LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Module Catalogue

Master's Programme: Biochemie (Master of Science, M.Sc.)

(120 ECTS credits)

Based on the *Prüfungs- und Studienordnung* of 1 January 2015

88/025/---/M0/H/2015

Issued on 01 August 2015

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Abbrevations and annotations

CP	Credit Points, ECTS credits
ECTS	European Credit Transfer and Accumulation System
h	hours
SoSe	summer semester
SWS	contact hours
WiSe	winter semester
WP	compulsory elective Module / course
P	mandatory Module / course

1. The ECTS credits assigned in the Module Catalogue are designated as follows: Credit Points not listed in parentheses are awarded when the pertinent examination of the Module or Module parts have/has been completed successfully. Credit Points in parentheses are listed for calculatory purposes only.

2. The semester for taking a Module can either be binding or may be considered as a recommendation, depending on the applicable data in Anlage 2 of the *Prüfungs- und Studienordnung* for your Programme. In this Module catalogue, the options are indicated as "scheduled semester" and "recommended semester".

3. Please note: The Module Catalogue is merely intended to serve as an orientation whereas the provisions of the applicable version of the *Prüfungs- und Studienordnung* (in German only) of your Programme are legally binding. See: www.lmu.de/studienangebot and select your Programme.

Module: P 1 Main topic Biochemistry - practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	P 1.1 Advanced research practical course in Biochemistry	WiSe and SoSe	240 h (16 SWS)	120 h	(12)
Seminar	P 1.2 Advanced seminar in Biochemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 15 ECTS credits have to be acquired. Class attendance averages about 18 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Biochemistry. Supervised by a professional scientist students get involved in a current research project. During the **practical course** they apply modern techniques and complement and deepen their methodical skills and theoretical knowledge. Students learn to plan and execute scientific experiments independently. At the **accompanying seminar** students extend their expertise of the research topic and present and discuss their own research results.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - transfer of theoretical knowledge to practical applications - planning and execution of complex experimental set-ups - recognition and estimation of security questions while handling hazardous material - decision making and critical interpretation and evaluation of experimental data - appraisal, presentation and discussion of research data

	and results
Type of examination	Practical course report or practical course evaluation
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Beckmann
Language(s)	English
Additional information	

Module: P 2 Main Topic Biochemistry I

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	P 2.1 Life cycle of proteins	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	P 2.2 Flow of genetic information	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	P 2.3 Model organisms	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 6 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 2 semesters.
Content	The module broadens and deepens special professional knowledge from the field of Biochemistry. The lectures cover key aspects of protein biochemistry, genome biology, and the most important model organisms used in modern research.
Learning outcomes	Students are introduced to up-to-date topics of current research in Biochemistry. They broaden their already acquired knowledge with current and special topics from Biochemistry. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.

Responsible contact	Prof. Hopfner
Language(s)	English

Additional information

Module: P 3 Fundamentals in data analysis

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	P 3.1 Practical Bioinformatics	WiSe and SoSe	15 h (1 SWS)	30 h	(1,5)
Exercise course	P 3.2 Tutorial in practical Bioinformatics	WiSe and SoSe	15 h (1 SWS)	30 h	(1,5)
Lecture	P 3.3 Statistics and data analysis	WiSe and SoSe	15 h (1 SWS)	30 h	(1,5)
Exercise course	P 3.3 Tutorial statistics and data analysis	WiSe and SoSe	15 h (1 SWS)	30 h	(1,5)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 1 semester.
Content	The module will introduce basic quantitative skills essential for understanding modern methods in structural biology and functional genomics. The module covers the application of bioinformatic methods to problems in biochemstry research and the implementation of statistics and data analysis to work on scientific problems. During accompaning tutorials the acquired knowledge will be practised.
Learning outcomes	Students acquire knowledge in basic and advanced quantitative methods and the skills to apply these methods to biologycal examples. They have the skills to use bioinformatic methods, statistics and data analysis to critical evaluate experimental data.

Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Gaul
Language(s)	English
Additional information	

Module: WP 1 Extension topic Lecture on Molecular System Biology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 1.1 Lecture on Molecular System Biology	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. Regarding the individual choice of modules, there are two options. ***Option A:*** From the compulsory elective fields "Extension Topic Molecular System Biology", "Extension Topic Structural Biology", "Extension Topic Molecular and Celeular Genetics", "Extension Topic Genetics", "Extension Topic Human Biology", "Extension Topic Molecular Plant Sciences", "Extension Topic Immunology", "Extension Topic Cell Biology", "Extension Topic Microbiology", "Extension Topic Virology", "Extension Topic Evolutionary Biology", "Extension Topic Neurobiology", „Extension Topic Informatics", "Subject-specific Extension Topic to Biochemistry", "Extension Topic Biological Chemistry", "Extension Topic Inorganic Chemistry", "Extension Topic Organic Chemistry", "Extension Topic Physical Chemistry" and "Extension Topic Theoretical Chemistry", three compulsory elective fields must be taken. In doing so, from the compulsory elective modules WP 1 - WP 7, WP 10 - WP 26 and WP 33 - WP 51, 1. for the compulsory elective field "Extension Topic Molecular System Biology", the compulsory elective modules WP 1, WP 10 and WP 11, 2. for the compulsory elective field "Extension Topic Structural Biology", the compulsory elective modules WP 2, WP 12 and WP 13,

3. for the compulsory elective field "Extension Topic Molecular and Cellular Genetics", the compulsory elective modules WP 3 and WP 14,
4. for the compulsory elective field "Extension Topic Genetics", the compulsory elective modules WP 4 and WP 15,
5. for the compulsory elective field "Extension Topic Human Biology", the compulsory elective modules WP 5 and WP 16,
6. for the compulsory elective field "Extension Topic Molecular Plant Sciences", the compulsory elective modules WP 6 and WP 17,
7. for the compulsory elective field "Extension Topic Immunology", the compulsory elective modules WP 7 and WP 18,
8. for the compulsory elective field "Extension Topic Cell Biology", the compulsory elective modules WP 19 and WP 33,
9. for the compulsory elective field "Extension Topic Microbiology", the compulsory elective modules WP 20 and WP 34,
10. for the compulsory elective field "Extension Topic Virology", the compulsory elective modules WP 21 and WP 35,
11. for the compulsory elective field "Extension Topic Evolutionary Biology", the compulsory elective modules WP 22 and WP 36,
12. for the compulsory elective field "Extension Topic Neurobiology", the compulsory elective modules WP 23 and WP 37,
13. for the compulsory elective field "Extension Topic Informatics", from the compulsory elective modules WP 24 - WP 26, WP 38 and WP 39, modules with a total value of 15 ECTS credits,
14. for the compulsory elective field "Subject-specific Extension Topic to Biochemistry", the compulsory elective modules WP 40 and WP 41,
15. for the compulsory elective field "Extension Topic Biological Chemistry", the compulsory elective modules WP 42 and WP 43,
16. for the compulsory elective field "Extension Topic Inorganic Chemistry", the compulsory elective modules WP 44 and WP 45,
17. for the compulsory elective field "Extension Topic Organic Chemistry ", the compulsory elective modules WP 46 and WP 47,
18. for the compulsory elective field "Extension Topic Physical Chemistry ", the compulsory elective modules WP 48 und WP 49,
19. for the compulsory elective field "Extension Topic Theoretical Chemistry ", the compulsory elective modules WP 50 and WP 51

must be taken.

Option B:

From the compulsory elective fields "Extension Topic Molecular System Biology", "Extension Topic Structural Biology", "Extension Topic Molecular and Celeular Genetics", "Extension Topic Genetics", "Extension Topic Human Biology", "Extension Topic Molecular Plant Sciences", "Extension Topic Immunology", "Extension Topic Cell Biology", "Extension Topic Microbiology", "Extension Topic Virology", "Extension Topic Evolutionary Biology", "Extension Topic Neurobiology", „Extension Topic Informatics", "Subject-specific Extension Topic to Biochemistry", "Extension Topic Biological Chemistry", "Extension Topic Inorganic Chemistry", "Extension Topic Organic Chemistry", "Extension Topic Physical Chemistry" and "Extension Topic Theoretical Chemistry", one compulsory field must be taken.

In doing so, from the compulsory elective modules WP 1 - WP 7, WP 10 - WP 26 and WP 33 - WP 51,

1. for the compulsory elective field "Extension Topic Molecular System Biology", the compulsory elective modules WP 1, WP 10 and WP 11,
2. for the compulsory elective field "Extension Topic Structural Biology", the compulsory elective modules WP 2, WP 12 and WP 13,
3. for the compulsory elective field "Extension Topic Molecular and Cellular Genetics", the compulsory elective modules WP 3 and WP 14,
4. for the compulsory elective field "Extension Topic Genetics", the compulsory elective modules WP 4 and WP 15,
5. for the compulsory elective field "Extension Topic Human Biology", the compulsory elective modules WP 5 and WP 16,
6. for the compulsory elective field "Extension Topic Molecular Plant Sciences", the compulsory elective modules WP 6 and WP 17,
7. for the compulsory elective field "Extension Topic Immunology", the compulsory elective modules WP 7 and WP 18,
8. for the compulsory elective field "Extension Topic Cell Biology", the compulsory elective modules WP 19 and WP 33,
9. for the compulsory elective field "Extension Topic Microbiology", the compulsory elective modules WP 20 and WP 34,
10. for the compulsory elective field "Extension Topic Virology", the compulsory elective modules WP 21 and WP 35,
11. for the compulsory elective field "Extension Topic Evolutionary Biology", the compulsory elective modules WP 22 and WP 36,
12. for the compulsory elective field "Extension Topic

Neurobiology", the compulsory elective modules WP 23 and WP 37,
13. for the compulsory elective field "Extension Topic Informatics", from the compulsory elective modules WP 24 - WP 26, WP 38 and WP 39, modules with a total value of 15 ECTS credits,
14. for the compulsory elective field "Subject-specific Extension Topic to Biochemistry", the compulsory elective modules WP 40 and WP 41,
15. for the compulsory elective field "Extension Topic Biological Chemistry", the compulsory elective modules WP 42 and WP 43,
16. for the compulsory elective field "Extension Topic Inorganic Chemistry", the compulsory elective modules WP 44 and WP 45,
17. for the compulsory elective field "Extension Topic Organic Chemistry ", the compulsory elective modules WP 46 and WP 47,
18. for the compulsory elective field "Extension Topic Physical Chemistry ", the compulsory elective modules WP 48 und WP 49,
19. for the compulsory elective field "Extension Topic Theoretical Chemistry ", the compulsory elective modules WP 50 and WP 51

must be taken.

From the compulsory elective fields "Main Topic Zellbiologie", "Main Topic Mikrobiologie", "Main Topic Anorganische Chemie", "Main Topic Organische Chemie", "Main Topic Physikalische Chemie" and "Main Topic Theoretische Chemie", one compulsory elective field must be taken.

In doing so, from the compulsory elective modules WP 8, WP 9, WP 27 - WP 32 and WP 52 - WP 57,

1. for the compulsory elective field "Main Topic Cell Biology", the compulsory elective modules WP 8, WP 27 and WP 52,
2. for the compulsory elective field "Main Topic Microbiology", the compulsory elective modules WP 9, WP 28 and WP 53,
3. for the compulsory elective field "Main Topic Inorganic Chemistry", the compulsory elective modules WP 29 and WP 54,
4. for the compulsory elective field "Main Topic Organic Chemistry", the compulsory elective modules WP 30 and WP 55,
5. for the compulsory elective field "Main Topic Physical Chemistry", the compulsory elective modules WP 31 and WP 56,
6. for the compulsory elective field "Main Topic Theoretical Chemistry", the compulsory elective modules WP 32 and WP 57

	must be taken. Once having taken the compulsory elective field "Extension Topic Cell Biology", you may not take the compulsory elective field "Main Topic Cell Biology". Once having taken the compulsory elective field "Extension Topic Microbiology", you may not take the compulsory elective field "Main Topic Microbiology ". Once having taken the compulsory elective field "Extension Topic Inorganic Chemistry", you may not take the compulsory elective field "Main Topic Inorganic Chemistry ". Once having taken the compulsory elective field "Extension Topic Organic Chemistry ", you may not take the compulsory elective field "Main Topic Organic Chemistry ". Once having taken the compulsory elective field "Extension Topic Physical Chemistry", you may not take the compulsory elective field "Main Topic Physical Chemistry ". Once having taken the compulsory elective field "Extension Topic Theoretical Chemistry", you may not take the compulsory elective field "Main Topic Theoretical Chemistry ".
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 1 semester.
Content	Regulation of transcription/translation from a genome-wide perspective (enhancer, promoter, general and specific transcription factors, chromatin), genome-wide identification of gene functions and pathways, analysis of regulatory networks
Learning outcomes	Introduce students the concepts and methods of MSB with topical examples; familiarize students with NGS and other high throughput experiments; forming and testing hypotheses using statistical data; prepare students for WP10 and WP11.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Gaul
Language(s)	English

Additional information

Module: WP 2 Extension Topic Lecture on Structural Biology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 2.1 Lectures on Structural Biology	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 1 semester.
Content	This lecture covers modern structural biology at an advanced level. The focus is on methods to reveal the three-dimensional structure of proteins and multiprotein complexes, including X-ray crystallography and electron microscopy.
Learning outcomes	Students learn the theoretical and methodical basics to analyse the three-dimensional structure of proteins. The lecture prepares students to apply these methods during the laboratory course in Structural Biology and enables them to read and critical evaluate publications in Structural Biology.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Hopfner

Language(s)	English

Additional information

Module: WP 3 Extension Topic Molecular and Cellular Genetics

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 3.1 Posttranscriptional Gene Regulation	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 3.2 Genetic Control of complex processes	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special knowledge from the field of Molecular and Cellular Genetics. The lectures cover genetic mechanisms underlying complex cellular processes and the multiple levels of regulation of gene expression after transcription.
Learning outcomes	Students are introduced to up-to-date topics of current research in Molecular and Cellular Genetics. They acquire knowledge of special topics about regulation of gene expression and about genetic mechanisms controlling complex cellular processes. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of	ECTS credits will be granted when the module examination

ECTS credits	(or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Beckmann
Language(s)	English
Additional information	

Module: WP 4 Extension Topic Genetics

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 4.1 Lecture Fundamentals in Genetics	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 4.2 Advanced Lecture on Genetics	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Genetics. Two lectures cover basic principles and current topics of Genetics.
Learning outcomes	Students acquire knowledge in basic principles in Genetics and are introduced to current research in Genetics. They broaden their already acquired knowledge with current and special topics from Genetics. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed

	successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 5 Extension Topic Human Biology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 5.1 Lecture Fundamentals in Human Biology	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 5.2 Advanced lecture on Human Biology	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Human Biology. Two lectures cover basic principles and current topics of Human Biology.
Learning outcomes	Students acquire knowledge in basic principles in Human Biology and are introduced to current research in Human Biology. They broaden their already acquired knowledge with current and special topics from Human Biology. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed

	successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 6 Extension Topic Molecular Plant Sciences

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 6.1 Lecture in Fundamentals in Molecular Plant Sciences	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 6.2 Advanced lecture in Molecular Plant Sciences	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Molecular Plant Sciences. Two lectures cover basic principles and current topics of Molecular Plant Sciences.
Learning outcomes	Students acquire knowledge in basic principles in Molecular Plant Sciences and are introduced to current research in Molecular Plant Sciences. They broaden their already acquired knowledge with current and special topics from Molecular Plant Sciences. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of	ECTS credits will be granted when the module examination

ECTS credits	(or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 7 Extension Topic Immunology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 7.1 Lecture on Immunology	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 7.2 Advanced Topics of Immunology	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Genetics. Two lectures cover basic principles and current topics of Genetics.
Learning outcomes	Students acquire knowledge in basic principles in Immunology and are introduced to current research in Immunology. They broaden their already acquired knowledge with current and special topics from Immunology. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed

	successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 8 Main Topic Cell Biology – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 8.1 Advanced seminar in Cell Biology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Practical laboratory course	WP 8.2 Advanced research practical course in Cell Biology	WiSe and SoSe	240 h (16 SWS)	120 h	(12)

For successful completion of the module, 15 ECTS credits have to be acquired. Class attendance averages about 18 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 2 semesters.
Content	Students work in a research group from the field of Cell Biology. Supervised by a professional scientist students get involved in a current research project. During the **practical course** they apply modern techniques and complement and deepen their methodical skills and theoretical knowledge. Students learn to plan and execute scientific experiments independently. At the **accompanying seminar** students extend their expertise of the research topic and present and discuss their own research results.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - transfer of theoretical knowledge to practical applications - planning and execution of complex experimental set-ups - recognition and estimation of security questions while handling hazardous material

	- decision making and critical interpretation and evaluation of experimental data - appraisal, presentation and discussion of research data and results
Type of examination	Practical course report or practical course evaluation
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 9 Main Topic Microbiology – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 9.1 Advanced seminar in Microbiology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Practical laboratory course	WP 9.2 Advanced research practical course in Microbiology	WiSe and SoSe	240 h (16 SWS)	120 h	(12)

For successful completion of the module, 15 ECTS credits have to be acquired. Class attendance averages about 18 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 1
Duration	The completion of the module takes 2 semesters.
Content	Students work in a research group from the field of Microbiology. Supervised by a professional scientist students get involved in a current research project. During the **practical course** they apply modern techniques and complement and deepen their methodical skills and theoretical knowledge. Students learn to plan and execute scientific experiments independently. At the **accompanying seminar** students extend their expertise of the research topic and present and discuss their own research results.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - transfer of theoretical knowledge to practical applications - planning and execution of complex experimental set-ups - recognition and estimation of security questions while handling hazardous material

	- decision making and critical interpretation and evaluation of experimental data - appraisal, presentation and discussion of research data and results
Type of examination	Practical course report or practical course evaluation
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: P 4 Main Topic Biochemistry II

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	P 4.1 Subject-specific seminar in Biochemistry	SoSe	30 h (2 SWS)	60 h	(3)
Colloquium	P 4.2 Subject-specific colloquium in Biochemistry	WiSe und SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	The module covers important and current literature and methods in Biochemistry and introduces up-to-date topics of research in Biochemistry. At the **seminar** students extend their expertise of current literature and methods in Biochemistry and present and discuss publications covering specific topics and methods. At the **colloquium** visiting professors and junior scientists present up-to-date research topics and results from the field of Biochemistry.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - critical interpretion and evaluation of experimental data - appraisal, presention and discussion of research data and results - integration of the content of a specific scientific presentation into the broader context of the subject Biochemistry

Type of examination	Presentation or scientific journal
Type of assessment	The successful completion of the module will not be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Förstemann
Language(s)	English
Additional information	

Module: P 5 Methods in Life Sciences

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	P 5.1 Practical course in Life Sciences	WiSe and SoSe	150 h (10 SWS)	75 h	(7,5)
Seminar	P 5.2 Advanced seminar in Life Sciences	WiSe and SoSe	15 h (1 SWS)	30 h	(1,5)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 11 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Mandatory module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	None
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group working in Life Sciences. Supervised by a professional scientist students get involved in a current research project. During the **practical course** they apply modern techniques and complement and deepen their methodical skills and theoretical knowledge. Students learn to plan and execute scientific experiments independently. At the **accompanying seminar** students extend their expertise of the research topic and present and discuss their own research results.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - transfer of theoretical knowledge to practical applications - planning and execution of complex experimental set-ups - recognition and estimation of security questions while handling hazardous material - decision making and critical interpretion and evaluation of experimental data - appraisal, presention and discussion of research data and

	results
Type of examination	Presentation or report on the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Förstemann
Language(s)	English
Additional information	

Module: WP 10 Extension Topic Advanced Topics in Molecular System Biology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 10.1 Advanced Topics in Molecular System Biology	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	Reading, presentation and discussion of key publications in the field of molecular systems biology.
Learning outcomes	Understanding of current concepts in MSB; ability to critically assess current literature; train presentational skills and critical discourse;
Type of examination	Written exam or presentation or scientific journal or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Gaul
Language(s)	English

Additional information

Module: WP 11 Extension Topic Molecular System Biology – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 11.1 Practical course in Molecular System Biology	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	Successful completion of module WP 1
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	Generating and analysing NGS data (Nucleosome mapping); Small scale functional RNAi screen and analysis of cell number/morphology (S2 cells); Measure and analyse binding affinity landscape of a transcription factor;
Learning outcomes	Hands-on experience with different experimental high throughput methods; Hands-on experience with different types of data analysis, including NGS and image analysis, and the underlying statistics. This utilizes and expands their training from the 'Data analysis' module, with intense exposure to important computational methods. Sensitize students to potential and pitfalls of high throughput experiments
Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.

Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Gaul
Language(s)	English
Additional information	

Module: WP 12 Extension Topic Advanced Topics in Structural Biology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (Mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 12.1 Advanced Topics in Structural Biology	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 3 ECTS credits have to be acquired. Class attendance averages about 2 contact hours. Including time for self-study, 90 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	Students extend their expertise of current literature and methods in Structural Biology and present and discuss up-to-date publications covering specific topics and methods from the filed of Structural Biology.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - critical interpretion and evaluation of experimental data - appraisal, presention and discussion of research data and results - integration of the content of a specific scientific publication into the broader context of the subject Structural Biology
Type of examination	Written exam or presentation or scientific journal or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of	ECTS credits will be granted when the module examination

ECTS credits	(or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Hopfner
Language(s)	English
Additional information	

Module: WP 13 Extension Topic Structural Biology – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 13.1 Forschungspraktikum in Strukturbiologie	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	Successful completion of module WP 2
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	The students perform basic crystallization trials, assess the amino acid sequence using bioinformatic tools, process X-ray data sets from a synchrotron source and solve the protein crystal structure by MAD. Students will process samples for the negative stain procedure of electron microscopy and visualise stained particles. They will experience sample preparartion for cryo-EM and how to acquire Low-Dose images. Cryo-EM data will be processed for 3-D reconstruction.
Learning outcomes	Students acquire expertise in state-of-the-art methods of solving three-dimensional protein structures and the architecture of large protein complexes.
Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.

Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Hopfner
Language(s)	English
Additional information	

Module: WP 14 Extension Topic Molecular and Cellular Genetics – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 14.1 Practical course in Molecular and Cellular Genetics	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	The students carry out RNAi in tissue culture cells, GFP-tag proteins by homologous recombination in eukaryotic cells, and determine their sub-cellular localization using fluorescence microscopy. They reconstitute macromolecular complexes in vitro and map protein-protein interactions using yeast two hybrid screens.
Learning outcomes	Students acquire expertise in - Genetic methods of quantitative screening - Experiments with quantitative read-out - In vitro constitution of protein complexes - Fluorescence microscopy
Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of	ECTS credits will be granted when the module examination (or

ECTS credits	the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Beckmann
Language(s)	English
Additional information	

Module: WP 15 Extension Topic Genetics – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 15.1 Research practical course in Genetics	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Genetics. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Genetics. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results
Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical

	laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 16 Extension Topic Humanbiologie Praktikum

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 16.1 Forschungspraktikum in Humanbiologie	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Human Biology. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Human Biology. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results
Type of examination	Written report on or assessment of the practical laboratory

	course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 17 Extension Topic Molecular Plant Sciences – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 17.1 Practical course in Molecular Plant Sciences	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Molecular Plant Sciences. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Molecular Plant Sciences. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results

Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 18 Extension Topic Immunology – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 18.1 Practical course in Immunology	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Genetics. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Genetics. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results
Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical

	laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 19 Extension Topic Cell Biology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 19.0.1 Advanced lecture on Cell Biology	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 19.0.2 Lecture on Advanced Methods in Cell Biology	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 19.0.3 Lecture on Cell and Developmental Biology of Plant	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 19.0.4 Lecture on Fundamentals in Cell Biology	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 19.0.5 Special lecture on Cell Biology	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 19.0.6 Special lecture on Methods in Cell Biology	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with compulsory elective courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the compulsory elective courses WP 19.0.1 - WP 19.0.6, two courses must be taken.
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Cell Biology. Two lectures covering basic principles and current topics of Cell Biology are chosen.
Learning outcomes	Students acquire knowledge in basic principles in Cell Biology and are introduced to current research in Cell Biology. They broaden their already acquired knowledge with current and special topics from Cell Biology. New

	information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 20 Extension Topic Microbiology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 20.0.1 Advanced lecture on Microbiology	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 20.0.2 Special lecture on Microbiology	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 20.0.3 Special lecture on Methods in Microbiology	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with compulsory elective courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the compulsory elective courses WP 20.0.1 - WP 20.0.3, two courses must be taken.
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Microbiology. Two lectures covering basic principles and current topics of Microbiology are chosen.
Learning outcomes	Students acquire knowledge in basic principles in Microbiology and are introduced to current research in Microbiology. They broaden their already acquired knowledge with current and special topics from Microbiology. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination

Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 21 Extension Topic Virology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 21.1 Current Topics in Virology	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 21.2 Lecture on Virology	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Virology. Two lectures cover basic principles and current topics of Virology.
Learning outcomes	Students acquire knowledge in basic principles in Virology and are introduced to current research in Virology. They broaden their already acquired knowledge with current and special topics from Virology. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.

Responsible contact	
Language(s)	English
Additional information	

Module: WP 22 Extension Topic Evolutionary Biology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 22.1 Current Topics in Evolutionary Biology	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 22.2 Lecture on Evolutionary Biology	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Evolutionary Biology. Two lectures cover basic principles and current topics of Evolutionary Biology.
Learning outcomes	Students acquire knowledge in basic principles in Evolutionary Biology and are introduced to current research in Evolutionary Biology. They broaden their already acquired knowledge with current and special topics from Evolutionary Biology. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed

	successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 23 Extension Topic Neurobiology

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 23.1 Current Topics in Neurobiology	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 23.2 Lecture on Neurobiology	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Neurobiology. Two lectures cover basic principles and current topics of Neurobiology.
Learning outcomes	Students acquire knowledge in basic principles in Neurobiology and are introduced to current research in Neurobiology. They broaden their already acquired knowledge with current and special topics from Neurobiology. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed

	successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 24 Introduction to Informatics: Systems and Applications

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 24.1 Lecture on Introduction to Informatics: Systems and Applications	SoSe	30 h (2 SWS)	60 h	(3)
Exercise course	WP 24.2 Tutorial Introduction to Informatics: Systems and Applications	SoSe	45 h (3 SWS)	45 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 5 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Regelsemester: 2
Duration	The completion of the module takes 1 semester.
Content	Together with the lecture on Introduction in Informatics: Programming and Software Development this course is the basis for the university education in Informatics as a minor subject. Therefore, the content is a broad introduction on the most important topics of Informatics in a low-level and application orientated way. Students acquire the basics to understand advanced topics from this field: - Fundamentals in computer hardware (von-Neumann model, multicore processors, working memory, permanent memory, etc.) - Fundamentals in operating systems (process model, syncronisation of concurrent processes, memory management, etc.) - Fundamentals in computer networks (ISO/OSI model, etc.) - Fundamentals in data base systems (relational model, relational algebra, SQL, ect)

	- Fundamentals of data mining (classification, cluster analysis, rules of association, etc.) The module consists of a lecture and tutorials in small groups. Topics of the lecture are practiced in the tutorials by practical applications.
Learning outcomes	Low-level and application orientated knowledge of the mot important fundamentals in Informatics. The course aims at a basic understanding of the important processes in a computer system, seen from the hardware point of view and from the operating system point of view. In addition, students learn fundamentals of data base systems and data mining on a academic level.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Christian Böhm
Language(s)	English
Additional information	

Module: WP 25 Computer Architecture

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 25.1 Lecture on computer architecture	SoSe	45 h (3 SWS)	45 h	(3)
Exercise course	WP 25.2 Tutorial Computer Architecture	SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 5 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Regelsemester: 2
Duration	The completion of the module takes 1 semester.
Content	This module gives an overview of the binary presentation of information on a computer and an overview of the architecture and the principle of operation of modern computers using von-Neumann's model. Classic components of a computer are introduced.
Learning outcomes	Students get a basic understanding of the architecture of modern computers.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Claudia Linnhoff-Popien

Language(s)	English

Additional information

Module: WP 26 Coding und Modeling

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 26.1 Lecture on Coding and Modeling	SoSe	30 h (2 SWS)	30 h	(2)
Exercise course	WP 26.2 Tutorial Coding and Modeling	SoSe	45 h (3 SWS)	75 h	(4)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 5 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Regelsemester: 2
Duration	The completion of the module takes 1 semester.
Content	The module introduces the basic principles of coding and data modeling using a functional coding language (currently Haskell).
Learning outcomes	Students acquire knowledge on: - Proficiency in basic concepts of coding - Skills to functional code small algorithm and to evaluate them in comparison to imperative solutions - Praperation for future development of coding languages
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.

Responsible contact	Prof. PhD Martin Hofmann
Language(s)	English
Additional information	

Module: WP 27 Main Topic Cell Biology I

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 27.0.1 Advanced lecture on Cell Biology	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 27.0.2 Lecture on Advanced Methods in Cell Biology	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 27.0.3 Lecture on Cell and Developmental Biology of Plant	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 27.0.4 Lecture on Fundamentals in Cell Biology	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 27.0.5 Special lecture on Cell Biology	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 27.0.6 Special lecture on Methods in Cell Biology	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 6 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with compulsory elective courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the compulsory elective courses WP 27.0.1 - WP 27.0.6, three courses must be taken.
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Cell Biology. Three lectures covering basic principles and current topics of Cell Biology are chosen.
Learning outcomes	Students acquire knowledge in basic principles in Cell Biology and are introduced to current research in Cell Biology. They broaden their already acquired knowledge with current and special topics from Cell Biology. New

	information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 28 Main Topic Microbiology I

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 28.0.1 Advanced lecture on Microbiology	SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 28.0.2 Special lecture on Microbiology	WiSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 28.0.3 Special lecture on Methods in Microbiology	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 6 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	The module introduces special professional knowledge from the field of Microbiology. Three lectures cover basic principles and current topics of Microbiology.
Learning outcomes	Students acquire knowledge in basic principles in Microbiology and are introduced to current research in Microbiology. They broaden their already acquired knowledge with current and special topics from Microbiology. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of	ECTS credits will be granted when the module examination

ECTS credits	(or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 29 Main Topic Inorganic Chemistry – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 29.1 Seminar in Inorganic Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Practical laboratory course	WP 29.2 Advanced research practical course in Inorganic Chemistry	WiSe and SoSe	240 h (16 SWS)	120 h	(12)

For successful completion of the module, 15 ECTS credits have to be acquired. Class attendance averages about 18 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	Students work in a research group from the field of Inorganic Chemistry. Supervised by a professional scientist students get involved in a current research project. During the **practical course** they apply modern techniques and complement and deepen their methodical skills and theoretical knowledge. Students learn to plan and execute scientific experiments independently. At the **accompanying seminar** students extend their expertise of the research topic and present and discuss their own research results.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - transfer of theoretical knowledge to practical applications - planning and execution of complex experimental set-ups

	- recognition and estimation of security questions while handling hazardous material - decision making and critical interpretation and evaluation of experimental data - appraisal, presentation and discussion of research data and results
Type of examination	Practical course report or practical course evaluation
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Klapötke
Language(s)	English
Additional information	

Module: WP 30 Main Topic Organic Chemistry – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 30.1 Seminar in Organic Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Practical laboratory course	WP 30.2 Advanced research practical course in Organic Chemistry	WiSe and SoSe	240 h (16 SWS)	120 h	(12)

For successful completion of the module, 15 ECTS credits have to be acquired. Class attendance averages about 18 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	Students work in a research group from the field of Organic Chemistry. Supervised by a professional scientist students get involved in a current research project. During the **practical course** they apply modern techniques and complement and deepen their methodical skills and theoretical knowledge. Students learn to plan and execute scientific experiments independently. At the **accompanying seminar** students extend their expertise of the research topic and present and discuss their own research results.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - transfer of theoretical knowledge to practical applications - planning and execution of complex experimental set-ups

	- recognition and estimation of security questions while handling hazardous material - decision making and critical interpretation and evaluation of experimental data - appraisal, presentation and discussion of research data and results
Type of examination	Practical course report or practical course evaluation
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Hendrik Zipse
Language(s)	English
Additional information	

Module: WP 31 Main Topic Physical Chemistry – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 31.1 Seminar in Physical Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Practical laboratory course	WP 31.2 Advanced research practical course in Physical Chemistry	WiSe and SoSe	240 h (16 SWS)	120 h	(12)

For successful completion of the module, 15 ECTS credits have to be acquired. Class attendance averages about 18 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	Students work in a research group from the field of Physical Chemistry. Supervised by a professional scientist students get involved in a current research project. During the **practical course** they apply modern techniques and complement and deepen their methodical skills and theoretical knowledge. Students learn to plan and execute scientific experiments independently. At the **accompanying seminar** students extend their expertise of the research topic and present and discuss their own research results.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - transfer of theoretical knowledge to practical applications - planning and execution of complex experimental set-ups

	- recognition and estimation of security questions while handling hazardous material - decision making and critical interpretation and evaluation of experimental data - appraisal, presentation and discussion of research data and results
Type of examination	Practical course report or practical course evaluation
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Bein
Language(s)	English
Additional information	

Module: WP 32 Main Topic Theoretical Chemistry – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Seminar	WP 32.1 Seminar in Theoretical Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Practical laboratory course	WP 32.2 Advanced research practical course in Theoretical Chemistry	WiSe and SoSe	240 h (16 SWS)	120 h	(12)

For successful completion of the module, 15 ECTS credits have to be acquired. Class attendance averages about 18 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 2
Duration	The completion of the module takes 2 semesters.
Content	During this course, we teach how to use quantum chemical program packages like Gaussian, MOLPRO, Q-Chem, TURBOMOLE. Different basis sets and methods (HF, MP2, DFT, CI, CASSCF) to solve the electronic Schrödinger equation are introduced and tested. Single point calculations, structure optimizations and frequency analysis are performed for the electronic groundstate. Potential energy surfaces are calculated and characterized by their critical points like minima, transition states and minimum energy paths to follow a chemical reaction. Methods for electron correlation and multiconfiguration character are compared. Their efficiency is tested for excited state calculations and conical intersection searches that are relevant for photochemical processes. We introduce continuum models to describe solvation effects. Furthermore, the ab initio calculation of NMR chemical shifts and electronic circular dichroism is introduced. For examplary cases it is shown that quantum

	chemicalcalculations can be crucial for, e.g., the structure determination by assigning experimental spectra as well as for determining the absolute configuration of molecules.In addition, different tools for visualization of the calculated molecular properties are presented.
Learning outcomes	- Upon completion of this course, the student should have a solid understanding of the operating principles of quantum chemical program codes and should be able to use the program packages on their own and critically judge the obtained results. They should know in detail different quantum chemical methods to solve the electronic Schrödinger equation and be able to decide which method should be used for a given applications. The students should be able to present and visualize the calculated results.
Type of examination	Practical course report or practical course evaluation
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Ochsenfeld
Language(s)	English
Additional information	

Module: WP 33 Extension Topic Cell Biology – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 33.1 Research practical course in Cell Biology	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Cell Biology. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Genetics. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results
Type of examination	Written report on or assessment of the practical laboratory

	course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 34 Extension Topic Microbiology – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 34.1 Research practical course in Microbiology	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Microbiology. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Genetics. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results
Type of examination	Written report on or assessment of the practical laboratory

	course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 35 Extension Topic Virologiy – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 35.1 Research practical course in Virology	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester
Content	Students work in a research group from the field of Virology. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Genetics. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results
Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical

	laboratory course.
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 36 Extension Topic Evolutionary Biology – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 36.1 Research practical course in Evolutionary Biology	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Evolutionary Biology. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Genetics. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results

Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 37 Extension Topic Neurobiology – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 37.1 Research practical course in Neurobiology	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester
Content	Students work in a research group from the field of Neurobiology. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Genetics. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results
Type of examination	Written report on or assessment of the practical laboratory

	course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 38 Introduction in Coding

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 38.1 Lecture on Introduction in Coding	WiSe	60 h (4 SWS)	120 h	(6)
Exercise course	WP 38.2 Tutorial Introduction in Coding	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 6 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module gives an introduction in the imperative, object orientated, and concurrent coding using a higher coding language, e.g. Java. The module cover skills in coding and general fundamentals, concepts, methods, and technics to present, structure and process data. The module covers: - Fundamental terms of programmes and their execution - Syntax of coding languages and their description - Basic data types and imperative control structures - Complexity and correctness of imperative programmes - Recursion - Simple sorting mechanisms - Introduction in object orientated coding dafts - Classes, interfaces, packages etc.
Learning outcomes	
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.

Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Hans Jürgen Ohlbach
Language(s)	English
Additional information	

Module: WP 39 Operating Systems

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 39.1 Lecture on Operating Systems	WiSe	45 h (3 SWS)	45 h	(3)
Exercise course	WP 39.2 Tutorial Operating Systems	WiSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 5 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	
Learning outcomes	
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Claudia Linnhoff-Popien
Language(s)	English
Additional information	

Module: WP 40 Subject specific Extension Topic in Biochemistry – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 40.1 Practical course in Subject specific Extension Topic in Biochemistry	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module introduces students to current, Biochemistry-related research topics. Students work on a selected scientific project and are integrated in a research group. Students acquire the fundamentals of the selected research topic on the level of a scientific orientated Master's programme and develop possible solutions to open scientific problems.
Learning outcomes	- Independet application of acquired skills and competences on a scientific problem - Evaluation of the own research results - Written presentation of results in reference to the scientific environment - Professional presentation of results
Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of	ECTS credits will be granted when the module examination (or

ECTS credits	the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Dr. Heidi Feldmann
Language(s)	English
Additional information	

Module: WP 41 Subject specific Extension Topic in Biochemistry

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 41.1 Lecture on Subject specific Extension Topic in Biochemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 41.2 Advanced Topics in Subject specific Extension Topic in Biochemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	This module complements knowledge in Biochemistry. Students select two Biochemistry-related courses.
Learning outcomes	The courses introduce students to up-to-date topics of Biochemistry. Students broaden their knowledge with current and special information. This information should get intregrated in existing knowledge to express and discuss scientific problems. The acquired knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed

	successfully.
Responsible contact	Dr. Heidi Feldmann
Language(s)	English
Additional information	

Module: WP 42 Extension Topic Biological Chemistry - practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 42.1 Research practical course in Biological Chemistry	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Biological Chemistry. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Biological Chemistry. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results

Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 43 Extension Topic Biological Chemistry

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 43.1 Basics of Cloning, Genomics and Proteomics	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 43.2 Co-enzymes and Biosynthesis	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module introduces special professional knowledge from the field of Biological Chemistry. Two lectures cover basic principles and current topics of Biological Chemistry.
Learning outcomes	Students acquire knowledge in basic principles in Biological Chemistry and are introduced to current research in Biological Chemistry. They broaden their already acquired knowledge with current and special topics from Biological Chemistry. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of	ECTS credits will be granted when the module examination

ECTS credits	(or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 44 Extension Topic Inorganic Chemistry – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 44.1 Research practical course in Inorganic Chemistry	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Inorganic Chemistry. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Inorganic Chemistry. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results

Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Klapötke
Language(s)	English
Additional information	

Module: WP 45 Extension Topic Inorganic Chemistry

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 45.0.1 Modern Inorganic Main-group Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 45.0.2 Solid-State Chemistry II	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 45.0.3 Coordination Chemistry II	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 45.0.4 Spectroscopic Methods	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 45.0.5 Special Lecture in Inorganic Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with compulsory elective courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the compulsory elective courses WP 45.0.1 - WP 45.0.5, two courses must be taken.
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module introduces special professional knowledge from the field of Inorganic Chemistry. Two lectures covering basic principles and current topics of Inorganic Chemistry are chosen.

Learning outcomes	Students acquire knowledge in basic principles in Inorganic Chemistry and are introduced to current research in Inorganic Chemistry. They broaden their already acquired knowledge with current and special topics from Inorganic Chemistry. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Klapötke
Language(s)	English
Additional information	

Module: WP 46 Extension Topic Organic Chemistry – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 46.1 Research practical course in Organic Chemistry	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Organic Chemistry. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Organic Chemistry. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results

Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Hendrik Zipse
Language(s)	English
Additional information	

Module: WP 47 Extension Topic Organic Chemistry

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 47.0.1 Physical-Organic Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 47.0.2 The Chemistry of Heterocycles	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 47.0.3 Modern Synthetic Methods	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 47.0.4 Synthesis Planning	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 47.0.5 Glycochemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 47.0.6 Radicals in Chemistry and Biology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 47.0.7 Lecture in Chemical Biology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 47.0.8 Advanced Topics in Chemical Biology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 47.0.9 Spezielle Special Lecture in Organic Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with compulsory elective courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the compulsory elective courses WP 47.0.1 -

	WP 47.0.9, two courses must be taken.
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module introduces special professional knowledge from the field of Organic Chemistry. Two lectures covering basic principles and current topics of Organic Chemistry are chosen.
Learning outcomes	Students acquire knowledge in basic principles in Organic Chemistry and are introduced to current research in Organic Chemistry. They broaden their already acquired knowledge with current and special topics from Organic Chemistry. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Hendrik Zipse
Language(s)	English
Additional information	

Module: WP 48 Extension Topic Physical Chemistry – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 48.1 Research practical course in Physical Chemistry	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	During this course, we teach how to use quantum chemical program packages like Gaussian, MOLPRO, Q-Chem, TURBOMOLE. Different basis sets and methods (HF, MP2, DFT, CI, CASSCF) to solve the electronic Schrödinger equation are introduced and tested. Single point calculations, structure optimizations and frequency analysis are performed for the electronic groundstate. Potential energy surfaces are calculated and characterized by their critical points like minima, transition states and minimum energy paths to follow a chemical reaction. Methods for electron correlation and multiconfiguration character are compared. Their efficiency is tested for excited state calculations and conical intersection searches that are relevant for photochemical processes. We introduce continuum models to describe solvation effects. Furthermore, the ab initio calculation of NMR chemical shifts and electronic circular dichroism is introduced. For examplary cases it is shown that quantum chemicalcalculations can be crucial for, e.g., the structure determination by assigning experimental spectra as well as

	for determining the absolute configuration of molecules.In addition, different tools for visualization of the calculated molecular properties are presented.
Learning outcomes	- Upon completion of this course, the student should have a solid understanding of the operating principles of quantum chemical program codes and should be able to use the program packages on their own and critically judge the obtained results. They should know in detail different quantum chemical methods to solve the electronic Schrödinger equation and be able to decide which method should be used for a given applications. The students should be able to present and visualize the calculated results.
Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Bein
Language(s)	English
Additional information	

Module: WP 49 Extension Topic Physical Chemistry

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 49.0.1 Energyconversion	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 49.0.2 Electrochemistry: fundamentals and applications	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 49.0.3 Introduction to Electron Microscopy	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 49.0.4 Microscopy for Nanotechnology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 49.0.5 Solid-State Spectroscopy	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 49.0.6 Fluorescence Microscopy and Spectroscopy	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 49.0.7 Laserspectroscopy	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 49.0.8 Heterogeneous Catalysis	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 49.0.9 Surface Physics	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 49.0.10 Nanoscience	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 49.0.11 Special Lecture in Physical Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with compulsory elective courses
Usability of the module in other Programmes	Master's Programme Chemistry

Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the compulsory elective courses WP 49.0.1 - WP 49.0.11, two courses must be taken.
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module introduces special professional knowledge from the field of Physical Chemistry. Two lectures covering basic principles and current topics of Physical Chemistry are chosen.
Learning outcomes	Students acquire knowledge in basic principles in Physical Chemistry and are introduced to current research in Physical Chemistry. They broaden their already acquired knowledge with current and special topics from Physical Chemistry. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Bein
Language(s)	English
Additional information	

Module: WP 50 Extension Topic Theoretical Chemistry – practical course

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Practical laboratory course	WP 50.1 Research practical course in Theoretical Chemistry	WiSe and SoSe	150 h (10 SWS)	120 h	(9)

For successful completion of the module, 9 ECTS credits have to be acquired. Class attendance averages about 10 contact hours. Including time for self-study, 270 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	Students work in a research group from the field of Theoretical Chemistry. Supervised by a professional scientist students get involved in a current research project. During the practical course they apply modern techniques and acquire methodical skills and theoretical knowledge in Theoretical Chemistry. Students learn to plan and execute scientific experiments independently.
Learning outcomes	Students acquire expertise for work in research: - Independent, target-oriented literature search - Transfer of theoretical knowledge to practical applications - Planning and execution of complex experimental set-ups - Recognition and estimation of security questions while handling hazardous material - Decision making and critical interpretation and evaluation of experimental data - Appraisal, presentation and discussion of research data and results

Type of examination	Written report on or assessment of the practical laboratory course or written report on and assessment of the practical laboratory course
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Ochsenfeld
Language(s)	English
Additional information	

Module: WP 51 Extension Topic Theoretical Chemistry

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 51.0.1 Theory of chemical dynamics: Molecular	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 51.0.2 Theory of chemical dynamics: Quantum dynamics	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 51.0.3 Density Functional Theorie	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 51.0.4 Theoretical Solid-State Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 51.0.5 Linear Scaling Quantum Methods for large Molecules	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 51.0.6 Special Lecture in Theoretical Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with compulsory elective courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the compulsory elective courses WP 51.0.1 - WP 51.0.6, two courses must be taken.
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module introduces special professional knowledge from the field of Theoretical Chemistry. Two lectures covering

	basic principles and current topics of Theoretical Chemistry are chosen.
Learning outcomes	Students acquire knowledge in basic principles in Theoretical Chemistry and are introduced to current research in Theoretical Chemistry. They broaden their already acquired knowledge with current and special topics from Theoretical Chemistry. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Ochsenfeld
Language(s)	English
Additional information	

Module: WP 52 Main Topic Cell Biology II

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Colloquium	WP 52.1 Subject-specific colloquium in Cell Biology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Seminar	WP 52.2 Subject-specific seminar in Cell Biology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module covers important and current literature and methods in Cell Biology and introduces up-to-date topics of research in Cell Biology. At the **seminar** students extend their expertise of current literature and methods in Cell Biology and present and discuss publications covering specific topics and methods. At the **colloquium** visiting professors and junior scientists present up-to-date research topics and results from the field of Cell Biology.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - critical interpretion and evaluation of experimental data - appraisal, presention and discussion of research data and results - integration of the content of a specific scientific

	presentation into the broader context of the subject Biochemistry
Type of examination	Presentation or scientific journal
Type of assessment	The successful completion of the module will not be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 53 Main Topic Mikrobiologie II

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Colloquium	WP 53.1 Subject-specific colloquium in Microbiologie	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Seminar	WP 53.2 Subject-specific seminar in Microbiology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 6 ECTS credits have to be acquired. Class attendance averages about 4 contact hours. Including time for self-study, 180 hours have to be invested.

Module type	Compulsory elective module with mandatory courses
Usability of the module in other Programmes	
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1).
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module covers important and current literature and methods in Microbiology and introduces up-to-date topics of research in Microbiology. At the **seminar** students extend their expertise of current literature and methods in Microbiology and present and discuss publications covering specific topics and methods. At the **colloquium** visiting professors and junior scientists present up-to-date research topics and results from the field of Microbiology.
Learning outcomes	Students acquire expertise for work in research: - independent, target-oriented literature search - critical interpretion and evaluation of experimental data - appraisal, presention and discussion of research data and results - integration of the content of a specific scientific

	presentation into the broader context of the subject Biochemistry
Type of examination	Presentation or scientific journal
Type of assessment	The successful completion of the module will not be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	
Language(s)	English
Additional information	

Module: WP 54 Main Topic Inorganic Chemistry

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Colloquium	WP 54.1 Subject-specific colloquium in Inorganic Chemistry	WiSe and SoSe	45 h (3 SWS)	135 h	(6)

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 54.2.1 Modern Inorganic Main-group Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 54.2.2 Solid-State Chemistry II	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 54.2.3 Coordination Chemistry II	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 54.2.4 Spectroscopic Methods	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 54.2.5 Special Lecture in Inorganic Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 15 ECTS credits have to be acquired, including 9 ECTS-credits from compulsory elective courses. Class attendance averages about 9 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Compulsory elective module with mandatory and compulsory elective courses.
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the module`s courses, WP 54.1 and three of the compulsory elective courses WP 54.2.1 - WP 54.2.5 must be taken. In doing so, at last two of the compulsory elective courses WP 54.2.1 - WP 54.2.3 must be taken.
Entry requirements	None

Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module broadens and deepens special professional knowledge from the field of Inorganic Chemistry. Three advanced lectures covering current topics of Inorganic Chemistry are chosen.
Learning outcomes	Students are introduced to up-to-date topics of current research in Inorganic Chemistry. They broaden their already acquired knowledge with current and special topics from Inorganic Chemistry. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Klapötke
Language(s)	English
Additional information	

Module: WP 55 Main Topic Organic Chemistry

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Colloquium	WP 55.1 Subject-specific colloquium in Organic Chemistry	WiSe and SoSe	45 h (3 SWS)	135 h	(6)

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 55.2.1 Physical-Organic Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 55.2.2 The Chemistry of Heterocycles	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 55.2.3 Modern Synthetic Methods	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 55.2.4 Synthesis Planning	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 55.2.5 Glycochemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 55.2.6 Radicals in Chemistry and Biology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 55.2.7 Lecture in Chemical Biology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 55.2.8 Advanced Topics in Chemical Biology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 55.2.9 Spezielle Special Lecture in Organic Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 15 credits have to be acquired, including 9 ECTS credits from compulsory elective courses. Class attendance averages about 9 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Compulsory elective module with mandatory and compulsory elective courses.
Usability of the module in other Programmes	Master's Programme Chemistry

Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the module's courses, WP 55.1 and three of the compulsory elective modules WP 55.2.1 - WP 55.2.9 must be taken.
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module broadens and deepens special professional knowledge from the field of Organic Chemistry. Three advanced lectures covering current topics of Organic Chemistry are chosen.
Learning outcomes	Students are introduced to up-to-date topics of current research in Organic Chemistry. They broaden their already acquired knowledge with current and special topics from Organic Chemistry. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Hendrik Zipse
Language(s)	English
Additional information	

Module: WP 56 Main Topic Physical Chemistry

Programme Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Colloquium	WP 56.1 Subject-specific colloquium in Physical Chemistry	WiSe and SoSe	45 h (3 SWS)	135 h	(6)

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 56.2.1 Energyconversion	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 56.2.2 Electrochemistry: fundamentals and applications	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 56.2.3 Introduction to Electron Microscopy	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 56.2.4 Microscopy for Nanotechnology	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 56.2.5 Solid-State Spectroscopy	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 56.2.6 Fluorescence Microscopy and Spectroscopy	WiSe und SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 56.2.7 Laserspectroscopy	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 56.2.8 Heterogeneous Catalysis	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 56.2.9 Surface Physics	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 56.2.10 Nanoscience	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 56.2.11 Special Lecture in Physical Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 15 ECTS credits have to be acquired, including 9 ECTS credits from compulsory elective courses. Class attendance averages about 9 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Compulsory elective module with mandatory and compulsory elective courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the module's courses, WP 56.1 and three of the compulsory elective courses WP 56.2.1 - WP 56.2.11 must be taken.
Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module broadens and deepens special professional knowledge from the field of Physical Chemistry. Three advanced lectures covering current topics of Physical Chemistry are chosen.
Learning outcomes	Students are introduced to up-to-date topics of current research in Physical Chemistry. They broaden their already acquired knowledge with current and special topics from Physical Chemistry. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Bein
Language(s)	English
Additional information	

Module: WP 57 Main Topic Theoretical Chemistry

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Colloquium	WP 57.1 Subject-specific colloquium in Theoretical Chemistry	WiSe and SoSe	45 h (3 SWS)	135 h	(6)

Course type	Course (compulsory elective)	Rotation	Contact hours	Self-study hours	ECTS
Lecture	WP 57.2.1 Theory of chemical dynamics: Molecular	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 57.2.2 Theory of chemical dynamics: Quantum dynamics	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 57.2.3 Density Functional Theorie	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 57.2.4 Theoretical Solid-State Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 57.2.5 Linear Scaling Quantum Methods for large Molecules	WiSe and SoSe	30 h (2 SWS)	60 h	(3)
Lecture	WP 57.2.6 Special Lecture in Theoretical Chemistry	WiSe and SoSe	30 h (2 SWS)	60 h	(3)

For successful completion of the module, 15 ECTS credits have to be acquired, including 9 ECTS credits from compulsory elective courses. Class attendance averages about 9 contact hours. Including time for self-study, 450 hours have to be invested.

Module type	Compulsory elective module with mandatory and compulsory elective courses
Usability of the module in other Programmes	Master's Programme Chemistry
Elective guidelines	With regard to the compulsory elective modules WP 1 - WP 57, modules must be taken with a total value of 45 ECTS credits. (For detailed information on the elective guidelines see description of Module WP 1). With regard to the module's courses, WP 57.1 and three of the compulsory elective courses WP 57.2.1 - WP 57.2.6 must be taken.

Entry requirements	None
Semester	Recommended semester: 3
Duration	The completion of the module takes 1 semester.
Content	The module broadens and deepens special professional knowledge from the field of Theoretical Chemistry. Three advanced lectures covering current topics of Theoretical Chemistry are chosen.
Learning outcomes	Students are introduced to up-to-date topics of current research in Theoretical Chemistry. They broaden their already acquired knowledge with current and special topics from Theoretical Chemistry. New information get integrated in existing knowledge to formulate and discuss scientific problems. The acquired theoretical knowledge will be implemented during the practical course.
Type of examination	Written exam or oral examination
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.
Responsible contact	Prof. Dr. Ochsenfeld
Language(s)	English
Additional information	

Module: P 6 Master's Degree Module

Programme	Master's Programme: Biochemistry (Master of Science, M.Sc.)

Related module parts

Course type	Course (mandatory)	Rotation	Contact hours	Self-study hours	ECTS
Master's thesis	P 6.1 Master's thesis	WiSe and SoSe	-	900 h	(30)

For successful completion of the module, 30 ECTS credits have to be acquired and 900 hours have to be invested.

Module type	Mandatory module
Usability of the module in other Programmes	
Elective guidelines	None
Entry requirements	Successful completion of the modules P 1 - P 3 and P 5
Semester	Recommended semester: 4
Duration	The completion of the module takes 1 semester.
Content	Focus of the thesis is the work on a special question from Biochemistry, Cell Biology, Microbiology or any Extension Topic, including a written scientific report.
Learning outcomes	Competence to compile and present a focused topic during 6 month in a complete manner. Ability to work in a team and on a project. The students get theoretical and practical understanding in specific challenges in biochemistry, Cell Biology, Microbiology or any Extension Topic. They can design and execute experiments addressing a given topic correctly, as well as present and discuss the results in a report in form and content properly.
Type of examination	Master's thesis
Type of assessment	The successful completion of the module will be graded.
Requirements for the gain of ECTS credits	ECTS credits will be granted when the module examination (or the examination of pertinent mandatory and potential elective compulsory module parts) has/have been completed successfully.

Responsible contact	Prof. Beckmann
Language(s)	English
Additional information	