Georg-August-Universität
Göttingen

Directory of Modules

Master-/Promotionsstudiengang "Molekulare Biologie" - referring to: Pruefungs- und Studienordnung fuer den konsekutiven internationalen Master-/Promotionsstudiengang "Molekulare Biologie" (Amtliche Mitteilungen I 29/2013 p. 851, last revised through Amtliche Mitteilungen I Nr. 35/2014 p. 1065)

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I. Master-/Promotionsstudiengang "Molekulare Biologie"

1. Period I (intensive year)

The following modules comprising 90 C have to be passed.

a. Theoretical modules

The 4 following modules comprising 27 C have to be passed.

M.MolBio.11: DNA and Gene Expression (7 C)..... 6458

M.MolBio.12: Metabolic and Genetic Networks (5 C)..... 6459

M.MolBio.13: Functional Organization of the Cell, Immunology and Neuroscience (8 C)..... 6460

M.MolBio.14: Model Systems, Developmental Biology and Biotechnology (7 C)..... 6461

b. Practical modules

The 5 following modules comprising 56 C have to be passed.

M.MolBio.21: Methods Courses: Proteins (2 C)..... 6462

M.MolBio.22: Methods Courses: Nucleic Acids (3 C)..... 6463

M.MolBio.23: Methods Courses: Cell Biology and Genetics (3 C)..... 6464

M.MolBio.24: Methods Courses: Special Techniques in Molecular Biology (3 C)..... 6465

M.MolBio.25: Lab Rotations (45 C)..... 6466

c. Area of professionalisation

The 2 following modules comprising 7 C have to be passed.

M.MolBio.31: Professional Skills in Science (2 C)..... 6467

M.MolBio.32: Results of the Research Projects (5 C)..... 6468

2. Period II (Master's thesis)

A total of 30 C are awarded for passing the Master's thesis.

Georg-August-Universität Göttingen **Module M.MolBio.11: DNA and Gene Expression**	7 C

Learning outcome, core skills: The students gain an understanding of the mechanisms behind the major processes in information management in the cell, such as DNA replication and repair, transcription, RNA splicing, or RNA quality control. They acquire knowledge of the methods that are appropriate to address scientific questions in this field and learn how to choose the best experimental setup.	**Workload:** Attendance time: 80 h Self-study time: 130 h

Courses: **1. Lecture (40 h)** **2. Tutorial (40 h)**	

Examination: Part of comprehensive examination (§ 7 PStO) **Examination requirements:** DNA repair and recombination, DNA replication, transcription, RNA splicing and processing, RNA-based regulation, protein structure and function, enzyme regulation, application problems, methods to solve scientific problems related to information management.	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** PD Dr. Wilfried Kramer
Course frequency: once a year	**Duration:** 10 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Teaching capacity provided by:

Uni-Bio: 14h lecture, 14h tutorial; Med-VK: 4h lecture, 4h tutorial; MPIs/DPZ: 22h lecture, 22h tutorial

Georg-August-Universität Göttingen **Module M.MolBio.12: Metabolic and Genetic Networks**	5 C

Learning outcome, core skills: The students study the metabolic organization of the cell. After an introduction to essential processes (respiration, central metabolism, photosynthesis) they learn about the integration of metabolic processes at the different levels of metabolic or regulatory networks. Moreover, they learn how genomics and bioinformatics help to attain a new level of understanding of life.	**Workload:** Attendance time: 48 h Self-study time: 102 h

Courses: **1. Lecture (24 h)** **2. Tutorial (24 h)**	

Examination: Part of comprehensive examination **Examination requirements:** Basic metabolism, biological membranes, photosynthesis, metabolic networks, signal transduction, genomics, bioinformatics.	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** Prof. Dr. Ivo Feußner
Course frequency: once a year	**Duration:** 6 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Teaching capacity provided by:

Uni-Bio: 10h lecture, 10h tutorial; Med-VK: 6h lecture, 6h tutorial; Med-KT: 4h lecture, 4h tutorial; Uni-Agr: 4h lecture, 4h tutorial

Georg-August-Universität Göttingen **Module M.MolBio.13: Functional Organization of the Cell, Immunology and Neuroscience**	8 C

Learning outcome, core skills: The students study the internal organization of the eukaryotic cell, in particular processes at the membrane and the cytoskeleton. They learn how to identify methods suited to address problems in these fields. They gain profound knowledge of relevant methods to study membrane processes and will be able to judge their relevance. Moreover, the students study the human immune system and learn to understand the underlying principles of some of the most important diseases such as cancer and infectious diseases.	**Workload:** Attendance time: 88 h Self-study time: 152 h

Courses: **1. Lecture (44 h)** **2. Tutorial (44 h)**	

Examination: Part of comprehensive examination **Examination requirements:** Protein sorting and processing, membrane traffic, biosynthesis of organelles, autophagocytosis, nucleocytoplasmic transport, cytoskeleton, cell adhesion, cell cycle, apoptosis, cancer, immunology, infectious diseases, principles of pathogenicity, nervous and sensory systems	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** Prof. Dr. Reinhard Jahn
Course frequency: once a year	**Duration:** 11 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Teaching capacity provided by:

Med-VK: 3h lecture, 3h tutorial; Med-KT: 16h lecture, 16h tutorial; Med-KL: 4h lecture, 4h tutorial; Uni-Phy: 4h lecture, 4h tutorial; MPIs/DPZ: 17h lecture, 17h tutorial

Georg-August-Universität Göttingen **Module M.MolBio.14: Model Systems, Developmental Biology and Biotechnology**	7 C

Learning outcome, core skills: The students gain an understanding of the major prokaryotic and eukaryotic systems that are commonly used in basic research. They learn how to evaluate the pros and cons of the different systems and to decide which is appropriate for a given problem. A special focus in this module is on developmental biology. Here, the students understand how model systems contribute to the investigation of human development and how this is important for human health.	**Workload:** Attendance time: 72 h Self-study time: 138 h

Courses: **1. Lecture (36 h)** **2. Tutorial (36 h)**	

Examination: Part of comprehensive examination **Examination requirements:** Fungi, *Arabidopsis*, *Drosophila*, *C. elegans*, zebrafish, *Xenopus*, mouse, viral systems and their use in primate research, human genetics, biotechnology (bacteria, fungi, plants, tissue engineering).	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** Prof. Dr. rer. nat. Tomas Pieler
Course frequency: once a year	**Duration:** 9 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Teaching capacity provided by:

Uni-Bio: 14h lecture, 14h tutorial; Med-VK: 6h lecture, 6h tutorial; Med-KT: 6h lecture, 6h tutorial; Med-ENI: 2h lecture, 2h tutorial; MPIs/DPZ: 8h lecture, 8h tutorial

Georg-August-Universität Göttingen **Module M.MolBio.21: Methods Courses: Proteins**	2 C

Learning outcome, core skills: The students get introduced to the major methods for studying the properties of proteins such as protein preparation, gene expression analysis with microarrays and sequencing, analysis of protein-protein and nucleic acid-protein interactions. They learn when and how to apply these methods.	**Workload:** Attendance time: 48 h Self-study time: 12 h

Course: Introductory methods course (24 h)	

Examination: Oral group examination, not graded **Examination requirements:** Scientific hypotheses, experimental design, laboratory techniques, analysis, interpretation and scientific presentation of research results.	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** Prof. Dr. rer. nat. Tomas Pieler
Course frequency: once a year	**Duration:** 2 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 5	

Additional notes and regulations:

Teaching capacity provided by:

Uni-Bio: 18h; Med-VK: 24h; Med-KT: 6h

Georg-August-Universität Göttingen **Module M.MolBio.22: Methods Courses: Nucleic Acids**	3 C

Learning outcome, core skills: The students get introduced to the basic methods for working with nucleic acids and learn to understand the theoretical background behind these methods, including purification and electrophoresis of nucleic acids, polymerase chain reaction I, cDNA synthesis and cloning, sequence analysis and bioinformatics, modeling of biological networks, chemical and enzymatic analysis of RNA structure, and the spectroscopic characterization of nucleic acids.	**Workload:** Attendance time: 72 h Self-study time: 18 h

Course: Introductory methods courses (72 h)	

Examination: Oral group examination, not graded **Examination requirements:** Scientific hypotheses, experimental design, laboratory techniques, analysis, interpretation and scientific presentation of research results.	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** Prof. Dr. rer. nat. Tomas Pieler
Course frequency: once a year	**Duration:** 3 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 5	

Additional notes and regulations:

Teaching capacity provided by:

Uni-Bio: 18h; Med-VK: 6h; Med-KT: 12h; Uni-Agr: 6h; MPIs/DPZ: 30h

Georg-August-Universität Göttingen **Module M.MolBio.23: Methods Courses: Cell Biology and Genetics**	3 C

Learning outcome, core skills: The students get introduced to the basic methods of cell biology. They gain an understanding of the theoretical background behind these methods, which include light microscopy, analysis of cellular compartments, cell culture, and expression analysis.	**Workload:** Attendance time: 48 h Self-study time: 42 h

Course: Introductory methods courses (48 h)	

Examination: Oral group examination, not graded **Examination requirements:** Scientific hypotheses, experimental design, laboratory techniques, analysis, interpretation and scientific presentation of research results.	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** Prof. Dr. rer. nat. Tomas Pieler
Course frequency: once a year	**Duration:** 3 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 5	

Additional notes and regulations:

Teaching capacity provided by:

Med-VK: 30h; Med-KT: 6h; MPIs/DPZ: 12h

Georg-August-Universität Göttingen **Module M.MolBio.24: Methods Courses: Special Techniques in Molecular Biology**	3 C

Learning outcome, core skills: The students get introduced to a selection of advanced special methods and gain an understanding of the theoretical background behind these methods. The advanced special courses cover structural analysis of protein and protein structure validation, (3D-Cryo) electron microscopy, NMR spectroscopy, mass spectrometry, and proteomics.	**Workload:** Attendance time: 48 h Self-study time: 42 h

Course: Advanced methods courses (48 h)	

Examination: Oral group examination, not graded **Examination requirements:** Scientific hypotheses, experimental design, laboratory techniques, analysis, interpretation and scientific presentation of research results.	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** Prof. Dr. rer. nat. Tomas Pieler
Course frequency: once a year	**Duration:** 2 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 5	

Additional notes and regulations:

Teaching capacity provided by:

MPIs/DPZ: 48h

Georg-August-Universität Göttingen **Module M.MolBio.25: Lab Rotations**	45 C

Learning outcome, core skills: In these individually supervised research projects, the students acquire the skills to organize a scientific project, from defining the scientific question, identifying the appropriate methods, performing the experiments, and evaluating the experiments, to presenting and discussing the results in written and oral reports. The students are encouraged to select their research projects from different research areas and methodological approaches.	**Workload:** Attendance time: 720 h Self-study time: 630 h

Course: Three Lab Rotations (8 weeks, 40 h teaching, 200 h laboratory work each)	

Examination: 3 lab reports, not graded **Examination requirements:** Scientific hypotheses, experimental design, laboratory techniques, analysis, interpretation and scientific presentation of research results.	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** Prof. Dr. Reinhard Jahn
Course frequency: once a year	**Duration:** 24 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 1	

Georg-August-Universität Göttingen **Module M.MolBio.31: Professional Skills in Science**	2 C

Learning outcome, core skills: The students are trained in scientific writing and oral presentation skills which enable them to adequately structure and compose scientific texts, particularly for written and oral reports on experimental findings in the field of their studies. They get introduced to the principles of good scientific practice and comprehension of adequate measures to secure ethical standards in science. In addition, the students gain an understanding of laboratory safety principles and knowledge of adequate measures and procedures to secure laboratory safety standards in a research environment.	**Workload:** Attendance time: 26 h Self-study time: 34 h

Courses:	
1. Seminar / Workshop: Scientific Writing and Graphics (12 h) (Seminar)	
2. Seminar / Workshop: Oral Presentation of Scientific Results (6 h) (Seminar)	
3. Seminar / Workshop: Laboratory Safety (4 h) (Seminar)	
4. Seminar / Workshop: Good Scientific Practice (4 h) (Seminar)	

Examination: Oral presentation, scientific text, oral group examination, not graded **Examination requirements:** Demonstration of writing competence, oral presentation skills, understanding of ethical codes of conduct and knowledge of lab safety rules and regulations in a scientific context in the English language at an advanced level.	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** Prof. Dr. Reinhard Jahn
Course frequency: once a year	**Duration:** 8 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 20	

Additional notes and regulations:

Teaching capacity provided by:

Uni-Bio: 6h; Med-ENI: 12h; MPIs/DPZ: 8h

Georg-August-Universität Göttingen **Module M.MolBio.32: Results of the Research Projects**	5 C

Learning outcome, core skills: The specific skills practiced in the seminar include efficient and concise presentation of own scientific results in English, supported by power point presentations, development of a differentiated scientific vocabulary, and the critical discussion of the scientific data in the broader context of their relevance for current research in the molecular biosciences.	**Workload:** Attendance time: 28 h Self-study time: 122 h

Course: Seminar (28 h) (Seminar)	

Examination: Two oral presentations per student, group discussion, not graded **Examination requirements:** Demonstration of adequate oral presentation skills including the critical discussion and evaluation of the data presented.	

Admission requirements: none	**Recommended previous knowledge:** -
Language: English	**Person responsible for module:** Prof. Dr. Reinhard Jahn
Course frequency: once a year	**Duration:** 8 weeks
Number of repeat examinations permitted: once	**Recommended semester:**
Maximum number of students: 1	

Additional notes and regulations:

Teaching capacity provided by:

MPIs/DPZ: 28h