, pathological changes in proliferation control, cell differentiation and cell communication, significance of the tumor microenvironment, immune recognition and immune escape mechanisms of tumor cells, tumor pharmacology, cell therapy of cancer diseases, antibody therapy of cancer, future perspectives in cancer therapy.</p> <p><i>The seminar must be combined with at least one of the lectures (CEM) or optionally both.</i></p>					
Learning outcomes and skills:					
<p><u>Lecture - Molecular Virology</u>: After attending the module, the students have a broad basic knowledge of the molecular processes of viral replication, viral diseases and their therapy options. On this basis, they can competently discuss and evaluate current developments and debates on emerging viral infections and the use of vaccines.</p> <p><u>Lecture - Tumor Biology</u>: The students have developed a basic understanding of the development of tumor cells and their interaction with the immune system. On this basis, they can take a critical stand on the current development of prevention and early detection programs as well as critically assess current therapy concepts.</p> <p><u>Seminar - Immunology</u>: After completing the module, the students have a basic understanding of the different stages of an immune response. This knowledge enables the students to understand pathological connections in immunology and to search for possible solutions.</p>					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:			Seminar: Regular and active participation		
Coursework:			Presentations		
Teaching and learning formats:			Lecture, seminar		
Module examination:			Form/duration/content, if applicable:		
Final module examination:					
Cumulative module examination:			Lectures: Written (90 minutes) or oral (30 minutes) final examination		
Calculation of the module grades for cumulative module examinations:			CP-weighted average of the grades		

[C2.1]	Advanced Methods in Biochemistry	Compulsory elective module in core area C2	3– 7 CPs (total) = 150– 240 h		2–4 SWS
			Contact hours 2–4 SWS / 30–60 h	Independent study 60–150 hours	
Course content:					
<p><u>Lecture</u>: General methods and overview; centrifugation techniques for quantitative protein determination; immunological techniques; chromatographic techniques; modification and cleavage of proteins; electrophoretic methods; capillary electrophoresis; amino acid analysis; protein sequencing; mass spectrometry; peptide solid phase synthesis; scanning probe microscopy; single molecule techniques; evolutionary biochemistry; expression systems</p> <p><u>Seminar (optional)</u>: Current publications, some of which use new methods, will be presented by the students in the seminar. The methods used are discussed and alternative approaches are discussed. The advantages and disadvantages of individual methods are also worked out.</p> <p><i>The lecture can optionally be combined with the seminar (CEM).</i></p>					
Learning outcomes and skills:					
<p><u>Lecture</u>: The students gain an in-depth understanding of various biochemical techniques, so that they can assess the advantages and disadvantages of the individual methods and, based on this knowledge, independently identify the best method for a scientific problem.</p> <p><u>Seminar</u>: The students can evaluate the significance of individual experiments and the quality of publications based on the methods used.</p>					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:			Seminar: Regular and active participation		
Coursework:			Seminar: Presentation (in English)		
Teaching and learning formats:			Lecture, seminar		
Module examination:			Form/duration/content, if applicable:		
Final module examination:			Final oral examination (30 minutes) on the lecture		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[C2.2]	Membrane Biology	Compulsory elective module in core area C2	4– 5 CPs (total) = 120– 150 h	2–3 SWS
			Contact hours 2–3 SWS/ 30–45 h	Independent study 90–115 h
Course content:				
<p>In this module we discuss biological membranes from the perspective of their main constituents: lipids and proteins. Each lecture combines both theory as well as related practical aspects for studying membrane lipids and proteins. Recent literature is discussed. The seminar will highlight most-recent developments in membrane biology.</p> <p>Lecture: Topics included are the diversity and design of lipids and membrane proteins, cellular organization of lipids, biogenesis of membrane proteins, membrane protein – lipid interactions, the pathophysiology of membrane proteins, and contemporary methodology for studying structure, function, and dynamics of membrane proteins. The students will independently study selected research papers addressing one of these topics and discuss these in the following lecture (self study).</p> <p>Seminar (optional): The students participate in research lectures and seminars on membrane biology to learn about recent achievements and methodological developments.</p> <p><i>The lecture can optionally be combined with the seminar (CEM).</i></p>				
Learning outcomes and skills:				
This module aims to provide comprehensive understanding of lipids and membrane proteins, along with specific practical approaches to studying them. Students will learn to assess the advantages and limitations of various methodological approaches, enabling them to critically evaluate published experimental data and design their own experiments.				
Prerequisites for the module or for individual courses in the module:				
None				
Course requirements for credits:				
Participation record:			Seminar: Regular and active participation	
Coursework:			None	
Teaching and learning formats:			Lecture, independent study, seminar	
Module examination:			Form/duration/content, if applicable:	
Final module examination:			Final oral examination on the lecture (30 minutes)	
Cumulative module examination:				
Calculation of the module grades for cumulative module examinations:				

[C2.3]	Advanced Molecular Biology & Microbiology	Compulsory elective module in core area C2	3– 5 CPs (total) = 90–150 h		2–3 SWS
			Contact hours 2–3 SWS / 30–45 hours	Independent study 60–105 hours	
Course content:					
<p><u>Lecture</u>: Current topics in molecular microbiology will be taught. A particular focus will be on e.g., bacterial architecture, intrinsic and acquired resistance mechanisms, antibiotic resistance, cell-cell communication.</p> <p><u>Practical course (optional)</u>: Related to the topics taught in the lecture, we will perform experiments focusing on antibiotic resistance, signaling and cell-cell communication. The experiments will cover cell and molecular biological approaches.</p> <p><i>The lecture can optionally be combined with the practical course (CEM).</i></p>					
Learning outcomes and skills:					
<p><u>Lecture</u>: The students learn about state-of-the-art microbiology. Emphasis is placed on novel approaches and technologies (from systems-based to individual molecules) that drive each field or have the potential to revolutionize future research in microbiology. In preparation of the lectures, students individually study book chapters and topical scientific papers summarizing the current knowledge of the respective topics.</p> <p><u>Practical course</u>: The students gain hands-on experience in different techniques from microfluidics approaches to functional studies of individual protein complexes. They learn to critically evaluate their results and put them into a physiological context.</p>					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:			Practical course: Regular and active participation		
Coursework:			Practical course: Fulfillment and protocols (in English) of the practical course experiments		
Teaching and learning formats:			Lecture, practical course		
Module examination:			Form/duration/content, if applicable:		
Final module examination:			Final written examination on the lecture (120 minutes)		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

Import module:

[C2.4]	Biological Synthesis	Compulsory elective module	7 CPs (total) = 210 hours		4 SWS
			Contact hours 4 SWS/ 60 h	Independent study 150 hours	
Course content:					
<p><u>Seminar:</u> Introduction to the concepts and principles that determine biological synthesis, demonstrated using selected examples: Biosynthetic concepts for the production of proteins, amino acids, nucleic acids, fatty acids, polyketides, non-ribosomal peptides, alkaloids and terpenes; conversion of light into chemical energy; fixation of CO₂; Key metabolic pathways in living organisms (i.e., citric acid cycle as the central metabolic pathway); engineering of biosynthetic pathways for the directed production of bioactive compounds (i.e., polyketides and non-ribosomal peptides). An overview of synthetic principles and a detailed mechanistic insight into specific enzymes are given. The focus will be on chemical-biological aspects. Concepts of selected structural biological methods (EM, ET and X-ray crystallography) as well as enzymatic assays are presented. Emerging technologies relevant to the field of biomolecule engineering and pathway design are introduced, such as amber codon suppression for the incorporation of non-canonical amino acids into proteins.</p> <p><u>Lecture:</u> Introduction to the application of biomacromolecules as bioactive substances to control metabolic processes, in particular the application of biomolecules and their pharmaceutical development aspects in the treatment of diseases and disorders. The focus is on diabetes and its treatment with insulin and antidiabetic peptides, viral infections (mainly HIV), immune disorders and other rare muscle diseases, and treatment with small molecule enzyme inhibitors, antibodies, and oligonucleotides (RNA). 3D structural biological methods and pharmaceutical development aspects are presented and selected case studies are discussed.</p>					
Learning outcomes and skills:					
<p>The course introduces biological synthesis as an alternative and complementary method to chemical synthesis and introduces key molecules that regulate biological synthesis and processes (factors, effectors, biologics, ...). The aim is to provide students with an inspiring background that enables them to 1) understand synthetic and regulatory processes in the cell, 2) rationally design and evolve biological systems to acquire new functions (e.g., synthesis of a non-natural polymer that can be used in materials science), 3) construct new macromolecular complexes or nanomachines that can be artificially regulated (e.g., synthesis of macromolecular machines that can be switched on and off), and 4) to pursue and design new approaches in synthetic biology that can lead to the creation of new artificial cells (e.g., design of a minimal artificial cell that can regenerate itself).</p>					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:			Seminar: Regular and active participation		
Coursework:			None		
Teaching and learning formats:			Lecture, seminar		
Module examination			Form/duration/content, if applicable:		
Final module examination:			Final oral examination (20 minutes)		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[C3.1]	Methods for Structural Biology and Biophysics	Compulsory elective module in core area C3	3– 7 CPs (total) = 90– 210 h		2–4 SWS
			Contact hours 2–4 SWS/ 30–60 h	Independent study 60–150 hours	
Course content:					
<p>To understand the function of biological molecules, knowledge of their 3D structure is essential. In this module, the most important methods are introduced and the necessary physical principles are taught.</p> <p><u>Lecture:</u></p> <ul style="list-style-type: none"> • General principles of spectroscopy • Fluorescence spectroscopy and microscopy (single molecule fluorescence, anisotropy, FCS, FRET, super resolution microscopy) • EPR spectroscopy • NMR spectroscopy in solution and solids • X-ray structural analysis • Cryo-electron microscopy • Methods of data acquisition and data analysis as well as structural calculation. <p><u>Seminar (optional):</u> In the seminar, the subject matter of the lecture is deepened through the discussion of concrete application examples. Presentations to be given by the students, which either deepen topics from the lecture or present current application examples from the literature, play a central role here.</p> <p><i>The lecture can optionally be combined with the seminar (CEM).</i></p>					
Learning outcomes and skills:					
<p>After completing the module, students will be able to:</p> <ul style="list-style-type: none"> • Critically assess the methods and technical details taught • Choose the right methods for specific questions • Calculate with produced data and discuss the results • Present current topics and application examples from the literature to a specialist audience. 					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:			Seminar: Regular and active participation, processing of exercises		
Coursework:			Seminar: Presentations		
Teaching and learning formats			Lecture, seminar		
Module examination:			Form/duration/content, if applicable:		
Final module examination:			Final oral examination on the lecture (45 minutes)		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[C3.2]	Advanced methods in membrane biochemistry	Compulsory elective module in core area C3	5 CPs (total) = 150 h		4 SWS
			Contact hours 4 SWS / 60 h	Independent study 90 h	
Course content:					
<p>The practical course consists of 2 different experimental parts, which are carried out all day in groups of usually two students.</p> <ol style="list-style-type: none"> Electrophysiology: The students investigate and analyze the electrical properties of cells and of proteins expressed in the membrane (light-inducible cation channel channelrhodopsin-2). Two-Electrode Voltage Clamp (TEVC) experiments are performed on <i>Xenopus laevis</i> oocytes and measurements are performed on the nematode <i>C. elegans</i> using the automatic Nemamatrix-Screenchip system. Reconstitution of a membrane protein: Using a typical membrane protein, all protein biochemical work steps that are necessary to prepare samples for further functional or structural biological studies are to be carried out. This involves cell disruption, membrane isolation, solubilization, purification, and incorporation of the membrane protein into liposomes. The obtained results are summarized and discussed in form of a scientific publication. 					
Learning outcomes and skills:					
<p>After completing the module, students will be able to:</p> <ul style="list-style-type: none"> Plan and perform basic biochemical experiments with membrane proteins Discuss and interpret biochemical data Write a manuscript Conduct and interpret basic electrophysiological experiments Accurately record and evaluate relevant data Correctly present and interpret the results obtained. 					
Prerequisites for the module or for individual courses in the module:					
Practical course 2. <i>Reconstitution of a membrane protein</i> : Module Advanced methods in biochemistry – C2.1					
Course requirements for credits:					
Participation record:			Regular participation		
Coursework:			Fulfillment and protocols of the practical course experiments		
Teaching and learning formats:			Practical course		
Module examination:			Form/duration/content, if applicable:		
Final module examination:			Protocols (not graded, see § 35)		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[C3.3]	Advanced methods in biochemistry and biophysics	Compulsory elective module in core area C3	3– 9 CPs (total) = 90–270 h		1.5–5.5 SWS
			Contact hours 1.5–5.5 SWS / 22.5–82.5 h	Independent study 67.5– 187.5 hours	
Course content:					
<p>The practical course consists of 5 different experimental parts, which are carried out all day in groups of usually two students.</p> <ol style="list-style-type: none"> Determining the structure of a protein using solution NMR: The students receive an introduction to multidimensional spectroscopy on an NMR device. They then evaluate the 3D and 2D spectra on the computer and calculate the structure of the protein. Mass spectrometry: Under supervision, the students record MALDI and ESI mass spectra of peptides and proteins. Using the spectra, the students learn how to interpret the data obtained, including determining the sequence of peptides from MS/MS data. With prepared PMF spectra of enzymatic protein restrictions (PMF = Peptide Mass Fingerprint), the identification of proteins using databases is learned. Solid-state NMR: The basics of MAS-NMR are taught (experimental setup; sample preparation; spectra recording). The basics of lineshape analysis and the influence of molecular motions will be introduced for the example of lipid bilayer samples. In addition, precise spin-spin distances are determined using dipolar recoupling techniques. The experimental data are evaluated by the students using computer simulations with the SIMPSON software. Structure determination using X-ray structure analysis: The students set up crystallization experiments and then mount the resulting crystals on an X-ray system. The scattered radiation of the crystals after X-ray bombardment is quantitatively recorded. The structure of the protein is determined from diffraction data by means of "molecular replacement". In the block course "Introduction to biological electron microscopy with image processing", after a 2-hour introductory lecture, practical aspects of biological electron microscopy and image processing are worked on directly on the research equipment in small groups (3-4 students). Students will use negative staining and cryo-fixation methods, and gain hands-on experience with TEMs. <p>At least 2 of the experimental parts must be taken.</p>					
Learning outcomes and skills:					
<p>After completing the module, students will be able to:</p> <ul style="list-style-type: none"> Apply these modern biophysical methods in the laboratory Select the right techniques for specific biophysical questions Accurately record and evaluate relevant data Link hypotheses about computer simulations with experimental data Correctly present and interpret the results obtained. 					
Prerequisites for the module or for individual courses in the module:					
Completion of the module <i>Methods for Structural Biology and Biophysics</i>					
Course requirements for credits:					
Participation record:			Regular participation		
Coursework:			Fulfillment and protocols of the practical course experiments		
Teaching and learning formats			Practical course		
Module examination:			Form/duration/content, if applicable:		
Final module examination:			Protocols (not graded, see § 35)		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[C3.4]	Structural Bioinformatics	Compulsory elective module in core area C3	3 CPs (total) = 90 h	2 SWS
			Contact hours 2 SWS / 30 h	Independent study 60 h
Course content:				
	<p>The module gives an introduction to Python programming and two central methods of structural bioinformatics: molecular dynamics simulation and the prediction and modeling of protein structures. The exercises allow students to obtain practical experience on the computer with programming in Python for applications in biochemistry.</p> <p><u>Lecture and exercise:</u></p> <p><u>Programming for Biochemists:</u> The first part of the course teaches the basics of a programming language, Python. The participants write various small and useful programs and develop a general understanding of programming methods.</p> <p><u>Structural Bioinformatics:</u> The second part of the course introduces the participants to get to the techniques of molecular dynamics simulation, structure modeling, and structure prediction.</p>			
Learning outcomes and skills				
	<p>After completing the module, students will be able to:</p> <ul style="list-style-type: none"> • Apply these modern biophysical methods in the laboratory • Select the right techniques for specific biophysical questions • Accurately record and evaluate relevant data • Link hypotheses about computer simulations with experimental data • Correctly present and interpret the results obtained. 			
Prerequisites for the module or for individual courses in the module:				
	None			
Course requirements for credits:				
	Participation record:	Exercises: Regular and active participation, processing of exercises		
	Coursework:	None		
	Teaching and learning formats:	Lecture, exercise		
Module examination:		Form/duration/content, if applicable:		
	Final module examination:	Final written module examination (90 minutes)		
	Cumulative module examination:			
	Calculation of the module grades for cumulative module examinations:			

[A1]	Group Research Proposal	Compulsory module	6 CPs (total) = 180 h		2 SWS
			Contact hours 2 SWS / 30 h	Independent study 150 h	
Course content:					
<p>In this module, students actively engage with content from the field of biochemistry by formulating a hypothetical research project. This process also hones their skills in crafting scientific documents. Consequently, students are introduced to the art of critically analyzing published works and identifying forward-looking subjects suitable for funding in a research project. They acquire the ability to construct hypotheses and provide scientific evidence for subsequent validation.</p> <p>Within this module, students will collaborate in groups to present and defend their research projects. These projects will pertain to current topics within the scope of the subject matter studied, and students will establish a timeline for their work. Those not presenting directly will act as audience members, serving as reviewers and learning to discern both the strengths and weaknesses in the proposals, and offering constructive feedback.</p> <p>Following these presentations and discussions, students will formulate a research proposal in English.</p>					
Learning outcomes and skills:					
<p>After conducting a comprehensive review of the literature, students pinpoint research-focused, forward-looking subjects. Subsequently, they collaboratively generate thought-provoking questions as part of their group work, which serve as a foundation for crafting a research proposal. Students deliberate on the methodologies to employ and provide an outline of the anticipated outcomes. They then compose a research project in English and present and justify their research project to a panel of experts. Throughout this process, they acquire skills in teamwork, effective communication, and task delegation.</p>					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:			Regular and active participation		
Coursework:			None		
Teaching and learning formats:			Seminar		
Module examination:			Form/duration/content, if applicable:		
Final module examination:			Presentation and discussion in groups (English) (90 minutes)		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[A2]	Developing a Research Project	Compulsory module	8 CPs (total) = 240 h		SWS
			Contact hours	Independent study 240 h	
Course content:					
<p>Building on the seminar of the module <i>Group Research Proposal</i>, the course will enable students to independently identify a meaningful and relevant question from the field of biochemistry, propose methodological approaches to answer it, and formulate this in a structured text based on a grant application for third-party funding</p> <p>The topic must be developed individually by the students and should be taken from the range of topics, which ranges from cellular biochemistry to biophysical chemistry. Topics may include current topics in membrane protein research, RNA biology, signal transduction structural biology, spectroscopy, or electrophysiology.</p> <p>The project descriptions are drawn up by the students under the individual supervision of a university lecturer in the subjects of biochemistry or biophysical chemistry. Through interactive discourse, students acquire knowledge of methods, text analysis, and data interpretation, as well as tips for creating a project outline and for assessing the feasibility of the project. The project outline is presented in the form of a lecture, accompanied by a detailed scientific discussion to examine the knowledge on the topic. Feedback is given on the originality of the topic, feasibility, and the presentation of scientific contexts.</p>					
Learning outcomes and skills:					
<p>After completing the module, students will be able to:</p> <ul style="list-style-type: none"> - Understand and assess the latest developments in biochemistry - Identify research-relevant and forward-looking topics in the specialist literature - Formulate hypotheses independently - Coherently present a scientific argument in a logically structured text - Independently develop, present, and defend a research project - Communicate with scientific precision in English. 					
Prerequisites for the module or for individual courses in the module:					
Completion of the module <i>Group Research Proposal</i>					
Course requirements for credits:					
Participation record:			None		
Coursework:			None		
Teaching and learning formats:			Project		
Module examination:			Form/duration/content, if applicable:		
Final module examination:					
Cumulative module examination:			<ul style="list-style-type: none"> - Proposal (written form, max. 3000 words) - Presentation of the proposal (15 minutes) - Oral examination on the proposal (45 minutes) 		
Calculation of the module grades for cumulative module examinations:			Arithmetic mean of the three partial examinations		

[A3]	Research Internships I and II	Compulsory module	10+ 10 CPs (total) = 240 h		30 + 30 working days
			Contact hours 240+ 240 h	Independent study 360 + 360 hours	
Course content:					
<ul style="list-style-type: none"> • Literature review • Familiarization with scientific topics • Working on a research project of limited scope • Writing a protocol • Presenting the project <p>The research internships serve as orientation when selecting the research area for the Master's thesis.</p>					
Learning outcomes and skills:					
<p>After completing the internship, students will be able to:</p> <ul style="list-style-type: none"> • Plan a research project and its implementation • Conduct a scientific research experiment • Evaluate and interpret the results using modern methods • Write a protocol with the framework of a scientific work • Present the results in the working group. 					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:			None		
Coursework:			<ul style="list-style-type: none"> - presentation of the project results - practical activity and protocol are evaluated equally. A grade is formed from both parts as an overall assessment. 		
Teaching and learning formats:			Practical course		
Module examination:			Form/duration/content, if applicable:		
Final module examination:			None		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[A4]	Master's thesis	Compulsory module	30 CPs (total) = 240 h		30 + 30 working days
			Contact hours 240+ 240 h	Independent study 360 + 360 hours	
Course content:					
Students familiarize themselves with a problem of current biochemical or cell biological research within the given time period. Based on the current state of research, solutions to the scientific problem are first identified and then implemented. Students apply appropriate scientific methods with increasing independence and present the results in writing in the Master's thesis in the style of a scientific publication.					
Learning outcomes and skills:					
<ul style="list-style-type: none"> • Working independently on a scientific topic • Project planning and implementation • Application of methodological knowledge to a demanding biochemical topic • Scientific documentation • Data analysis and interpretation • Graphic presentation of scientific results • Deepening of problem-solving skills and the transfer of methodological knowledge • Presentation, scientific evaluation, and discussion of the possible solutions to the topic of the Master's thesis in written form 					
Prerequisites for the module or for individual courses in the module:					
The student must have achieved 60 CPs in the Master's degree program before they start the Master's thesis. In order to be able to apply for admission to the Master's thesis, the student must have submitted the proposal in the module <i>Developing a Research Project</i> .					
Course requirements for credits:					
Participation record:					
Coursework: None					
Teaching and learning formats:					
Module examination:					
Final module examination:			Form/duration/content, if applicable:		
			Written Master's thesis (6 months, usually approx. 70 pages, does not usually exceed 90 pages)		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

[E1.1]	Advanced Biophysical Methods	Compulsory elective module	5 CPs (total) = 150 h		4 SWS
			Contact hours 4 SWS / 60 h	Independent study 90 h	
Course content:					
<p><u>Seminar:</u> In the seminar, advanced biophysical methods and concepts needed to explain the interaction of structure, function and dynamics of biological macromolecules (e.g. quantum chemical fundamentals of spectroscopy, advanced EPR spectroscopy (pulsed method), advanced L-NMR spectroscopy (dynamics, structure calculation), advanced solid state NMR spectroscopy (techniques for structure determination), scattering and diffraction methods: SAND, SAXS) are thematised through the discussion of concrete application examples. Presentations to be given by the students, which either deepen topics from the lecture or present current application examples from the literature, play a central role here.</p> <p><u>Practical course:</u> Solid state NMR is an important method for studying insoluble proteins (fibrils, membrane proteins). In this experiment, the students learn the most important features of MASNMR and learn to understand anisotropic interactions. You will measure precise core-core distances via dipole-dipole coupling and compare these data with those from crystallography and solution NMR. The data is evaluated using simulations, so that general knowledge about the interplay between theoretical predictions and experimental verification is also imparted.</p>					
Learning outcomes and skills:					
<p>After successful completion, students are able to:</p> <ul style="list-style-type: none"> • are able to critically evaluate and discuss original literature on this topic (in English) are able to analyze and interpret results and to verify measurement data on the basis of the learned methods of data acquisition. • are able to apply the methods to concrete tasks and to calculate with measurement data. • have developed a feeling for actual measurements. • are able to critically assess the applicability of the above methods for specific questions • are able to work out special topics and application examples with the background knowledge acquired and to present them to a specialist audience • are able to critically evaluate and discuss original literature on this topic (in English) 					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:					
Coursework:					
Practical course: Conducting experiments and writing a protocol Expert discussion (30 min.)					
Teaching and learning formats:					
Seminar, practical course					
Module examination:					
Form/duration/content, if applicable:					
Final module examination:					
None					
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

Import module from Faculty 14 (Biochemistry, Chemistry, and Pharmacy), see original degree program: MSc in Chemistry:

- [E1.2] Solid State NMR Spectroscopy
- [E1.3] Liquid State NMR Spectroscopy
- [E1.4] EPR Spectroscopy
- [E1.5] Single Molecule Spectroscopy and High-resolution Microscopy
- [E1.7] X-ray Structure Analysis
- [E1.8] Modeling and Simulation of Biomolecules
- [E1.9] Structure and Function of Biomacromolecules
- [E1.10] Structure and Function of Biomacromolecules
- [E1.11] Modern Statistical Data Analysis for Practitioners
- [E1.12] Advanced Organic Chemistry
- [E1.13] Chemical Synthesis of Natural Products
- [E1.14] Chemistry of Heterocycles
- [E1.15] Highlights of Organic Chemistry and Chemical Biology [E1.16] Laser Chemistry
- [E1.19] Advanced Chemical Biology
- [E1.20] Advanced Chemical Biology– Practical Course
- [E1.21] Pharmacology
- [E2.1] Key qualifications

Import module from Faculty 13, see original degree program: MSc in Biophysics:

- [E1.22] Computer-aided Drug Design

Partial import module: *Module is offered in German.*

[E1.6]	Biophysics	Compulsory elective module	3– 15 CPs (total) = 90– 450 h		2–12 SWS
			Contact hours 2–12 SWS/ 30–180 h	Independent study 60–270 h	
Course content:					
<p><u>Lecture – <i>Introduction to Biophysics</i></u>: Structure, dynamics, and function of proteins and nucleic acids, for example, with regard to molecular motors, information transfer, energy conversion, sensor technology; properties of biological membranes; excitation conduction; reaction mechanisms; experimental methods for investigating the structure and function of biological macromolecules; theoretical methods for their description. An exercise is offered to deepen the content covered in the lecture.</p> <p><u>Seminar (optional)</u>: Oral presentation and discussion on biophysical questions related to the lecture or topics from biophysical literature.</p> <p><u>Practical course (optional)</u>: Experiments on methods and questions of modern biophysics (e.g., spectroscopy, medical physics, membrane biophysics).</p> <p><u>Lecture – <i>(Bio-)molecular Dynamics</i></u>: Experimental methods are presented from the following areas: time-resolved X-ray diffraction, crystallography and electron diffraction; ultrafast spectroscopy; multidimensional optical spectroscopy; single-molecule spectroscopy; single-molecule microscopy; force microscopy; optical tweezers; time-resolved NMR spectroscopy; mass spectrometry. Important examples are used to explain the information content of the different experiments. They include: Molecular motors; enzyme function; photoreceptors; photosynthesis; protein folding; proton transfer; breakage and formation of chemical bonds; catalysts; formation of transient structures in liquids; energy transfer in molecules; elucidation of reaction mechanisms.</p> <p><i>Students may attend individual lectures. Participation in the seminar and/or the practical course is optional and is subject to meeting certain prerequisites. Students must register for the practical course; participation may be restricted for capacity reasons. The rules for the practical course will be announced at the beginning of the practical course.</i></p>					
Learning outcomes and skills:					
<p><u>Lecture, seminar, practical course – <i>Biophysics</i></u>: Students will become familiar with the structure of biological macromolecules and membranes and obtain insights into the dynamics of these systems, the function of proteins, reaction kinetics, and bioenergetics. They will become familiar with spectroscopic techniques and diffraction techniques for investigating the structure and dynamics of biological macromolecules and acquire the ability to understand, present and discuss biophysical relationships and carry out basic biophysical experiments.</p> <p><u>Lecture – <i>(Bio-)molecular Dynamics</i></u>: Students will obtain an overview of dynamic processes in molecules that are significant for chemical reactions, the function of biological macromolecules in organisms, and structure formation in condensed matter. The importance of coupling processes across different time scales (from femtoseconds to seconds) and length scales (from fractions of a bond length to the diameter of large proteins) is explored. Students will learn the latest methods for measuring molecular dynamics across these time and length scales. Students will be able to critically evaluate the validity and significance of experiments described in specialist literature. Students will be able to assess which information about molecule dynamics can be accessed with different methods and select the method that is suited for investigating a specific question. Students will be able to assess the significance of molecular dynamics for different phenomena (chemical reactions, protein function, structure formation in condensed matter).</p>					
Prerequisites for the module or for individual courses in the module:					
<p>Seminar: Coursework for the lecture <i>Introduction to Biophysics</i> or <i>(Bio-)molecular Dynamics</i> Practical course: Coursework for the lecture <i>Introduction to Biophysics</i></p>					
Course requirements for credits:					
Participation record:			Exercise and seminar: Regular and active participation		
Coursework:			<ul style="list-style-type: none"> - Lectures: A written examination (90 minutes) or subject-specific discussion (30 minutes) on each lecture - Optional seminar: Presentation (30 minutes) - Optional practical course: Successful completion of and preparation of protocols of the experiments in the practical course (see rules for the practical course) 		
Teaching and learning formats:			Lecture, seminar, practical course		
Module examination:			Form/duration/content, if applicable		
Final module examination:			None		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

Partial import module:

[E1.16]	Molecular Biosciences	Compulsory elective module	6 CPs (total) = 180 h		4 SWS
			Contact hours 4 SWS/ 60 h	Independent study 120 h	
Course content:					
<p>In this module, students must take four lectures from the field of molecular biosciences. The lectures cover different molecular aspects of biology.</p> <p>The following eight lectures can be attended:</p> <p><u>Genome Function & Gene Regulation:</u> Molecular genetics and molecular biology of archaeal and bacterial model species. Genome function and regulation of gene expression at different levels, metabolic regulation. Modern methods of molecular genetics, molecular biology, biochemistry, microbiology, and cell biology.</p> <p><u>Molecular & Applied Microbiology:</u> The focus is on teaching the molecular basis of the adaptation of microbes to their environment, signal recognition and signal transmission, including the regulation of transcription and enzyme activity.</p> <p><u>Plant Biochemistry:</u> The lecture deals with the biochemistry of the chloroplasts, metabolic flows and their regulation, as well as the bioenergetics of photosynthetic organisms.</p> <p><u>RNA Biology:</u> The lecture covers chemical structure and conformation of RNA building blocks, secondary and tertiary structure of RNA, regulatory RNA elements in prokaryotes, RNA-based mechanisms in eukaryotes, and structure and function of RNA-based molecular machines using the example of the ribosome and spliceosome.</p> <p><u>Biosynthesis of Natural Substances:</u> In this module, students receive a functional overview of secondary substances. One focus is on the biosynthetic pathways that lead to polyketides and peptides, but also to other classes of natural products (alkaloids, terpenes, phenylpropanoids). Typical reaction processes are discussed as examples. Additional content includes gene cloning and genetic metabolic modifications in various organisms.</p> <p><u>Molecular Cell Biology and Biochemistry of Eukaryotic Systems:</u> The course covers the cell biology of higher eukaryotes with a focus on intracellular mass transport and membrane biology, as well as the cellular biochemistry of eukaryotes using mammalian cells, yeasts, and plants as examples. Special focus areas are signal transport and its specificities in the various systems, protein transport in cells from synthesis to degradation, material fluxes in the cell and across the membrane, and organelle and protein complex dynamics.</p> <p><i>Four lectures must be selected.</i></p>					
Learning outcomes and skills:					
<p>Upon completion of this module, students will have an overview of a spectrum of specific aspects of plant biochemistry, microbiology, and molecular biology. This special knowledge will help students prepare for seminar papers and find an appropriate research field.</p>					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:			None		
Coursework:			Written examination on each lecture (30 minutes)		
Teaching and learning formats:			Lecture		
Module examination:			Form/duration/content, if applicable:		
Final module examination:			None		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

Partial import module: *Module is offered in German.*

[E1.17]	Toxicology and Ecology	Compulsory elective module	6 CPs (total) = 180 h		4 SWS
			Contact hours 4 SWS / 60 h	Independent study 120 h	
Course content:					
<p><u>Principles of Ecotoxicology:</u> The lecture provides theoretical knowledge in the field of ecotoxicology. The lecture content includes general and in-depth specific knowledge of the behavior and effects of chemicals in the environment, their impact on organisms and biocoenoses, and the assessment of the risk they pose to ecosystems.</p> <p>The lecture focuses on the following subjects: The production and release of pollutants, their entry pathways into ecosystems, behavior in environmental compartments, long-distance transport of chemicals, persistence, and abiotic transformation, the persistence of pollutants in terrestrial and aquatic ecosystems, including toxicokinetics and toxicodynamics, uptake and accumulation, distribution, transformation, and excretion by organisms, the characterization of poisoning, mechanisms of action, concentration-effect relationships, biological test methods, environmental risk assessment of chemicals, derivation of limit values, biomonitoring, bioindication, and case studies of pollutant effects.</p> <p><u>Introduction to Human Toxicology:</u> The lecture provides an introduction to all areas of human toxicology. In addition to the principles of toxicology (General Toxicology; Part 1 of the lecture), the lecture covers the toxicology of important organ systems (Part 2) and examples of substance groups (Part 3), forming the foundation of Specific Toxicology.</p> <p>In Part 1, the tasks performed in toxicology are characterized and toxicodynamics and toxicokinetics, the two main disciplines of toxicology, are described in more detail. General rules of characterizing the effect of pollutants and describing mechanisms of action are discussed. In toxicokinetics, the principles of uptake, distribution, degradation, and excretion of toxic substances by the human body are presented. Additionally, the assessment of the toxicity of hazardous substances and the treatment of poisoning are discussed.</p> <p>In Part 2, toxic impacts of substances on the digestive and excretory organs, blood, and blood-forming organs, immune and nervous systems (including sensory organs), as well as the skin and lungs are discussed. Particular attention is paid to the teratogenic, carcinogenic, and endocrine-like effects of hazardous substances.</p> <p>In the last part of the lecture, examples of different substance groups and their toxic impacts are presented. In addition to metals and metalloids, these also include aliphatic and aromatic hydrocarbons, organic nitrogen compounds, halogenated hydrocarbons, alcohols, ether, phosphoric acid esters, carbamates, and alkalating agents.</p> <p><u>Aquatic Ecology:</u> The lecture provides theoretical knowledge in the field of ecotoxicology. The focus is on linking all sub-areas of basic limnological and aquatic ecological knowledge concerning water protection, the management of water quality, and the state of water bodies. In detail, the following topics are dealt with intensively: water as a habitat, hydrobiology, discharge components, characteristics of standing and flowing waters, chemical-physical factors in waters, substance balance and cycles, nutrient distribution, types of lakes and flowing water, zoning of water bodies, biotic communities and colonization of water bodies, food chains and webs in limnic systems, plankton, neuston/pleuston, benthon, nekton, anthropogenic (material and hydraulic) pollution and renaturation of water bodies, water body structure mapping and biological water quality assessment, macroinvertebrate community analyses, the EU Water Framework Directive and management concepts for water bodies.</p> <p><i>Two lectures must be selected.</i></p>					
Learning outcomes and skills:					
<p><u>Principles of Ecotoxicology:</u> After completing the lecture and seminar, the students will have a comprehensive knowledge of the production and release of pollutants. They will be familiar with the basic exchange processes for chemicals between the environmental compartments and are able to predict the uptake, metabolism and excretion of substances by animal and plant organisms and to assess their hazard and risk potential. This will enable them to independently identify particularly problematic substances, differentiate between them in terms of their environmental relevance, and prioritize them for subsequent investigations. Students will possess the theoretical knowledge to select suitable experimental methods for detecting potential environmental hazards and quantitatively deriving the risk posed by these substances. They will be able to independently conduct appropriate analyses and critically evaluate their results.</p> <p><u>Human Toxicology:</u> In the lecture, students acquire basic knowledge about the effects of substances on the human body. In addition to covering toxicodynamic principles, which allow for the characterization of chemical effects by considering mechanistic aspects, structure-activity, and dose-response relationships, the lecture also focuses on toxicokinetic principles, which describe the uptake, distribution, and elimination of substances based on their material properties. Students are also taught the current regulations and legal foundations for evaluating chemical toxicity and the principles of treating poisoning. They will learn about the most significant effects of substances on various human organ systems and the impacts of key substance groups.</p> <p>General mechanisms are presented and further discussed in greater detail through concrete examples. This is emphasized by the connection to everyday applications. A positive learning environment prevails where students are encouraged to actively engage, contribute their suggestions, and offer solutions. Current cases are also discussed.</p> <p>While this lecture is an introductory course that covers basic principles, it also explains more in-depth systems and mechanisms. By attending additional courses, students can acquire additional specialization.</p> <p><u>Aquatic Ecology:</u> After completing the lecture and seminar, students will have a theoretical understanding of the basics of limnology. They will be able to distinguish and assess the physical and ecological functioning of standing and flowing waters, compare ecosystem relationships and processes in different aquatic ecosystems, assess the role of aquatic ecology in relation to environmental protection, and be able to interpret the different effects of ecological impairments.</p>					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					

Participation record:	
Coursework:	For each lecture, a written examination on the content of the lecture (60 minutes)
Teaching and learning formats:	Lecture
Module examination:	Form/duration/content, if applicable:
Final module examination:	None
Cumulative module examination:	
Calculation of the module grades for cumulative module examinations:	

Partial import module: *Module is offered in German.*

[E1.22]	Drug Development	Compulsory elective module	5– 6 CPs (total) = 150– 180 h		2.5–4 SWS
			Contact hours 2.5–4 SWS/ 37.5– 60 h	Independent study 112.5– 120 h	
Course content:					
<p><i>Students can attend either Combination I: lecture – “Drug Development – Medicinal Chemical Aspects” + seminar “Case Study” OR Combination II: lecture – “Drug Development – Biochemical Aspects” + seminar – “Molecular Mechanisms of Drugs” (II).</i></p> <p>I. <u>Lecture – “Drug Development – Medicinal Chemical Aspects”</u>: Drug targets, homology modeling, molecular docking, biophysical methods in drug research, principles of medicinal chemistry, lead optimization, virtual screening, bioisosteric replacement, modern synthesis methods, QSAR, fragment-based drug development <u>Seminar “Case Study”</u>: As part of a presentation that students have prepared independently on an example of successful drug development, they will work in groups of two to deepen and apply the knowledge they have acquired. Each group will present their findings to their peers, with a focus on the entire value chain of drug development, from drug design to market approval.</p> <p>II. <u>Lecture – “Drug Development – Biochemical Aspects”</u>: Identification of drug targets; signal pathways, enzymatic reactions and their suitable verification systems (assays); foundations of working with molecular structures and database entries; modern biochemical methods for assay development and high-throughput screening: alpha screen, (TR-)FRET, (bio-)luminescence, BRET, FP; orthogonal assays and duplexing; methods for checking off-target effects and toxicity; biophysical methods in drug discovery research, SPR, ITC, DSE, CD; utilization of structural biology; examples of drug development for neurodegenerative diseases. <u>Seminar – “Molecular Mechanisms of Drugs”</u> As part of a presentation that students have prepared independently on an example of successful drug development, they will work in groups of two to deepen and apply the knowledge they have acquired. The focus is on the early phases of drug discovery research. Using publications, students will outline the most important steps from target validation to assay development and screening, as well as the identification of suitable scaffolds, orthogonal assays, SAR testing and selecting suitable cell lines, as well as animal models. <u>Seminar – “Current Aspects of Pharmaceutical Science”</u> (optional) Seminar talks on current topics in the area of drug and pharmaceutical research <i>Students can optionally attend the seminar “Current Aspects of Pharmaceutical Science.”</i></p>					
Learning outcomes and skills:					
<p>The lecture “Drug Development – Medicinal Chemical Aspects” provides students with insights into drug research. Students will achieve comprehensive understanding of the interdisciplinary approaches used in drug research and will be familiar with the interdisciplinary approach to identifying and optimizing new drugs.</p> <p>By independently preparing a case study of a successful drug development in the “Case Study” seminar, students will develop the ability to independently research, prepare, assess, and clearly present complex pharmaceutical scenarios using the skills they have acquired in their Master’s degree studies.</p> <p>After attending the lecture “Drug Development – Biochemical Aspects,” students will be able to identify suitable assays for various target proteins and related questions. They gain a thorough understanding of the different biochemical and biophysical methods used in drug discovery research and how these methods interact with those in other disciplines to identify and optimize new drugs.</p> <p>By independently preparing a case study of successful preclinical drug development in the seminar “<i>Molecular Mechanisms of Drugs</i>,” students will deepen their knowledge. Using the skills acquired in their Master’s course studies, they will be able to use publications to process complex biochemical detection systems and data, present these clearly, and evaluate them effectively.</p>					
Prerequisites for the module or for individual courses in the module:					
None					
Course requirements for credits:					
Participation record:			Seminar: Regular and active participation		
Coursework:			Presentation (20 minutes)		
Teaching and learning formats:			Lecture, seminar		
Module examination:			Form/duration/content, if applicable:		
Final module examination;			None		
Cumulative module examination:					
Calculation of the module grades for cumulative module examinations:					

Partial import module: *Module is offered in German.*

[E2.2] / [W.20] <i>Economics</i>	Economics	Compulsory elective module	5– 15 CPs (total) = 150– 450 h		3–9 SWS
			Contact hours 3–9 SWS/ 45–135 h	Independent study 105–315 h	
Course content:					
<p><u>Lecture – “Introduction to Economic Theory”</u>: The lecture provides an analysis of fundamental economic models; algebraic and geometric model analysis; markets and economic cycles; analysis of international business relations</p> <p><u>Lecture – “Accounting”</u>: The lecture covers principles and techniques of double-entry book-keeping; fixed and current assets, liabilities, provisions, accruals and deferrals; preparation and auditing of annual financial statements (balance sheet and income statement)</p> <p><u>Lecture – “Marketing 1”</u>: This course offers a theoretically sound yet practical overview of all key areas, tasks, and methods of marketing. It presents an analysis of typical practical marketing problems and challenges. The lecture begins with an in-depth analysis and understanding of the initial situation concerning a specific marketing objective. From there, marketing strategies are developed and implemented using various tools within the marketing mix. The effectiveness of these strategies is then evaluated concerning the initially set objectives.</p> <p><u>Lecture – “Finance 1”</u>: This lecture covers the capital value method for the evaluation of investment projects, basics of portfolio theory according to Markowitz, risk-return relationship in models (CAPM), and central elements of the one-period binomial model.</p> <p><u>Lecture – “Philosophy, Politics, and Business”</u>: This lecture covers ethics and economics, as well as theories of business ethics.</p> <p>It presents the history of ethical and economic thought; market failure and economic policy; failed states and corporate responsibility; morality and rationality (social preferences, moral rules, economics of morality).</p> <p><u>Lecture – “Microeconomics 1”</u>: This lecture presents a basic model of perfect competition; household theory, and theory of the firm.</p> <p>It also covers market equilibrium under conditions of both perfect competition and imperfect competition; monopoly markets; asymmetrical information; and externalities.</p>					
Learning outcomes and skills:					
<p><u>Lecture – “Introduction to Economic Theory”</u>: By attending this lecture, students will</p> <ul style="list-style-type: none"> - Acquire the fundamental economic principles required for the Bachelor’s degree program. - Gain an overview of various subareas of economics - Understand how markets and economic cycles function in both national and international contexts through macroeconomic and microeconomic analyses - Explore the role of the state and state institutions within an economy - Develop skills for solving practice tasks during the accompanying tutorial sessions. <p><u>Lecture – “Accounting”</u>: By attending this lecture, students will</p> <ul style="list-style-type: none"> - Learn the basic principles and techniques of double-entry bookkeeping - Be able to record postings (affecting net income) in individual asset and liability items, as well as the income statement accounts - Become familiar with the legal requirements for bookkeeping and annual financial statements - Master the principles of annual financial statements, in particular, the preparation of the balance sheet and income statement - Acquire the foundational knowledge of bookkeeping and accounting required for the Bachelor's degree - Develop skills for solving practice tasks during the accompanying tutorial sessions. <p><u>Lecture – “Marketing 1”</u>: By attending this lecture, students will</p> <ul style="list-style-type: none"> - Become familiar with the fundamental concepts of marketing and understand how they interrelate - Be able to apply basic analytical methods for designing well-founded marketing measures - Be able to classify and apply the specialist knowledge in practical scenarios - Be able to critically reflect on marketing objectives in the context of broader societal challenges. <p><u>Lecture – “Finance 1”</u>: By attending this lecture, students will</p> <ul style="list-style-type: none"> - Acquire the fundamental principles of finance required for the Bachelor’s degree program - Develop a basic understanding of the valuation of both safe and risky cash flows - Be able to assess risk in investment projects and evaluate modern financial instruments - Acquire insights into various perspectives of neoclassical and institutional economic finance theory - Develop skills for solving practice tasks during the accompanying tutorial sessions. <p><u>Lecture – “Philosophy, Politics, and Business”</u>: By attending this lecture, students will</p> <ul style="list-style-type: none"> - Gain a sound understanding of the relationship between ethics and economics, considering various concepts of business ethics and related disciplines - Be able to reflect appropriately on business and economic problems from an ethical perspective 					

- Recognize the significance of politics in solving economic problems and the importance of economics in addressing political issues in the context of institutions and institutional economics
- Learn to systematically integrate ideas and requirements of corporate social responsibility into economic thinking and action, understanding the relevance of economics and business administration in resolving ethical issues
- Be able to analyze problems in a nuanced manner from the perspectives of individual, corporate, and regulatory ethics
- Acquire the skills to decide and act in an ethically and economically responsible manner.

Lecture – “Microeconomics 1”: By attending this lecture, students will

- Acquire the foundational knowledge of microeconomics required for the Bachelor's degree
- Be familiar with basic economic models of microeconomics
- Apply microeconomic models and interpret results in an economic context
- Develop economic and formal skills for developing solutions for practice tasks.

Prerequisites for the module or for individual courses in the module	
Course requirements for credits:	
Participation record:	None
Coursework:	<p>Written examination on each lecture (90 minutes) or portfolio, consisting of components completed throughout the semester such as:</p> <ul style="list-style-type: none"> -Creation of a digital service, such as an image or sound sequence (e.g., a podcast) -Development of a pictorial or graphic service (e.g., a graphic process representation, organizational and decision-making structure diagrams) -Creation of a computer-based service (e.g., programming an IT application) -Performing a creative service -Group work with a collaborative presentation -Oral presentations -Written reflection in the form of essay or brainstorming -Completing and submitting exercise sheets. <p>The portfolio comprises approximately 45 working hours. The type and scope of the individual elements of the portfolio will be communicated by the lecturers at the beginning of the course.</p>
Teaching and learning formats:	Lecture, exercise (students are required to present solutions to the practice tasks).
Module examination:	Form/duration/content, if applicable:
Final module examination:	
Cumulative module examination:	
Calculation of the module grades for cumulative module examinations:	