Master Molecular Life Sciences –
Microbiology, Biotechnology and Biochemistry

MSc/PhD Program

Molecular Life Sciences -

Microbiology, Biotechnology and Biochemistry

Prof. Dr. Stefanie Pöggeler

spoegge@gwdg.de

UNIVERSITÄT
GÖTTINGEN

21_06_2024

Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry

Key feature:

Research-oriented Studies

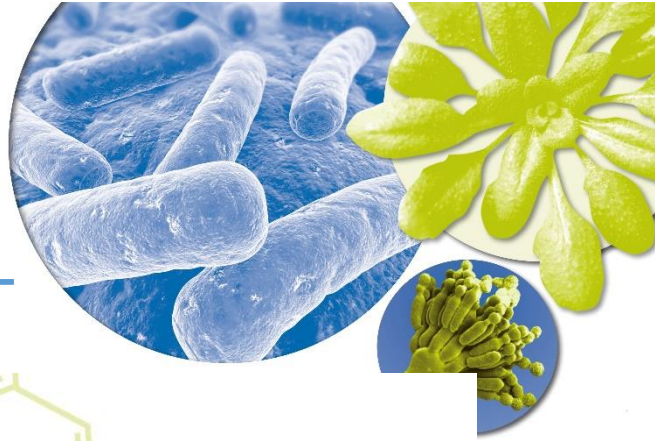
Primary Model Organisms:

Microorganisms (single cell, multicellular)

↕ Plant-Microbe Interactions

Plants

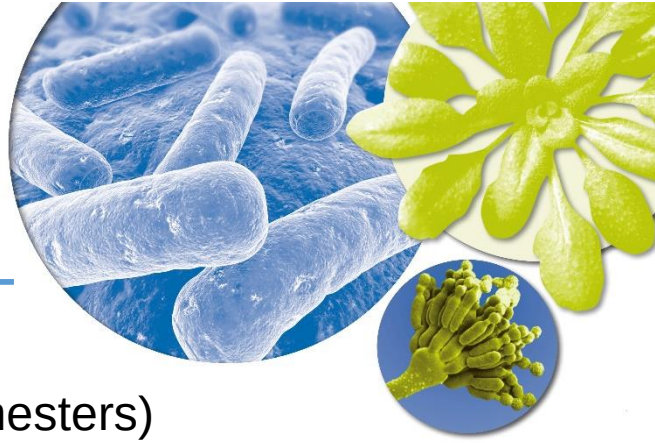
Master Molecular Life Sciences –
Microbiology, Biotechnology and Biochemistry



Subjects

- Biochemistry
- Structural Biology
- Molecular Genetics
- Cell Biology
- Microbiology
- Biotechnology
- Plant Molecular Biology
- Plant-Microbe Interactions
- Chemical Biology
- -Omics
- Biophysics
- Bioinformatics

Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry



Key features

→ from BSc to MSc in 2 years (4 semesters)

→ consistent focused program

→ 120 credits according to the European Credit Transfer System (ECTS)

→ program limited to 48 students

→ English as main teaching language

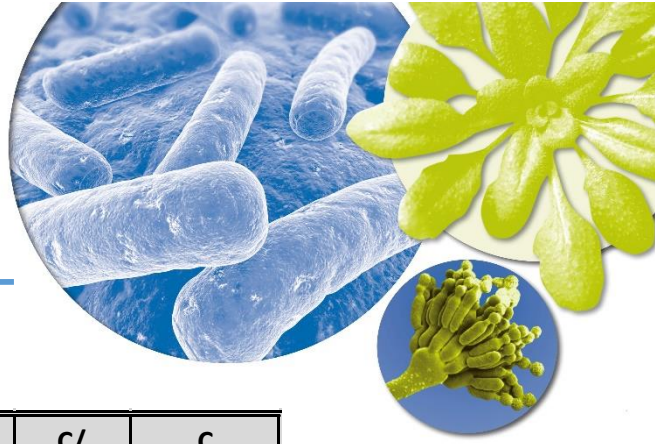
→ practical training in small groups with state of the art equipment

→ inspiring international research environment

→ complementary training (“soft skills”)

→ direct access to the PhD programs of the faculty for excellent students

Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry



Basic structure

module	number	structure and options		C/ module	C total
core module	**3**	lecture + seminar/tutorial + methods course	choice of 7 different modules	**12**	**36**

Seven Core Modules

"General and Applied Microbiology”

”Molecular Genetics & Microbial Cell Biology”

„Applied Bioinformatics in Molecular Bioscience“

"Enzyme Catalysis and Chemical Biology"

"Cell & Molecular Biology of Plant-Microbe Interactions”

“Structural Biochemistry”

“Biochemistry & Biophysics”

„M.Bio.101 General & Applied Microbiology"

Biology

Prof. Jörg Stülke

Metabolic and Regulatory Patterns in Bacterial Cells

Regulated protein-RNA Interaction

PD Dr. Michael Hoppert

Biomineral formation

Terrestrial microalgal biofilms

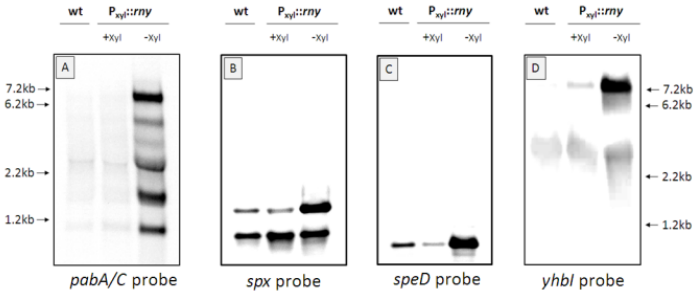
Prof. Rolf Daniel

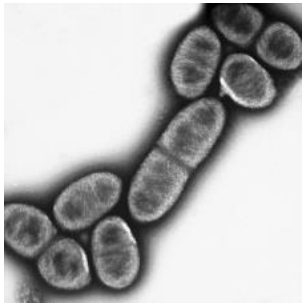
PD Dr. Heiko Liesegang

(Meta)genomics

Applied Microbiology
Synthetic Microbiology

Genes and enzymes for biotechnology





BioMik GenoTech Network Centre Göttingen

GenoMik

„M.Bio.102 Molecular Genetics & Microbial Cell Biology“

Biology

Prof. Stefanie Pöggeler

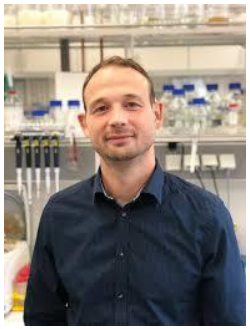
Fruiting-body Development in Filamentous Ascomycetes

Prof. Gerhard Braus

Fungal Genetics, Development and Cell Biology

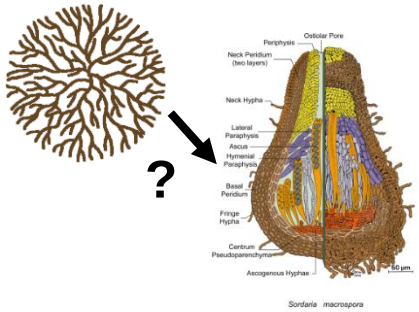
Prof. Heike Krebber

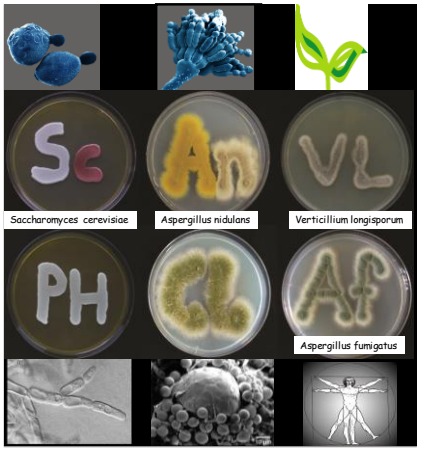
Nucleocytoplasmic Transport

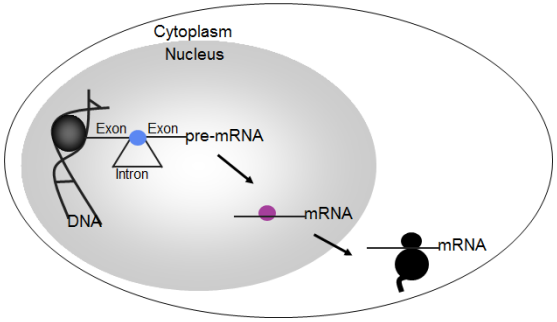


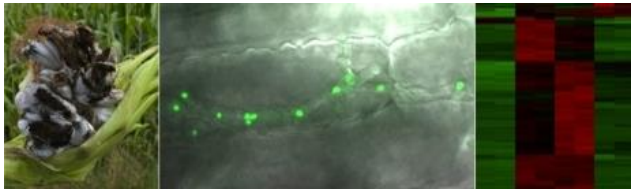
Prof. Kai Heimel

Unfolded Protein Response in Filamentous Fungi









„M.Bio.105 Applied Bioinformatics in Molecular Bioscience"

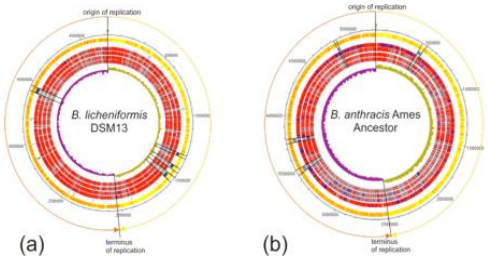
Biology

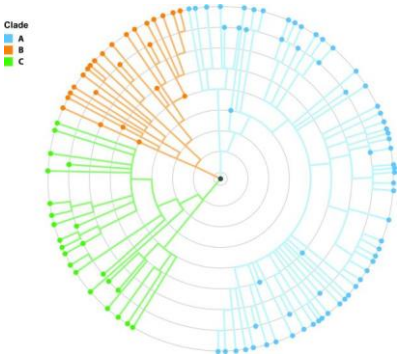
Prof. Rolf Daniel

PD Dr. Heiko Liesegang

Handling of programs, bioinformatic tools and databases with respect to data-driven Omics-based research

- **Application of bioinformatic approaches in molecular phylogeny, evolution, genome dynamics und (meta)Omics**
- **Bioinformatic analysis of RNAs and proteins**
- **Identification of motifs and genes**
- **Generation and analysis of metabolic models and networks**





„M.Bio 108 Enzyme Catalysis & Chemical Biology"

Biology

Prof. Kai Tittmann

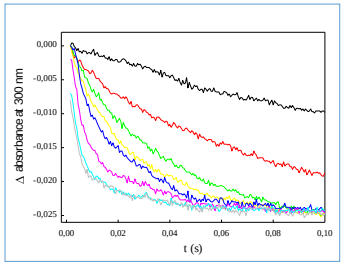
Reaction mechanisms of thiamin-dependent enzymes and flavoenzymes

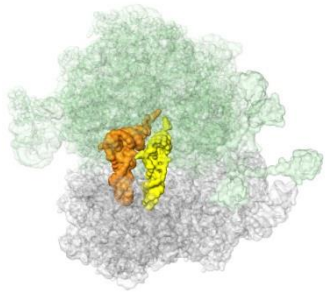
MAX-PLANCK-GESELLSCHAFT

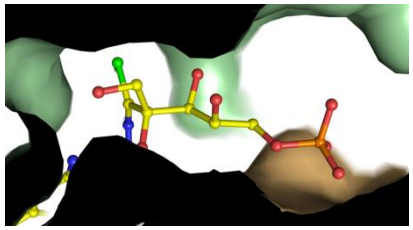
MPI for Multidisciplinary Science

Prof. Marina Rodnina

Kinetics of Bacterial Translation







- **Reaction mechanisms of enzymes and macromolecular machines**

- **Kinetics and thermodynamics of biochemical reactions**

- **Synthesis of biooligomers and ligands**

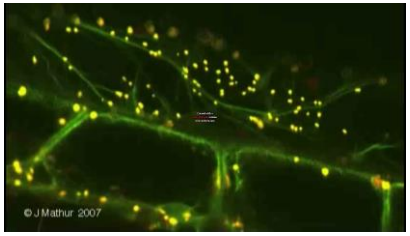
- **Chemical model systems of enzymes**

„M.Bio.104 Cell & Molecular Biology of Plant-Microbe Interactions"

Biology

Prof. Volker Lipka

Signal perception & dynamic cellular defence in plant innate immunity



Biology

Prof. N.N.

Molecular Stress Physiology

„M.Bio.107 Biochemistry & Biophysics"

Biology

Prof. Ivo Feussner

Biochemical analysis of
carbohydrates, lipids, proteins and nucleic acids
(HPLC / GC / GCMS / UPLCMS / ESIMS)
Plant biotechnology for production of renewable resources

Chemistry

Prof. Claudia Steinem

Chemistry

Prof. Andreas Janshoff

Spectroscopy of biomolecules
(fluorescence, FT-IR, CD, UV/Vis),
optical microscopy, scanning probe techniques

- **Plant primary and secondary metabolism → Metabolomics**
- **Lipid metabolism, enzymes of lipid metabolism and lipids as signal molecules**
- **Modern biophysical methods for analysis of biomolecules**
- **Molecular biochemistry and biophysics of different classes of biomolecules**
- **Functional analysis of membrane proteins**

„M.Bio.106 Structural Biochemistry"

Biology

Prof. Ralf Ficner

Molecular structural biology

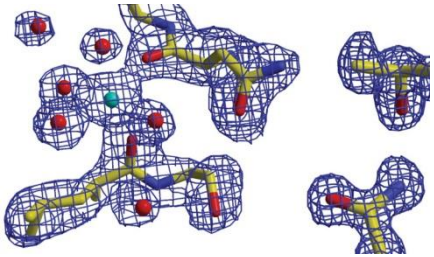
RNA processing & transport

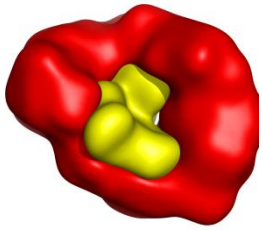
MAX-PLANCK-GESELLSCHAFT

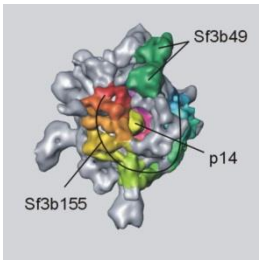
MPI for Multidisciplinary Science

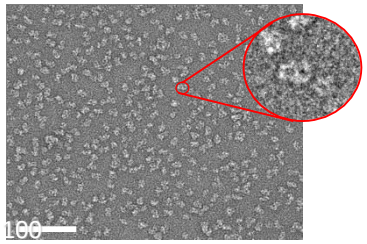
Prof. Holger Stark

3D Electron Cryomicroscopy









Structure-function relationship
Protein-Protein interaction
Protein-RNA-DNA recognition

Structure-based drug design

Methods in Structural Biology
X-ray crystallography
NMR spectroscopy
Electron Microscopy
Computational Methods

Profile module (12C)

module	number	structure and options		C/ module	C total
core module	**3**	lecture + seminar/tutorial + methods course	choice of 7 different modules	**12**	**36**
profile module	**1**	additional core module MLS core module DNB, MSc Chemistry interdisciplinary courses*		**12**	**12**

(flexibility option)

*** permission of examination board required**

examples for approved external profile modules:

University Uppsala, **Sweden**
University of Queensland, Brisbane, **Australia**
Sanford Burnham Medical Research Institute, San Diego, **USA**
Donnelly Center, Toronto, **Canada**
Sainsbury Laboratory, Norwich, **United Kingdom**
University of Exeter, **United Kingdom**
University of Aberdeen, **United Kingdom**
Massey University, **New Zealand**

Module M.MM.101 "Biomolecules and Pathogens" of Master program "**Molecular Medicine**" in **Göttingen**

Internships in departments of the **MPI for Multidisciplinary Science**, **Göttingen**

Internship in pharmaceutical or chemistry industry:
Henkel AG & Co, **Düsseldorf,** Bayer Crop Science, **Monheim,** DSM Nutritional Products, **Basel,** BASF, **Ludwigshafen**

Key Competence Module (2-12C)

module	number	structure and options		C/ module	C total
core module	**3**	lecture + seminar/tutorial + methods course	choice of 7 different modules	**12**	**36**
profile module	**1**	additional core module MLS core module DNB, MSc Chemistry interdisciplinary courses*		**12**	**12**
key competence module		course offer cross faculty, ZESS course offer MLS, Chemistry, DNB, BEE interdisciplinary courses*		**2-12**	**12**

e.g.

language courses

German language courses (6 C) for students with fair language skills (B1)

„Industry excursions“

MLS = Master „Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry"
DNB = Master "Developmental, Neural, and Behavioral Biology
BEE = Master "Biodiversity and Ecology"
ZESS = "Zentrale Einrichtung für Sprach- und Schlüsselkompetenzen„ (e.g. language courses)

Master Programme (M.Bio.150)
Key Competence Module "Industry excursion" (3C)"

- 3 days excursion: WS semester break
- visit of companies which hire molecular biologists/biochemists
- get an insight into the job of molecular biologist/biochemist in the industry

Master Programme (M.Bio.149)
Key Competence Module
"Planing and organization of Industry excursons (3C)"

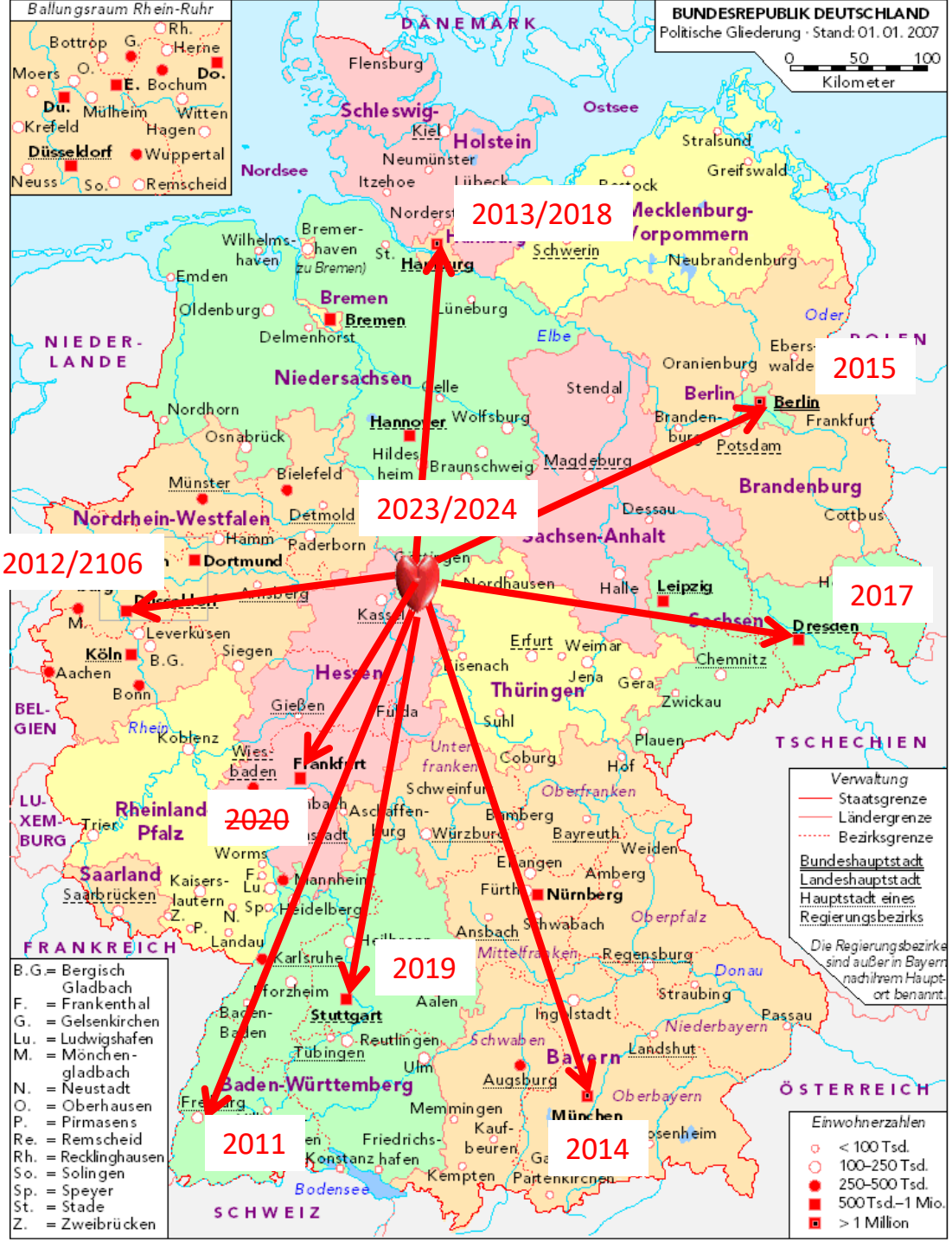
- selection and contact of the companies
- travel organization: bus operators, youth hostal etc.

Admission requirements: participitation in the core module M.Bio.102 "Molecular Genetics and Microbial Cell Biology"

West
North
South
East
South-East

~~2021~~

~~2022~~



Industry excursion 2024 Göttingen

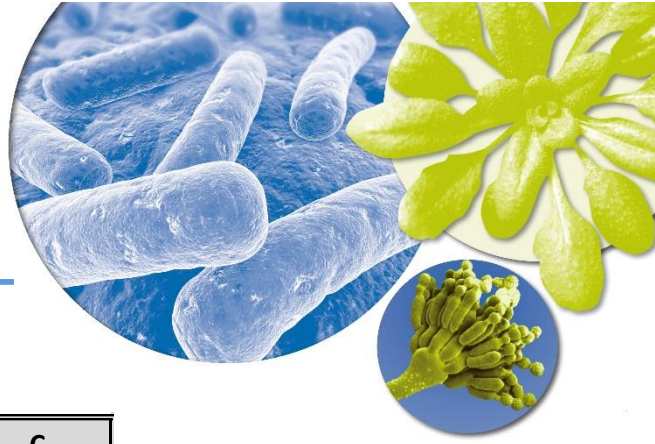
Plant breeding and seed company KWS Saat AG Einbeck

Global supplier of fragrances, flavors, and ingredients for both food and cosmetics, Holzminden

Pharmaceutical company Evotec, Göttingen

NextPharma contract development and manufacturing company. Production of high variety of pharmaceutical dosage forms which include solids, liquids and semi-solids., Göttingen

Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry



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key competence module		course offer cross faculty, ZESS course offer MLS, Chemistry, DNB, BEE interdisciplinary courses*		**2-12**	**12**
advanced module	**1**	7 weeks lab course I		**12**	**30**
	1	7 weeks lab course II		**12**	
	1	scientific project management		**6**	
Master thesis (26 weeks)					**30**

Master Molecular Life Sciences – Microbiology, Biotechnology and Biochemistry

Basic structure

module	number	structure and options		C/ module	C total
core module	3	lecture + seminar/tutorial + methods course	choice of 7 different modules	12	36
profile module	1	additional core module MLS core module DNB, MSc Chemistry interdisciplinary courses*		12	12
key competence module		course offer cross faculty, ZESS course offer MLS, Chemistry, DNB, BEE interdisciplinary courses*		2-12	12
advanced module	1	7 weeks lab course I		12	30
	1	7 weeks lab course II		12	
	1	scientific project management		6	
Master thesis (26 weeks)					30

*** Permission of examination board required**

MLS = Master Molecular Life Sciences: Microbiology , Biotechnology and Biochemistry

DNB = Master Developmental, Neural and Behavioral Biology

BEE = Master Biodiversity, Ecology and Evolution

ZESS = Zentrale Einrichtung für Sprach- und Schlüsselkompetenzen

Curriculum

examplary study plan	
core I	12
core II	12
key competence	6
profile	12
core III	12
key competence	6
advanced I	12
advanced II	12
scientific project management	6
Master thesis	30

PhD (GAUSS)

Timetable winter term

Time/ Weekday	Monday	Tuesday	Wednesday	Thursday	Friday
8 - 9	M.Bio.101/M.Bio.141 Microbiology (lecture/seminar) **	M.Bio.102/M.Bio.142 Genetics and cell biology (lecture/seminar)**	M.Bio.108/158 Enzymes and biolog Chemistry (lecture/tutorial)	M.Bio.102/M.Bio.142 (lecture/seminar)**	M.Bio.101/M.Bio.141 (lecture/seminar)**
9 - 10					
10 - 11	M.Bio.108/M.Bio.158 (lecture/tutorial)				
11 - 12					

block methods courses

October			November			December			January			February		
1	Sa		1	Di	Isolation of biotechn relev MOs or Signaltransduction in bacteria	1	Do	M.Bio.102	1	So	christmas break	1	Mi	M.Bio.108 Enzyme catalysis and biological chemistry
2	So		2	Mi		2	Fr		2	Mo		2	Do	
3	Mo	Tag der Deutschen Einheit	3	Do		3	Sa		3	Di		3	Fr	
4	Di		4	Fr		4	So		4	Mi		4	Sa	
5	Mi		5	Sa		5	Mo	bioinformatics sciences	5	Do				
6	Do	introductory meeting	6	So		6	Di		6	Fr				
7	Fr		7	Mo		7	Mi		7	Sa				
8	Sa		8	Di		8	Do		8					
9	So		9	Mi		9	Fr							
10	Mo		10	Do		10	Sa							
11	Di		11	Fr		11	So					11	Sa	
12	Mi		12	Sa								12	So	
13	Do		13	So								13	Mo	
14	Fr		14	Mo					14	Sa		14	Di	
15	Sa		15						15	So		15	Mi	
16	So								16	Mo		16	Do	
17	Mo								17	Di		17	Fr	
18	Di					18	So		18	Mi		18	Sa	
19	Mi					19	Mo		19	Do		19	So	
20	Do					20	Di		20	Fr		20	Mo	
21	Fr		21	Mo	M.Bio.102 Molecular genetics and microbial ce	21	Mi		21	Sa	M.Bio.105 Applied bioinformatics in molecular biosciences	21	Di	
22	Sa		22	Di		22	Do		22	So		22	Mi	
23	So		23	Mi		23	Fr		23	Mo		23	Do	
24	Mo	M.Bio.101 General and applied microbiology	24	Do		24	Sa	christmas break	24	Di		24	Fr	
25	Di		25	Fr		25	So		25	Mi		25	Sa	
26	Mi		26	Sa		26	Mo		26	Do		26	So	
27	Do		27	So		27	Di		27	Fr		27	Mo	
28	Fr		28	Mo		28	Mi		28	Sa		28	Di	
29	Sa		29	Di		29	Do		29	So				
30	So		30	Mi		30	Fr		30	Mo	M.Bio.108			
31	Mo					31	Sa		31	Di				

Example! Check current schedule and course dates online.

Timetable summer term

Time/ Weekday	Monday	Tuesday	Wednesday	Thursday	Friday
8 - 9	M.Bio.107/147 Biochemistry and Biophysics (lecture)	M.Bio.104/144 Plant-microbe-IA (lecture)	Plant-microbe-IA (lecture)	M.Bio.107/147 Biochemistry and Biophysics (lecture/tutorial)	Structural Biochemistry (lecture/seminar)
9 - 10			Plant-microbe-IA (seminar)		
10 - 11			M.Bio.106/156 Structural Biochemistry (lecture)		
11 - 12					

block methods courses

April		May		June		July		August	
1 Sa		1 Mo		1 Do		1 Sa		1 Mo	
2 So		2 Di		2 Fr		2 So		2 Di	
3 Mo		3 Mi		3 Sa		3 Mo		3 Mi	
4 Di		4 Do		4 So		4		4 Do	
5 Mi		5 Fr		5 Mo		5		5 Fr	
6 Do		6 Sa		6 Di		6		6 Sa	
7 Fr		7 So		7		7		7 Mo	
8 Sa	easter break	8 Mo						8 Di	
9 So	easter break	9 Di						9 Mi	
10 Mo	easter break	10 Mi				Mo		10 Do	
11 Di	M.Bio.104 Cellular and molecular biology of plant-...		M.Bio.107 Biochemistry or Biop...		M.Bio.108 Structural Biochemistry	11 Di		11 Fr	
12 Mi						12 Mi		12 Sa	
13 Do						13 Do		13 So	
14 Fr				14 Mi		14 Fr		14 Mo	
15 Sa				15 Do		15 Sa		15 Di	
16 So				16 Fr		16 So		16 Mi	
17 Mo				17 Sa		17 Mo		17 Do	
18 Di		18 Do		18 So		18 Di		18 Fr	
19 Mi		19 Fr		19 Mo		19 Mi		19 Sa	
20 Do		20 Sa		20 Di		20 Do		20 So	
21 Fr		21 So		21 Mi		21 Fr		21 Mo	
22 Sa		22 Mo		22 Do		22 Sa		22 Di	
23 So		23 Di		23 Fr		23 So		23 Mi	
24 Mo		24 Mi		24 Sa		24 Mo		24 Do	
25 Di		25 Do		25 So		25 Di		25 Fr	
26 Mi		26 Fr		26 Mo		26 Mi		26 Sa	
27 Do		27 Sa		27 Di		27 Do		27 So	
28 Fr		28 So		28 Mi		28 Fr		28 Mo	
29 Sa		29 Mo		29 Do		29 Sa		29 Di	
30 So		30 Di		30 Fr		30 So		30 Mi	
		31 Mi				31 Mo		31 Do	

Example! Check current schedule and course dates online.

Welcome to Göttingen!