University of Regensburg
Faculty of Chemistry and Pharmacy
http://www.chemie.uni-regensburg.de

Module Catalogue

Master of Science Chemistry

University of Regensburg

13.1.2014

The Master of Science Chemistry at the University of Regensburg comprises the following modules:

1. Compulsory Elective Basic Modules:

CHE-MSc-M 1	Basic Module Inorganic Chemistry
CHE-MSc-M 2	Basic Module Organic Chemistry
CHE-MSc-M 3	Basic Module Physical Chemistry
CHE-MSc-M 4	Basic Module Bioanalytical Chemistry
CHE-MSc-M 5	Basic Module Theoretical Chemistry
CHE-MSc-M 6	Basic Module Biochemistry
CHE-MSc-M 15	Basic Module Medicinal Chemistry
CHE-MSc-External-M01:	Basic Module Physics
CHE-MSc-External-M02:	Basic Module Biology
CHE-MSc-External-M03:	Basic Module Scientific Informatics
CHE-MSc-External-M04:	Basic Module Nanoscience

2. Compulsory Elective Advanced Modules I:

CHE-MSc-M 7	Advanced Module I Inorganic Chemistry
CHE-MSc-M 8	Advanced Module I Inorganic Chemistry
CHE-MSc-M 9	Advanced Module I Physical Chemistry

CHE-MSc-M 10	Advanced Module I Bioanalytical Chemistry
CHE-MSc-M 11	Advanced Module I Theoretical Chemistry
CHE-MSc-M 16	Advanced Module I Sustainable Chemistry

3. Compulsory Modules:

CHE-MSc-M 12	Advanced Module II
CHE-MSc-M 13	Concluding Module
CHE-MSc-M 14	Master Thesis Module

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1. COMPULSORY ELECTIVE BASIC Modules:

The student has to select three of the following Compulsory Elective Basic Modules:

CHE-MSc-M 01

1. Module Name:	Basic Module Inorganic Chemistry
2. Field / Person in Charge:	Chemistry / Prof. Dr. Arno Pfitzner
3. Synopsis:	Lectures for this basic module will be given in the fields of inorganic molecular chemistry, solid state chemistry, material chemistry, bioinorganic chemistry, structural chemistry, organometallics and methods of inorganic chemistry. The student will select some topics out of this field. Lectures will provide a deeper exemplary insight in current topics and new trends in inorganic chemistry by examples. The lab "Experimental Methods of Inorganic Chemistry" will give an overview over the current techniques. The focus will be on X-ray deflection, vibrational spectroscopy and heteronuclear NMR-spectroscopy. Methods of thermal analysis and electron microscopy will be treated with respect to the establishment of phase diagrams.
4. Competences Acquired:	Having completed this basic module students • understand new trends in Inorganic Chemistry; • recognize the relations to other chemical disciplines; • are able to apply modern concepts to current issues in both basic and applied research and to judge critically specialized literature.
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Inorganic Chemistry as obtained within a preceding Bachelor program in chemistry or related fields.
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every semester
8. Module Duration:	2 semesters

9. Recommended Semester in Major:	1st and 2nd semester in major
10. Total workload of the module / credit points:	480 hours/ 16 credit points* (225 h attendance time, 255 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	WP	V	Compulsory Elective Lecture Inorganic Chemistry I	2	
2	WP	V	Compulsory Elective Lecture Inorganic Chemistry 2	2	
3	WP	V	Compulsory Elective Lecture Inorganic Chemistry 3	2	
4	WP	V	Compulsory Elective Lecture Inorganic Chemistry 4	2	
5	P	P + S	Experimental Methods in Inorganic Chemistry	7	

Remarks:

Four lectures in Inorganic Chemistry have to be selected from the pool of lectures in inorganic chemistry (e.g. inorganic molecular chemistry, inorganic material chemistry, coordination chemistry, bioinorganic chemistry, inorganic structural chemistry, etc.). The lectures will be announced in the official lecture schedule.

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Examination:

*A/T**	*Mode and content of examination*	*Prerequisites for admission ***	*Duration*	*Time*	*Mode of grading*
A	Final examination covering the courses given in 11 (oral).	Courses given under 11. completed successfully	30 min		graded

Remarks:

Examination periods are as follows:

winter semester: September 1st – December 15th and February 1st – March 31th

summer semester: Mai 1st – May 31th and July 1st – July 31th

** A = module final examination; T = module partial examination ** optional*

13. Module Grade:		
☒	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☐	The module will not be graded	

14. Others:
If the module examination is not passed successfully in the first repetition, a second repetition is possible. Generally, this second repetition is an oral examination covering the complete module. It will be conducted by an examining board of at least two examiners. The grade of this examination will be the grade of the module.

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CHE-MSc-M 02

1. Module Name:	Basic Module Organic Chemistry
2. Field / Person in Charge::	Chemistry / Prof. Dr. Ruth Gschwind
3. Synopsis:	In the lab course *Methods of Organic Synthesis* students will learn modern methods of organic synthesis in a research-orientated manner and practise the safe handling of demanding laboratory techniques. The experiments cover enantioselective catalysis, organocatalysis, synthesis of heterocycles and drugs, methods of chromatographic separation (DC, GC, HPLC) and the characterization of intermediates and products using spectroscopy. The lab will be accompanied by a seminar (in English), where current topics in Organic Chemistry will be addressed by short presentations of the participants. From the given pool of lectures in Organic Chemistry the students will have to select four. These lectures will provide deeper insight in the theoretical background of a current research topic or an area of long-time importance, e.g. catalysis, bioorganic chemistry, planning of synthesis, methods of NMR-spectroscopy, and synthesis of natural compounds. For these respective fields of Organic Chemistry the basics, the state of the art and current perspectives will be discussed using examples from research.
4. Competences Acquired:	Having completed this basic module students know and understand advanced modern methods and techniques in Organic Chemistry and they are able to apply these in theory and practical work. This includes the understanding of complex reaction mechanisms, the determination of the structure of more complex organic molecules by spectroscopy, the proposal and the evaluation of synthetic pathways as well as the practical completion of technically demanding steps of synthesis and separation in the lab.
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Organic Chemistry as obtained within a preceding Bachelor program in chemistry or related fields.

b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every semester
8. Module Duration:	2 semesters
9. Recommended Semester in Major:	1st and 2nd semester in major
10. Total workload of the module / credit points:	480 hours/ 16 credit points* (240 h attendance time, 240 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	WP	V	Compulsory Elective Lecture Organic Chemistry I	2	
2	WP	V	Compulsory Elective Lecture Organic Chemistry 2	2	
3	WP	V	Compulsory Elective Lecture Organic Chemistry 3	2	
4	WP	V	Compulsory Elective Lecture Organic Chemistry 4	2	
5	P	P	Methods in Organic Synthesis	6	Oral colloquia before the experiments
6	P	S	Seminar accompanying the Lab Methods in Organic Synthesis	2	Seminar talk in English covering a given subject

Remarks:

Four lectures in Organic Chemistry have to be selected from the pool (OC sequence A–D). The lectures that are offered in one particular semester are announced in the lecture timetable.

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Examination:					
*A/T**	*Mode and content of examination*	*Prerequisites for admission ***	*Duration*	*Time*	*Mode of grading*
A	Module final examination covering the courses given in 11 (oral).	Courses given under 11. completed successfully	30 min		graded
Remarks: **Examination periods are as follows:** **winter semester: September 1st – December 15th and February 1st – March 31th** **summer semester: Mai 1st – May 31th and July 1st – July 31th**					

** A = module final examination; T = module partial examination ** optional*

13. Module Grade:		
☒	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☐	The module will not be graded	

14. Others:
If the module examination is not passed successfully in the first repetition, a second repetition is possible. Generally, this second repetition is an oral examination covering the complete module. It will be conducted by an examining board of at least two examiners. The grade of this examination will be the grade of the module.

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CHE-MSc-M 03

1. Module Name:	Basic Module Physical Chemistry
2. Field / Person in Charge:	Chemistry / Prof. Dr. Werner Kunz and Prof. Dr. Bernhard Dick
3. Synopsis:	Topics of Physical Chemistry that have been introduced in the modules of the Bachelor program, e.g. in the fields of spectroscopy, colloid- and interface chemistry and electrochemistry will be considered in more detail. Lectures can be selected from the current pool of lectures which is updated annually. The project lab can be chosen from the fields of spectroscopy, colloid- and interface chemistry, physical chemistry of liquids and electrochemistry. The lab course in Physical Chemistry offers several one-day experiments. The student has to select six of them. Currently the following experiments are available: • NMR spectroscopy: simple measurements using a 300 MHz spectrometer • Raman spectroscopy • Determination of a BET isotherm • Vapour pressure osmometry: Determination of molar masses and dissociation constants using osmometric measurements • Advanced calorimetry: calorimetric sensors, bomb calorimetry and differential scanning calorimetry (DSC). • Determination of dipole moments • Cyclic voltammetry. • Phase diagrams obtained from cooling curves • Measurement of quenching of excited states by integrated and time-resolved fluorescence (Stern-Volmer analysis, static and dynamic quenching, time-correlated single photon counting). Further experiments are in preparation.

4. Competences Acquired:	Having completed this basic module students have a deeper insight in current topics in Physical Chemistry and are able to understand complex relations and projects in current research. The labs put emphasis on working independently conducting students to the requirements of the Master Thesis.
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Physical Chemistry as obtained within a preceding Bachelor program in chemistry or related fields.
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every semester
8. Module Duration:	2 semesters
9. Recommended Semester in Major:	1st and 2nd semester in major
10. Total workload of the module / credit points:	480 hours/ 16 credit points* (180 h attendance time, 300 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	WP	V	Compulsory Elective Lecture Physical Chemistry I	4	
2	WP	V	Compulsory Elective Lecture Physical Chemistry 2 or Project Lab Physical Chemistry	4	
3	P	P	Lab Course Physical Chemistry	4	

Remarks:

Either two lectures in Physical Chemistry have to be selected from the pool or one lecture and a project lab in Physical Chemistry. Lectures and project labs are announced in the lecture timetable.

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Examination:					
*A/T**	*Mode and content of examination*	*Prerequisites for admission ***	*Duration*	*Time*	*Mode of grading*
A	Final examination covering the courses given in 11 (oral).	Courses given under 11. completed successfully	30 min		graded

Remarks:

Examination periods are as follows:

winter semester: September 1st – December 15th and February 1st – March 31th

summer semester: Mai 1st – May 31th and July 1st – July 31th

** A = module final examination; T = module partial examination ** optional*

13. Module Grade:		
☒	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☐	The module will not be graded	

14. Others:
If the module examination is not passed successfully in the first repetition, a second repetition is possible. Generally, this second repetition is an oral examination covering the complete module. It will be conducted by an examining board of at least two examiners. The grade of this examination will be the grade of the module.

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CHE-MSc-M 04

1. Module Name:	Basic Module Bioanalytics & Biosensors
2. Field / Person in Charge:	Chemistry / Prof. Dr. Frank-Michael Matysik
3. Synopsis:	**Lecture Bioanalytics I** • Repetition: Structural and functional properties of important biomolecules • Optical analytics in the bulk phase: concentration and structural analysis using UV/VIS, CD, ORD, IR, fluorescence techniques • Separation techniques: gas- and liquid chromatography, electrophoresis, capillary electrophoresis, hyphentated techniques • Methods in mass spectrometry: categorization of MS-methods according to ionization and principles of mass seperation: electrospray ionization-MS (ESI), matrix-assisted laser desorption ionization MS (MALDI), secondary ion mass spectrometry (SIMS) • Radioanalytical methods **Lecture Bioanalytics II** • Special bioanalytics of selected biomolecules: Proteins and Peptides / Carbohydrates / Lipids / Nucleic acids • Currents topics in bioanalytics **Lab Bioanalytics** • Isolation, quantification and microscopic localization of an intracellular protein • Genetic fingerprinting • Biosensors for glucose • Quantitative determination of binding constants by SPR • Capillary electrophoretic separations • Miniaturizes solid phase extraction of neurotransmitters and chromatographic quantification • Conformational analysis using circular dichroism • Derivative spectroscopy for quantitative analysis of vitamine mixtures • Quantitative isotop determination in biological liquids

4. Competences Acquired:	Having completed this basic module students are able to • chose suitable analytical techniques for important biomolecules with respect to structure, concentration and matrix • judge the applicability, strength and limitation of bioanalytical methods • extract, accumulate and quantify biomolecules to be analyzed from a biological matrix • name and judge methods to quantify biomolecular recognition • understand and analyse biosensor concepts for the determination of biomolecules • understand imaging techniques in molecular bioanalytics and judge them according to their respective field of application
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Analytical Chemistry as obtained within a preceding Bachelor program in chemistry or related fields. Basic knowledge in Biochemistry.
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every winter semester
8. Module Duration:	2 semesters
9. Recommended Semester in Major:	1st and 2nd semester in major
10. Total workload of the module / credit points:	480 hours/ 16 credit points* (195 h attendance time, 285 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	V	Lecture Bioanalytics I	3	
2	P	V	Lecture Bioanalytics II	2	
3	P	P	Lab Course Bioanalytics	8	Colloquia to the respective experiments; lab reports
Remarks:					

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Examination:

*A/T**	*Mode and content of examination*	*Prerequisites for admission ***	*Duration*	*Time*	*Mode of grading*
A	Final examination covering the courses given in 11 (oral).	Courses given under 11. completed successfully	30 min		graded

Remarks:

Examination periods are as follows:

winter semester: September 1st – December 15th and February 1st – March 31th

summer semester: Mai 1st – May 31th and July 1st – July 31th

** A = module final examination; T = module partial examination ** optional*

13. Module Grade:

☒	The module grade corresponds to the grade obtained in the final module exam.
☐	The module grade is calculated as follows:
☐	The module will not be graded

14. Others:

If the module examination is not passed successfully in the first repetition, a second repetition is possible. Generally, this second repetition is an oral examination covering the complete module. It will be conducted by an examining board of at least two examiners. The grade of this examination will be the grade of the module.

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CHE-MSc-M 05

1. Module Name:	Basic Module Theoretical Chemistry
2. Field / Person in Charge:	Chemistry / Prof. Dr. Martin Schütz
3. Synopsis:	The module covers two compulsory lectures with excercises and a lab course (computer excercises) which extend and deepen the basic knowledge in Theoretical Chemistry introduced in the Bachelor program Chemistry. The lectures cover a thorough discussion of methods of electron structure like density functional theory, coupled clusters, perturbation theory, multi reference methods as well as time-dependent response methods for electronically excited states. Theoretical tools (secondary quantization, Wick´s theorem, diagram methods) are introduced, practiced and applied. In the computer excercises these methods will be applied to different problems using the program package MOLPRO. In addition students implement an own Hartree-Fock program (in FORTRAN and MATLAB).
4. Competences Acquired:	The aim of this module is to provide the students both, a profound understanding of different relevant methods of electron structure and their implementation in computing. Having completed the module students are able to derive formalisms of the electron structure methods using the theoretical tools discussed in the lecture (e.g. diagram methods). In addition students gain knowledge of strengths, drawbacks and limitations of the respective methods enabling them to judge theoretical chemistry contributions in the literature.
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Theoretical Chemistry as obtained within a preceding Bachelor program in chemistry or related fields.
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every semester
8. Module Duration:	2 semesters

9. Recommended Semester in Major:	1st and 2nd semester in major
10. Total workload of the module / credit points:	480 hours/ 16 credit points* (180 h attendance time, 300 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	V+Ü	Lecture Theoretical Chemistry I	3+1	
2	P	V+Ü	Lecture Theoretical Chemistry II	3+1	
3	P	P	Lab Course Theoretical Chemistry	4	
Remarks:					

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Examination:

*A/T**	*Mode and content of examination*	*Prerequisites for admission ***	*Duration*	*Time*	*Mode of grading*
A	Final examination covering the courses given in 11 (oral).	Courses listed under 11. completed successfully	30 min		graded

Remarks:

Examination periods are as follows:

winter semester: September 1st – December 15th and February 1st – March 31th

summer semester: Mai 1st – May 31th and July 1st – July 31th

** A = module final examination; T = module partial examination ** optional*

13. Module Grade:

☒	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☐	The module will not be graded	

14. Others:

If the module examination is not passed successfully in the first repetition, a second repetition is possible. Generally, this second repetition is an oral examination covering the complete module. It will be conducted by an examining board of at least two examiners. The grade of this examination will be the grade of the module.

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CHE-MSc-M 06

1. Module Name:	Basic Module Biochemistry
2. Field / Person in Charge:	Chemistry / Prof. Dr. Joachim Wegener
3. Synopsis:	Lecture: Basics of Metabolism • General principles of metabolism • Catabolism of carbohydrates, lipids and proteins • Anabolism of carbohydrates, lipids proteins and nucleotides Lecture: Molecular Cell Biology • Cell structure: compartments and functional role of the compartments; cell junctions, cytoskeleton, extracellular matrix • Mechanisms of uptake and secretion (endocytosis, exocytosis), and intracellular transport • Detailed discussion of elementary processes in molecular biology: replication, DNA-reparation, recombination, transcription, RNA-processing, translation • Posttranslational modifications • Protein targeting • Control and regulation of gene expression • Cell cycle and proliferation control • Cell death: apoptosis and necrosis • Selected topics in molecular physiology (biochemistry of vision, signal transduction at the axon, chemical and electrical synapses, muscle contraction, immune system, complement system, pathogens) • Selected topics in biochemistry: resistance to antibiotics, AIDS, Schweinegrippe, prions and prion deseases, neurodegenerative deseases • Experimental work on a current research topic in biochemistry
4. Competences Acquired:	Having completed this basic module students are able to • describe the structure of pro- and eukaryotic cells and to name and judge the functional differences between them • describe the elementary processes in molecular biology with the species involved and to analyse their importance and role in dysfunction for the organism

	• recognize and analyse mechanisms of regulation in differential gene expression • discuss the role of cell proliferation and cell death in physiological and pathophysiological context • describe and analyse basic processes in molecular physiology on the basis of biochemistry • transfer basic knowledge in biochemistry to current topics in the life sciences • conduct clear-cut biochemical research under instruction
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Biochemistry as obtained within a preceding Bachelor program in chemistry or related fields.
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every semester
8. Module Duration:	2 semesters
9. Recommended Semester in Major:	1st and 2nd semester in major
10. Total workload of the module / credit points:	480 hours/ 16 credit points* (210 h attendance time, 270 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	V	Lecture: Molecular Cell Biology	2	
2	P	S	Lecture: Basics of Metabolism	2	
3	P	P	Lab Biochemistry (NWF III)	10	Completed lab report; testified by supervisor
Remarks: The lab “Biochemistry” will be offered by the faculty of Biology and Preclinical Medicine..					

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Examination:					
*A/T**	*Mode and content of examination*	*Prerequisites for admission ***	*Duration*	*Time*	*Mode of grading*
A	Final examination covering the courses given in 11 (oral).	Courses given under 11. completed successfully	30 min		graded
Remarks: **The lab "Biochemistry" will be offered by the faculty of *Biology and Preclinical Medicine*.** **Examination periods are as follows:** **winter semester: September 1st – December 15th and February 1st – March 31th** **summer semester: Mai 1st – May 31th and July 1st – July 31th**					

** A = module final examination; T = module partial examination ** optional*

13. Module grade:		
☒	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☐	The module will not be graded	

14. Others:
If the module examination is not passed successfully in the first repetition, a second repetition is possible. Generally, this second repetition is an oral examination covering the complete module. It will be conducted by an examining board of at least two examiners. The grade of this examination will be the grade of the module.

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CHE-MSc-M 15

1. Module Name:	Basic Module Medicinal Chemistry
2. Field / Person in Charge:	Chemistry / Prof. Dr. Achim Buschauer
3. Synopsis:	The lectures of the basic module Medicinal Chemistry concern general and special pharmaceutical/ medicinal chemistry as well as biotechnology. Within this framework both the basics of drug chemistry (ligand-receptor interactions, qualitative and quantitative relationships of structure and activity, computer-based methods, drug design, structure and functions of most important target molecules) and deepened insight in current drug chemistry will be given by selected substance classes and areas of indication. This concerns the chemistry (synthesis, chemical properties) of the respective drugs, their molecular modes of effect and structure-activity relations, the underlying pharmaco-therapeutic concepts, desired and important undesired drug effects as well as the biotransformation of drugs. The course “Computational methods in Medicinal Chemistry” teaches the theoretical basics of molecular modelling and covers essential structure and ligand-based approaches for the generation and optimization of lead structures. Application of these methods will be done on examples in a lab course (computer course using the software suite SYBYL)
4. Competences Acquired:	Students having completed this basic module understand the chemical basis of the biological activity of drugs and know important microbiological, pharmacological and computational methods in drug design as well as processes for synthesis and extraction of drugs. They are able both to analyze structure-activity relationships and to recognize correlations, to apply concepts to other drugs and to understand current developments in drug research due to their endeepened treatment of important drug classes.
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Organic Chemistry and Biochemistry as obtained within a preceding Bachelor program in chemistry or related fields.

b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every winter semester
8. Module Duration:	2 semesters
9. Recommended Semester in Major:	1st and 2nd semester in major
10. Total workload of the module / credit points:	480 hours/ 16 credit points* (210 h attendance time, 270 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	V	Lecture: General Medicinal Chemistry	2	Exam (passed/not passed)
2	P	V	Lecture: Medicinal Chemistry I	4	Exam (passed/not passed)
3	P	V	Lecture: Medicinal Chemistry II	4	Exam (passed/not passed)
4	P	P+S	Computational Methods in Medicinal Chemistry	4	

Remarks:

The exams related to the courses 11.1, 11.2 and 11.3 have to be passed before registration for the oral module final examination is possible.

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Examination:

*A/T**	*Mode and content of examination*	*Prerequisites for admission ***	*Duration*	*Time*	*Mode of grading*
A	Final examination covering the courses given in 11. (oral).	Courses given under 11. completed successfully	30 min		graded

Remarks:

Examination periods are as follows:

winter semester: September 1st – December 15th and February 1st – March 31th

summer semester: Mai 1st – May 31th and July 1st – July 31th

** A = module final examination; T = module partial examination ** optional*

13. Module grade:		
☒	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☐	The module will not be graded	

14. Others:
If the module examination is not passed successfully in the first repetition, a second repetition is possible. Generally, this second repetition is an oral examination covering the complete module. It will be conducted by an examining board of at least two examiners. The grade of this examination will be the grade of the module.

CHE-MSc-Extern-M 01: Grundmodul Physik

CHE-MSc-Extern-M 02: Grundmodul Biologie

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CHE-MSc-Extern-M 03

1. Module Name:	Basic Module Scientific Informatics
2. Field / Person in Charge:	Chemistry / Prof. Dr. Dominik Horinek Physics / Dr. Wünsch
3. Synopsis:	Selected topics in applied informatics with impact in the area of chemistry and physics. Courses will be offered by the faculties Mathematics / Physics / Biology / Chemistry / Medicine and the Rechenzentrum. The concrete courses will fixed for every semester by the institutions involved and will be announced by internet. Examples cover: • Statistical methods • Numerical procedures, optimization • Non-numerical algorithms and data structures • Monte-Carlo methods for simulation of physical and chemical systems • Molecular modelling • Molecular dynamics simulations • Bioinformatics • Genomic data analysis • Automatic learning • Technical: IT, regulation, data logging, digital signal processing • Dynamic, database-supported web techniques, computer- and microcontroller techniques • Programming of parallel computers • Techniques of objects-orientated programming
4. Competences Acquired:	Students having completed this basic module will learn exemplary methods of applied informatics that are important in their main subject physics or chemistry. This will enable them to act with competence in their later professional life in all upcoming issues related to informatics.
5. Prerequisites for Participation:	
a) Recommended:	Knowledge of a programming language, knowledge in the use of software for symbolic mathematics

b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	M.Sc. Chemistry, M.Sc. Physics
7. Module Start:	Every semester
8. Module Duration:	2 semesters
9. Recommended Semester in Major:	1st and 2nd semester in major
10. Total workload of the module / credit points:	480 hours/ 16 credit points* (200 h attendance time, 280 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	V	Altogether courses have to be chosen from the offer announced by internet that cover 12 SWS. Selected courses must not be given by a single faculty. The offer is announced in internet for every semester: www.physik.uni-regensburg.de/studium/sciinf	2	Exam (passed/not passed)

Remarks:

A selected course must not be used for another module in the master study of either chemistry or physics.

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Examination:

*A/T**	*Mode and content of examination*	*Prerequisites for admission ***	*Duration*	*Time*	*Mode of grading*
A	Final examination covering the courses given in 11. (oral).	Courses given under 11. completed successfully	30 min		graded

Remarks:
Students chose topics from the 12 SWS taken in a volume of 8 SWS for the examination which will be carried out by two examiners that must not belong to the same faculty. Examiners will be appointed by the board of examinations of the M.Sc. Chemistry or M.Sc. Physics, respectively. Generally, all persons offering courses in scientific informatics will be authorized examiners. The examination can be taken at any time, after the courses in the required volume have been completed.

** A = module final examination; T = module partial examination ** optional*

13. Module grade:		
☒	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☐	The module will not be graded	

14. Others:
If the module examination is not passed successfully in the first repetition, a second repetition is possible. Generally, this second repetition is an oral examination covering the complete module. It will be conducted by an examining board of at least two examiners. The grade of this examination will be the grade of the module.

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CHE-MSc-Extern-M 04

1. Module Name:	Basic Module „Nanoscience“
2. Field / Person in Charge:	Dean of the Faculty of Physics
3. Synopsis:	Lectures Nanomaterials I and II: Crash course in molecular and solid state physics, light-matter-interaction, macromolecules, quantum dots, nanowires, nanotubes and semiconductor nanostructures, colloids, self-organization and directed crystal growth, microscopic and spectroscopic methods of nanoscience, plasmonics, optoelectronics, metamaterials, nanoparticle-based sensors, examples from current science Lab Nanoscience: Preliminary note: The labs will be regularly advanced; thus, certain experiments may be added or replaced by others. - Optical tweezers - Atomic Force Microscopy (AFM) - Scanning Tunnel Microscopy (STM) - Electron beam lithography / Scanning electron microscopy - Magneto transport - Quantum-hall effect - Luminescence of “Quantentöpfe” - Fluorescence spectroscopy of quantum dots
4. Competences Acquired:	Students having completed this basic module will be able to characterize and categorize important basic physical properties of typical nanomaterials and can classify basically methods for preparation and investigation of nanomaterials. The ability to recognize connections of different traditional scientific disciplines in nanoscience and to use them methodically will be developed. Students will learn to project, plan, carry out and evaluate experiments for predictions of physical theories and to judge and analyze the results on their own both in qualitative and quantitative way and to present and defend their results in a scientific talk.
5. Prerequisites for Participation:	
a) Recommended:	Knowledge of a programming language, knowledge in the use of software for symbolic mathematics

b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	M.Sc. Chemistry, B.Sc. Nanoscience
7. Module Start:	Annual
8. Module Duration:	2 semesters
9. Recommended Semester in Major:	1st and 2nd semester in major
10. Total workload of the module / credit points:	480 hours/ 16 credit points* (225 h attendance time, 255 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	V	Nanomaterials I: Basics	2+2	(Home) exercises
2	P		Nanomaterials I: Structuring and Self-Organization	2+2	(Home) exercises
3	P		Lab Nanoscience (Part B)	7	Preparation of experiments, certificates, protocols
Remarks:					

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Examination:

*A/T**	*Mode and content of examination*	*Prerequisites for admission ***	*Duration*	*Time*	*Mode of grading*
A	Final examination covering the courses given in 11. (oral).		30 min		graded

Remarks:

Examination periods are as follows:

winter semester: September 1st – December 15th and February 1st – March 31th

summer semester: Mai 1st – May 31th and July 1st – July 31th

** A = module final examination; T = module partial examination ** optional*

13. Module grade:		
☒	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☐	The module will not be graded	

14. Others:
If the module examination is not passed successfully in the first repetition, a second repetition is possible. Generally, this second repetition is an oral examination covering the complete module. It will be conducted by an examining board of at least two examiners. The grade of this examination will be the grade of the module.

2. COMPULSORY ELECTIVE ADVANCED COURSES:

The student has to select two of the modules from the pool of advanced modules. The selection of an advanced module requires successful completion of the respective basic module.

CHE-MSc-M 07

1. Module Name:	Advanced module I Inorganic Chemistry
2. Field / Person in Charge:	Chemistry / Prof. Dr. Arno Pfitzner
3. Synopsis:	Lab course on inorganic synthesis with accompanying seminar for advanced students: The lab course will introduce advanced techniques in molecular and coordination chemistry as well as solid state chemistry with particular emphasis on special methods of synthesis. In the accompanying seminar current research topics from all areas of Inorganic Chemistry will be presented.
4. Competences Acquired:	Having completed this advanced module students are able to conduct more demanding synthesis in Inorganic Chemistry according to the literature and also, at least in part, to develop new synthesis under instruction. They can propose, conduct and analyse reasonable experiments to characterize new compounds on their own. Furthermore, students are able to present their experimental results to experts in a talk.
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Inorganic Chemistry as obtained within a preceding Bachelor program in chemistry or related fields. Knowledge and skills as provided by module CHE-MSc-M01 “Basic module Inorganic Chemistry”
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every winter semester
8. Module Duration:	1 semester

9. Recommended Semester in Major:	1st or 2nd semester in major
10. Total workload of the module / credit points:	180 hours/ 6 credit points* (75 h attendance time, 105 h home study)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	P	Lab Course in Inorganic Synthesis	4	Colloquia (passed / not passed); synthesis of selected compounds and their characterization
2	P	S	Accompanying Seminar to the Lab Course on inorganic synthesis	1	Presentation, if advanced module II is selected, too
Remarks:					

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Grade:

☐	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☒	The module will not be graded	

13. Others:

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CHE-MSc-M 08

1. Module Name:	Advanced module I Organic Chemistry
2. Field / Person in Charge:	Chemistry / Prof. Dr. Burkhard König
3. Synopsis:	The lab course on organic synthesis requires the students to solve problems using modern methods of synthesis and analysis, like solid phase reactions, combinatorial chemistry, microreaction technique, hyphenated analysis techniques (HPLC-MS) or special metal-, organo- or photocatalytic reactions. Students will give short talks (in English language) about the theoretical background, advantages and limitations of the methods addressed in the lab course. The accompanying lecture will illustrate the use of modern synthetic methods in organic chemistry using examples from current research and industrial research.
4. Competences Acquired:	Having completed this advanced module students know possibilities and limitations of important modern methods of synthesis and analysis in organic chemistry (combinatorial and solid state synthesis, microreaction technique, catalysis, coupled analysis techniques). They will be able to chose the best technique for solving a given problem and to judge their application.
5. Prerequisites for Participation	
a) Recommended:	Basic knowledge of Organic Chemistry as obtained within a preceding Bachelor program in chemistry or related fields. Knowledge and skills as provided by module CHE-MSc-M02 “Basic module Organic Chemistry”
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every summer semester
8. Module Duration:	1 semester

9. Recommended Semester in Major:	1st or 2nd semester in major
10. Total workload of the module / credit points:	180 hours/ 6 credit points* (90 h attendance time, 90 h home study)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	P	Preparatory Lab Course in Organic Synthesis	2	Experimental problems will have to be addressed and solved in groups. Results will be summarized in reports.
2	P	S	Accompanying Seminar to the Organic Synthesis Lab Course	2	Presentation on a given topic (in English)
3	WP	V	Elective compulsory lecture Organic Chemistry V	2	Exam (passed / not passed)

Remarks:

One lecture in Organic Chemistry has to be selected from the pool (OC sequence A–D). The lectures that will be announced in the lecture timetable.

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Grade:

☐	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☒	The module will not be graded	

13. Others:

Modern methods in synthesis will be endeepened.

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CHE-MSc-M 09

1. Module Name:	Advanced module I Physical Chemistry
2. Field / Person in Charge:	Chemistry / Prof. Dr. Werner Kunz and Prof. Dr. Bernhard Dick
3. Synopsis:	The project lab can be chosen from the fields spectroscopy, colloid- and surface chemistry, physical chemistry of liquids or electrochemistry.
4. Competences Acquired:	Student shall be given a deeper insight in current topics of Physical Chemistry, so that they understand even complex relations and current research work. Moreover they should be able to work out a limited topic on their own and to summarize it in either oral or written form.
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Physical Chemistry as obtained within a preceding Bachelor program in chemistry or related fields. Knowledge and skills as provided by the basic module in Physical Chemistry CHE-MSc-M03 if the selected lecture builds up on that.
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every semester
8. Module Duration:	1 semester
9. Recommended Semester in Major:	1st or 2nd semester in major
10. Total workload of the module / credit points:	180 hours/ 6 credit points* (75 h attendance time, 105 h home study)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	V	Project lab Physical Chemistry	4	Successful attendance of lab with reports (certification of person in charge)
2	P	S	Seminar accompanying Project lab	1	
Remarks:					

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Grade:

☐	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☒	The module will not be graded	

13. Others:

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CHE-MSc-M 10

1. Module Name:	Advanced Module I „Bioanalytics & Biosensors“
2. Field / Person in Charge:	Chemistry / Prof. Dr. Joachim Wegener
3. Synopsis:	**Lecture: Sensors, Arrays, Screening** • Sensors: - Introduction into Sensors & Biosensing; - Optical Sensors: Principles, Transducers, Label-based and label-free techniques - Electrochemical Sensors: Potentiometric Sensors (Principles, Transducers, Applications), Conductance Sensors (Principles, Transducers, Applications), Amperometric Sensors (Principles, Transducers, Applications) • Arrays: - Surface immobilization of biomolecules - Methods of array production, - Array readout and analysis, - Examples (Gen-Chips, Protein-Chips, …) • Screening: - Introduction into screening (the ‘omics’, HTS vs HCS); - Molecular screening (screening schemes for molecular recognition and biological activity); - Cell-based screening (cell and tissue culture in vitro, low tech screening assays, high tech screening formats, screening for differential gene expression); **Lab Course: Sensors, Arrays, Screening** • Impedimetric screening with human cells • Immunological screening techniques (ELISA) • Femtoliter array for single molecule analysis • DNA-Arrays • Screening for molecular recognition • Screening for cytotoxicity • SPR-imaging of bio-organized surfaces

4. Competences Acquired:	Having completed this module students are able to • analyse a biosensor with regard to its functional principle • develop concepts for biosensor design based on known signal transducers and judge different approaches • analyse and compare characteristics of biosensors • develop, judge and apply concepts for immobilization of biomolecules on surfaces • understand and explain design strategies of biosensors • understand High Content and High Throughput Screening approaches • recognize advantages and limitations of screening approaches • conduct experiments in molecular and cell based screening with low throughput
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Analytical Chemistry as obtained within a preceding Bachelor program in chemistry or related fields. Knowledge and skills as provided by module CHE-MSc-M04 “Basic module Bioanalytics”; Basic knowledge in Biochemistry;
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every summer semester
8. Module Duration:	1 semester
9. Recommended Semester in Major:	2nd semester in major
10. Total workload of the module / credit points:	180 hours/ 6 credit points* (105 h attendance time, 75 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:					
	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	V	Lecture Sensors, Arrays, Screening (in English)	3	Exam (passed / not passed)
2	P	P	Lab Course Sensors, Arrays, Screening	4	Colloquia to the respective experiments; lab reports
Remarks: The lecture “Sensors, Arrays, Screening” will be given in English					

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Grade:		
☐	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☒	The module will not be graded	

13. Others:

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CHE-MSc-M 11

1. Module Name:	Advanced Module I Theoretical Chemistry
2. Field / Person in Charge:	Chemistry / Prof. Dr. Martin Schütz
3. Synopsis:	During the research lab students will be integrated into a current research project. The student will work on a given topic and will conduct investigations supervised by the team leader or an assistant. Students are expected to develop their own concepts to solve the given problem. The module continues with the content of the basic module in a research-orientated manner. Thus, completion of the Basic Module in Theoretical Chemistry is required.
4. Competences Acquired:	Having completed the module students are able to apply theoretical models to a given problem on their own and, with instruction, to contribute to the development of new theoretical methods.
5. Prerequisites for Participation:	
a) Recommended:	Knowledge of Theoretical Chemistry as obtained within a preceding Bachelor program in chemistry or related fields. Knowledge and skills as provided by module CHE-MSc-M05 “Basic Module Theoretical Chemistry”
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every summer semester
8. Module Duration:	1 semester
9. Recommended Semester in Major:	1st or 2nd semester in major
10. Total workload of the module / credit points:	180 hours/ 6 credit points* (75 h attendance time, 105 h home study including preparation for examination)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:					
	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	P	Research Lab Theoretical Chemistry	5	Report
Remarks:					

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Grade:		
☐	The module grade is given by the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☒	The module will not be graded	

13. Others:

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CHE-MSc-M 16

1. Module Name:	Advanced Module I Sustainable Chemistry
2. Field / Person in Charge:	Chemistry / Prof. Dr. Burkhard König Prof.Dr. Werner Kunz Prof. Dr. Jörg Heilmann
3. Synopsis:	During a seminar the instructors of several institutes will introduce different topics of sustainable chemistry. These will cover both terminology and ecological accounting with related measurement methods, chemical conversion of renewable resources into fine chemicals, topics like the use of alternative solvents, emulgators and biopolymers and, finally, as a specific example, the use of medical plants. In addition, every participant will give a short talk on a selected topic. In a research lab which can be carried out in different working group in both Regensburg and at the Science Park Straubing particular questions concerning sustainable chemistry will be addressed and endeepened in the laboratory.
4. Competences Acquired:	Having completed the module students know the essential terms and techniques in sustainable chemistry for comparative and holistic evaluation of reactions, processes and chemical substances. The participants have applied those to concrete problems and are able to transfer methods of evaluation and optimization to new questions.
5. Prerequisites for Participation:	
a) Recommended:	Knowledge of Chemistry as obtained within a preceding Bachelor program in chemistry or related fields. Knowledge and skills as provided by one of the modules CHE-MSc-M01 – CHE-MSc-M04
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every summer semester
8. Module Duration:	1 semester
9. Recommended Semester in Major:	1st or 2nd semester in major

10. Total workload of the module / credit points:	180 hours/ 6 credit points* (60 h attendance time, 120 h home study)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P	P	Research Lab in one of the workgroups involved in Regensburg or at the Science Park Straubing	2	Practical problems are solved individually. The results will be recorded.
2	P	S	Seminar accompanying the lab Sustainable Chemistry	2	Talk on a given topic (in English)
Remarks:					

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Grade:

☐	The module grade is given by the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☒	The module will not be graded	

13. Others:

As a prerequisite for the Advanced Module I Sustainable Chemistry the Basic Module Inorganic Chemistry, Organic Chemistry, Physical Chemistry or Bioanalytics has to be taken.

3. COMPULSORY PART:

CHE-MSc-M 12

1. Module Name:	Advanced Module II
2. Field / Person in Charge:	Chemistry / Prof. Dr. Arno Pfitzner
3. Synopsis:	During the research lab the student will be integrated into a current project of a research group. He/she will work on a given topic and conduct research under supervision of the head of the group or an assistant. Students will be expected to generate and contribute individual strategies to solve a given problem. In an accompanying lecture the theoretical facts and skills in the particular field of chemistry will be strengthened. The module is meant to study in more detail the contents of the previous modules in a research-orientated way. Thus, the Advanced Module II is only open in those fields that have been selected as Basic Module and Advanced Module I before.
4. Competences Acquired:	Having completed this advanced module students are able to address scientific problems in the discipline of choice and to work on them on their own with only a limited amount of support using their theoretical and practical knowledge gathered so far.
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Chemistry as obtained within a preceding Bachelor program in chemistry or related fields. Knowledge and skills as provided by modules CHE-MSc-M01 – CHE-MSc-M11 as they were selected along the master program.
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every semester
8. Module Duration:	1 semester
9. Recommended Semester in Major:	3rd semester in major

10. Total workload of the module / credit points:	360 hours/ 12 credit points*

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	WP	P	Research Lab (to be chosen in either AC, OC, PC, AnC)	5/6	Report
2	WP	V	Lecture (to be chosen in either AC, OC, PC, AnC) Choice in AC: Inorganic Structural Chemistry OR Molecular Chemistry Choice in OC: Catalysis and Application OR NMR Spectroscopy of Organic Molecules Choice in PC: By arrangement Choice in AnC: Nanobioanalytics AND Radiobioanalytics	2/4	Exam (passed / not passed)

Remarks:

In this elective compulsory part both, a research lab and a lecture have to be selected in the same chemical discipline. Only those subjects can be selected, that have been studied in both, the Basic Module and the Advanced Module I. PC can be also chosen, if the Basic Module and the Advanced Module I Theoretical Chemistry has been taken. On demand the research lab in PC may be substituted by another lecture.

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Grade:

☐	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☒	The module will not be graded	

13. Others:

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CHE-MSc-M 13

1. Module Name:	Concluding module
2. Field / Person in Charge:	Chemistry / Prof. Dr. Manfred Scheer
3. Synopsis:	The module consists of a course addressing the methods applied in that chemical discipline, in which the master thesis will be completed, and a scientific field-trip. The former will provide more detailed instructions in important scientific skills in the field of the master thesis and their practical application. The scientific field-trip will demonstrate aspects of applied chemistry in selected chemical companies as well as non-university research institutes.
4. Competences Acquired:	The students will be able to apply advanced scientific methods in the field of their master thesis that have studied theoretically and practically. They have basic knowledge of generic concepts in applied chemistry as found in industry and the job profiles of chemists in leading positions of non-university companies and institutions.
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Chemistry as obtained within a preceding Bachelor program in chemistry or related fields. Knowledge and skills as provided by modules CHE-MSc-M01 – CHE-MSc-M12 as they were selected along the individual master program.
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till ☐	none
6. Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every semester
8. Module Duration:	2 semesters
9. Recommended Semester in Major:	3rd and 4th semester in major
10. Total workload of the module / credit points:	450 hours/ 15 credit points* (225 h attendance time, 225 h home study)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:					
	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	WP		Course in Methodology	10	Certificate of attendance
2	WP		Excursion	5	Certificate of attendance
Remarks:					

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Grade:		
☐	The module grade corresponds to the grade obtained in the final module exam.	
☐	The module grade is calculated as follows:	
☒	The module will not be graded	

13. Others:

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CHE-MSc-M 14

1. Module Name:	Master thesis
2. Field / Person in Charge:	Chemistry / Prof. Dr. Joachim Wegener
3. Synopsis:	The module includes the research on the topic of the master thesis as well as the regular attendance of the research group seminar offered by the supervisor of the thesis. In the master thesis a current topic in chemistry or a neighboring scientific discipline will be investigated by the student, under supervision but mostly on its own. Both topic and methods will be agreed on with the supervisor. Current topics in ongoing research will be presented and discussed in the regular seminar of the research group. The student will report at least once the results of his thesis. The module will practice the writing of a scientific text and lead the student to autonomous research.
4. Competences Acquired:	The students will be able to plan and conduct research on a scientific problem in chemistry or a related natural science on their own. The student has advanced skills in literature search and -analysis, design of experiments and their analysis as well as in scientific writing.
5. Prerequisites for Participation:	
a) Recommended:	Basic knowledge of Chemistry as obtained within a preceding Bachelor program in chemistry or related fields. Knowledge and skills as provided by modules CHE-MSc-M 01 – CHE-MSc-M 12 and CHE-MSc-M 15 – CHE-MSc-M 16 as they were selected along the individual master program.
b) Compulsory Certificates: to be submitted instantly ☐ to hand in till end of 3.semester in major ☒	At least 60 CP obtained during the M.Sc. Chemistry The application for admission to the master thesis has to take place at the examination office at least 2 weeks before research is about to start, however, earliest after the last examination required for admission is passed.
6. Module Module Accepted in:	Chemistry M.Sc.
7. Module Start:	Every semester
8. Module Duration:	2 semesters

9. Recommended Semester in Major:	3rd and 4th semester in major
10. Total workload of the module / credit points:	990 hours/ 3 credit points* (480 h attendance time, 510 h home study)

**The CP for the module will not be awarded before the final module exam or all parts of the module exam have been passed.*

11. Courses:

	*P / WP / W **	*Type of course*	*Topic*	*Required time of attendance in SWS o. h.*	*Deliverables*
1	P		Master thesis		Master thesis (graded)
2	P	S	Seminar	4	Reports on current research during the Master thesis

Remarks:

The grade of the master thesis will be the mean of the grades given by both expertises. If the grades of both expertises differ by more than a full grade, the examination board will fix the grade after consultation of the examiners.

** P = required course; WP = elective compulsory course; W = elective course*

12. Module Grade:

☐	The module grade corresponds to the grade obtained in the final module exam.	
☒	The module grade is calculated as follows: Grade for the Master thesis	 100 %
☐	The module will not be graded	

13. Others: